Naval Facilities Engineering Systems Command Hawaii

Site Characterization Report
November 2021 JP-5 Release in Adit 3, Operable Unit 1
Red Hill Bulk Fuel Storage Facility

JBPHH, O‘ahu, Hawai‘i

DOH Facility ID No. 9-102271
DOH Release ID No. 20211120_2330

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Prepared for NAVFAC Hawaii by

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Executive Summary

This Operable Unit 1 (OU-1) Site Characterization Report was prepared for Naval Facilities Engineering Systems Command (NAVFAC) Hawaii by AECOM in accordance with the State of Hawai‘i Department of Health (DOH) *Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan* (TGM) (DOH 2021a) and in response to the DOH release confirmation letter dated November 24, 2021 for the Red Hill Bulk Fuel Storage Facility (Facility) and as required by Hawai‘i Administrative Rules (HAR) 11-280.1-65.2.

This report focuses on site characterization of OU-1, which includes the shallow subsurface environmental media including soil vapor, soil, rock, and groundwater located below the tunnel floor (btf) and above the bottom of the shallow water (perched groundwater), estimated at (b) (3) (A) (ft) btf within the Study Area. The Study Area includes the (b) (3) (A) of the Adit 3 Tunnel and the (b) (3) (A) of the Pearl Harbor Tunnel. The main features of the Study Area include the Adit 3 Sump; the US Navy Well 2254-01, also known as Red Hill Shaft (RHS); the RHS water development tunnel; the intersection of the Adit 3 and Pearl Harbor Tunnels, called the Adit 3 and Pearl Harbor Tunnel wye, and the location of the November 20, 2021 Jet Propellant No. 5 (JP-5) fuel release to the environment from an overhead fire suppression discharge line, as shown on Figure ES-1. The period of time covered by this report (reporting period) extends from November 20, 2021 through January 31, 2023.

(b) (3) (A)

Figure ES-1. Adit 3 Study Area Features

This report describes the initial phases of an ongoing environmental investigation. A comprehensive report will be prepared following the completion of the investigation of JP-5 in environmental soil vapor, soil, rock, and groundwater below the OU-1 Study Area, including the impacted basal aquifer, which is a drinking water source, and the RHS water development tunnel, also known as Operable Unit 2 (OU-2). This report does not address other releases that may have occurred before the November 20, 2021 JP-5 release, or outside of the Study Area defined above.

Objectives

The principal study questions to be considered in this report are as follows:

- What are the extent and magnitude of JP-5 that remains in the environment within the Study Area that would have the potential to threaten human health and the environment?
- What are the migration pathways that could transport chemicals of potential concern (COPCs) from the environment to receptors at concentrations that could pose unacceptable risk?
- What are the primary and secondary media of concern that can be treated to mitigate the migration of COPCs to receptors at concentrations that could pose an unacceptable risk?
- Who/what are the human and environmental receptors that may be at unacceptable risk from COPCs that remain in the environment from the November 2021 Release?

Field Activities

In December 2021, subslab soil vapor monitoring points (SVMPs) were installed into the concrete floor throughout the Study Area to identify initial variations in fuel-related vapors, including areas of high concentrations (hot spots) using hand-held instruments with real-time results for organic vapors and related vapor parameters. Long-term periodic monitoring of these subslab SVMPs has also provided evidence of fuel migration and degradation in the environmental material directly beneath the tunnel floor. Subslab SVMP monitoring began on December 17, 2021, with initial monitoring conducted daily, then weekly through June 2022. As of the current reporting period, subslab SVMPs are monitored monthly, with out-of-frequency sampling occurring following significant rain events. As of this reporting period, monitoring events continue although subslab vapor concentrations have continued to decrease at all subslab SVMPs locations.

In addition, selected subslab and shallow SVMPs have been sampled for laboratory analysis to identify the concentration of specific COPCs, including: total petroleum hydrocarbons (TPH); selected volatile organic compounds (VOCs); and gases related to the fate and transport of the COPCs, including helium, carbon dioxide, and oxygen. These will be used to establish a baseline for future monitoring comparisons.

Geophysical surveys using ground-penetrating radar (GPR) and electrical resistivity/induced polarity (ER/IP) were conducted within the Adit 3 and Pearl Harbor Tunnels in January and February 2022. The purpose of this first phase was to evaluate the capability of these technologies to provide information on the presence of JP-5, as well as to identify preferential pathways that

JP-5 might travel from the release location to the underlying basal aquifer (OU-1 and OU-2). Based on the results of the first phase and results from interim environmental sampling described below, a second-phase GPR survey was conducted in November 2022 in the Adit 3 Tunnel that focused on the presence of JP-5 and potential migration pathways in the shallow media associated with OU-1.

Intrusive shallow excavations, drilling and environmental sampling of OU-1 soil, rock, and groundwater followed a phased approach such that information observed in early phases of the investigation was used to plan and conduct later phases. The purpose of this multi-phased process was to provide information required to estimate the nature and extent of contamination and to support the design and implementation of cleanup remedies.

The first phase of the intrusive investigation was performed in March 2022. The Navy installed six shallow trenches and associated soil borings for shallow (less than 5 ft btf) SVMPs in the Adit 3 and Pearl Harbor Tunnels Study Area. The objectives were to collect information on the conditions in the shallow soil, rock, and soil vapor that would support later phases of focused drilling and sampling to the underlying basal aquifer that is a source of drinking water; and to uncover the Hume drain, which conveys stormwater and RHS pump cooling water to the Adit 3 Sump and is expected to have transported JP-5 throughout the OU-1 subsurface.

Initially, five shallow trenches were excavated to bedrock, which ranged from 0.5 to approximately 3 ft btf, where data from subslab vapor pins showed high concentrations of organic vapors. A shallow soil boring was installed at each trench to a maximum depth of 6 ft btf for the installation of shallow (less than 5 ft btf) soil vapor probes. JP-5 was observed in the trench boring located (b) (3) (A) to the Pump Station at thicknesses ranging from a sheen to 0.4 ft. In addition, the first evidence of shallow perched water was observed in the following three trench borings: between the Adit 3 Sump and the Pump Station; (b) (3) (A) to the Pump Station, associated with JP-5 observations; and to a lesser degree in the Adit 3 Tunnel (b) (3) (A) to the wye.

A sixth shallow trench was excavated, sampled, and vaulted (b) (3) (A) to the US Navy Well 2254-01 Pump Station to provide access to the 6-inch concrete Hume line and gravel-filled utility corridor. The Hume drain and corridor were expected to be uncovered within the initial five trenches, but instead was identified in an existing core hole along the (b) (3) (A) wall of the Adit 3 Tunnel. During the release event, JP-5 filled the Adit 3 Sump to approximately 2 ft above the Hume drain discharge opening, creating overhead pressure that likely caused JP-5 to backflow up the drain line and utility corridor toward RHS.

Trenches and associated soil borings were backfilled, and the surface of tunnels were returned to initial conditions in April 2022.

Based on the observations of fuel and perched water observed in the trench borings, a second phase was conducted, which included installation and sampling of step-out borings between June 24, 2022 and January 18, 2023. The objective of the second phase was to delineate the JP-5 in soil and perched groundwater in the OU-1 Study Area.

Perched groundwater samples were collected during the first and second phases of the investigation. In March 2022, groundwater samples were collected from two of five soil borings, in which the perched groundwater was encountered between 3 and 4 ft btf while advancing borings for SVMPs. These qualitative samples were collected to better understand the extent of JP-5 migration. In September 2022, the second phase of groundwater samples were collected from seven temporary wells that were installed in selected soil borings. These temporary wells were properly developed, and groundwater and JP-5 samples were collected and analyzed that quantitatively defined the groundwater COPCs concentrations and the JP-5 fuel forensics. In addition, pressure transducers were installed in seven temporary wells, which continuously record fluctuations in water levels within the perched water system.

In March 2022, a monitoring program was implemented as step-out borings temporary borings were installed in the Adit 3 and Pearl Harbor Tunnels. This included gauging the thickness of JP-5 as light nonaqueous-phase liquid (LNAPL); measuring static groundwater levels; and measuring organic vapors with real-time photoionization detectors (PIDs). Weekly measurements were recorded starting in May 2022 and continued through this reporting period. At the completion of this reporting period, the monitoring program described above consisted of 23 step-out borings, including seven borings that have been converted to temporary wells.

Analytical Results

Petroleum-impacted soil, perched groundwater and LNAPL, and soil vapor results for this investigation were evaluated for the COPCs as defined in the DOH TGM for middle distillates including:

- TPH in the gasoline range (TPH-g)
- TPH in the diesel range (TPH-d)
- TPH in the residual oil range (TPH-o)
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX)
- Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene (N, 1MN, and 2MN)
- LNAPL

These analytical results were compared to DOH Hazard Evaluation and Emergency Response (HEER) Environmental Action Levels (EALs) (DOH 2017) that are relevant to the Study Area. This evaluation identified concentrations of COPCs in soil/rock and perched water that exceeded conservative EALs for the following exposure routes: potential Leaching to Groundwater that is a source of drinking water; Direct Exposure to human receptors; potential impacts to Chronic Aquatic Habitat; and Nuisance thresholds (taste and odor).

JP-5 was observed in OU-1 as LNAPL accumulation in perched water table wells; and in soil and rock from test kit results. This LNAPL is an ongoing source for COPCs that could potentially be transported to the underlying drinking water aquifer.

Recommendations

The Navy recommends continuing site characterization of the deeper vadose zone located between OU-1 and the basal aquifer, which is designated OU-2. OU-1 and OU-2 site characterization is recommended to continue in parallel with design and implementation of pilot studies The pilot studies that will evaluate remediation technologies, including soil vapor extraction (SVE) in the unsaturated fractured rock and permeable clinker zones as well as air sparging in the saturated perched water zone.

Following the completion of the OU-2 site characterization, the Navy recommends addressing unacceptable site-specific risks to support the development of remedial action objectives (RAOs) that will be protective of human health and the environment for both OU-1 and OU-2. The Navy will prepare an Environmental Hazard Evaluation (EHE) in accordance with the DOH TGM to document site-specific risks and resulting RAOs.

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Acronyms and Abbreviations

%R	percent recovery
µg/L	micrograms per liter
1MN	1-methylnaphthalene
2MN	2-methylnaphthalene
amsl	above mean sea level
BTEX	benzene, toluene, ethylbenzene, and total xylenes
BTEXMN	benzene, toluene, ethylbenzene, xylenes, methylnaphthalenes, and naphthalene
btf	below tunnel floor
BWS	Honolulu Board of Water Supply
CO_2	carbon dioxide
CoC	chain of custody
COPC	chemical of potential concern
CSM	conceptual site model
CTO	contract task order
DoD	United States Department of Defense
DOH	State of Hawai‘i Department of Health
DQO	data quality objective
DRO	diesel range organics
DSVMP	deep nested soil vapor monitoring point
DU	decision unit
EAL	Environmental Action Level
EDD	electronic data deliverable
EDMS	Environmental Data Management System
EDS	Environmental Data Services, Ltd.
EHE	Environmental Hazard Evaluation
EPA	Environmental Protection Agency, United States
ER/IP	electrical resistivity and induced polarity
FD	field duplicate
ft	foot/feet
GC/MS	gas chromatography/mass spectrometry
GPR	ground-penetrating radar
HAR	Hawai‘i Administrative Rules
HDPE	high-density polyethylene
HEER	Hazard Evaluation and Emergency Response
HGI	hydroGEOPHYSICS, Inc.
ID	identification
JBPHH	Joint Base Pearl Harbor-Hickam
JP-5	jet fuel propellant number 5
LCS	laboratory control sample

LCSD	laboratory control sample duplicate
LNAPL	light nonaqueous-phase liquid
LOD	limit of detection
LOQ	limit of quantitation
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mgd	million gallons per day
MHz	megahertz
MIS	multi-increment sampling
MS	matrix spike
MSD	matrix spike duplicate
N	naphthalene
NAPL	nonaqueous-phase liquid
NAVFAC	Naval Facilities Engineering Systems Command
Navy	United States Department of the Navy
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Interest
NSZD	natural source-zone depletion
O_2	oxygen
OU	Operable Unit
OWDF	Oily Waste Disposal Facility
PAH	polynuclear aromatic hydrocarbon
PIANO	paraffins, isoparaffins, aromatics, naphthalenes, and olefins
PID	photoionization detector
ppmv	parts per million by volume
QA	quality assurance
QC	quality control
QSM	Quality Systems Manual
RA	Regulatory Agency
RHS	Red Hill Shaft
ROV	remotely operated vehicle
RPD	relative percent difference
SDG	sample delivery group
SHC	saturated hydrocarbon
SIM	selected ion monitoring
SME	subject matter expert
SOP	standard operating procedure
SVMP	soil vapor monitoring point
SVE	soil vapor extraction
TAT	turnaround time
TGM	Technical Guidance Manual
TPH	total petroleum hydrocarbons

TPH-d	total petroleum hydrocarbons – diesel range organics
TPH-g	total petroleum hydrocarbons – gasoline range organics
TPH-o	total petroleum hydrocarbons – residual oil range organics
U.S.	United States
UIC	Underground Injection Control
UV	ultraviolet
VOC	volatile organic compound

1.0 Introduction and Purpose

This Site Characterization Report was prepared for Naval Facilities Engineering Systems Command (NAVFAC) Hawaii by AECOM Technical Services, Inc. to present information collected while assessing the November 20, 2021 release of Jet Propellant No. 5 (JP-5) (the November 2021 Release) to the Adit 3 and Pearl Harbor Tunnels (the Study Area). The Study Area is part of the Red Hill Bulk Fuel Storage Facility (the Facility), which consists of [redacted] (b) (3) (A) within the Red Hill ridge that divides South Hālawa Valley from Moanalua Valley (Figure 1-1). This Site Characterization Report was prepared in accordance with the State of Hawai‘i Department of Health (DOH) *Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan* (TGM) (DOH 2021a) as required by Hawai‘i Administrative Rules (HAR) 11-280.1-65.2. This Site Characterization Report was prepared under Contract N62742-17-D-1800, Contract Task Order (CTO) N6274222F0106.

Statement of Purpose. Investigation activities were performed to address the November 2021 Release. DOH issued the following Notice of Interest (NOI) letter for this release event:

- DOH Hazard Evaluation and Emergency Response Release Incident Case No. 20211120-2330 on November 24, 2021 (DOH 2021b)

This report is focused on Operable Unit (OU)-1 of the Adit 3 subsurface investigation, which includes the shallow subsurface environmental media comprised of soil, rock, and groundwater between the bottom of the shallow water layer (approximately [redacted] (b) (3) (A) below the tunnel floor) and the tunnel floor within the Study Area. This report focuses on media that have been impacted by the November 2021 Release inside Adit 3, and is not intended to discuss other investigations occurring elsewhere at the Red Hill Facility. The period of time covered by this report (reporting period) extends from November 20, 2021 through January 31, 2023.

2.0 Background

On November 20, 2021, a release of JP-5 fuel occurred in the Adit 3 Tunnel of the Facility. JP-5 fuel was released from an overhead 14-inch polyvinyl chloride fire suppression recovery drain line at a location approximately [redacted] (b) (3) (A) of the water supply Pump Station for Navy Well 2254-01, also known as Red Hill Shaft (RHS), and approximately [redacted] (b) (3) (A) of the junction with the Pearl Harbor Tunnel. RHS is a Maui-type well comprising a [redacted] (b) (3) (A) shaft that connects to a [redacted] (b) (3) (A) water development tunnel that extends greater than [redacted] (b) (3) (A) of the Pump Station at an elevation of approximately [redacted] (b) (3) (A) above mean sea level (amsl). The release point location was [redacted] (b) (3) (A) in close proximity to the water development tunnel, with approximately [redacted] (b) (3) (A) of [redacted] (b) (3) (A) separation from the release point to the [redacted] (b) (3) (A) of the water development tunnel. See Figure 2-1 and Figure 2-2 for site features.

Released fuel flowed along the Adit 3 Tunnel floor [redacted] (b) (3) (A) past the junction with the Pearl Harbor Tunnel and Navy Well 2254-01. Fuel accumulated in a groundwater sump (Adit 3 Sump), approximately [redacted] (b) (3) (A) of the November 2021 Release point.

Upon confirmation that a fuel-like odor was present in drinking water in homes served by the Navy drinking water distribution system, Navy Well 2254-01 was shut off and isolated from the drinking water distribution system on November 28, 2021. On December 2, 2021, a sample that included JP-5 and groundwater was collected from the RHS water development tunnel from sampling point RHMW2254-01.

2.1 Site Description

Figures 2-1 and 2-2 present the major features of the Study Area described below. The Study Area described in this Site Characterization Report is located within the [redacted] (b) (3) (A) of the Adit 3 Tunnel and the [redacted] (b) (3) (A) of the adjoining Pearl Harbor Tunnel, which is part of the Facility. The main features of the Study Area include: the Adit 3 Sump; the US Navy Well 2254-01, also known as Red Hill Shaft (RHS); the RHS water development tunnel; the intersection of the Adit 3 and Pearl Harbor Tunnels, called the Adit 3 and Pearl Harbor Tunnel wye; and the November 20, 2021 JP-5 release location, where fuel was released to the environment from an overhead fire suppression discharge line.

These tunnels were excavated into the bedrock (volcanic lava flows) that forms the Red Hill ridge. The bedrock is described in later subsections.

The valve breach that resulted in the November 2021 Release occurred in the vent room of the Adit 3 Tunnel, approximately [redacted] (b) (3) (A) of the Adit 3 entrance at approximately [redacted] (b) (3) (A) amsl. The vent room is approximately [redacted] (b) (3) (A) long with [redacted] (b) (3) (A) and [redacted] (b) (3) (A) containment doors and a wooden threshold on the [redacted] (b) (3) (A) doorway. During the JP-5 release, fuel moved [redacted] (b) (3) (A) along the tunnel floor toward the Adit 3 entrance and infiltrated through the tunnel floor into the volcanic bedrock underlying the site.

The Adit 3 and Pearl Harbor Tunnels are approximately [redacted] (b) (3) (A) wide with arched ceilings and include utilities running along the sidewalls, in overhead utility trays, or as metal pipes hung from the ceiling. Large-diameter steel pipes that carry fuel from the tank farm to Pearl Harbor are located along the [redacted] (b) (3) (A) sidewall of the Pearl Harbor Tunnel and along the [redacted] (b) (3) (A) sidewall of the Adit 3 Tunnel [redacted] (b) (3) (A) of the Pearl Harbor Tunnel intersection.

The tunnel floors consist of reinforced concrete ranging from [redacted] (b) (3) (A) in thickness. A 24-gauge rail system is located in the middle of the tunnel floors throughout the Study Area and is used to transport materials and supplies throughout the lower access tunnels via an electric train. The train rails at the intersection between the Adit 3 and Pearl Harbor Tunnels are designed as a triangular switching wye to allow service trains to change travel directions within the Study Area. The switches are bolted into the tunnel floors and may represent migration pathways into the subsurface volcanic material vertically through fractures and permeable bedding planes.

Approximately [redacted] (b) (3) (A) of the release area is RHS (Hawai‘i Well Identification [ID] 2254-01), which was a potable water Pump Station operated by NAVFAC Hawaii, Utilities and Energy

Division prior to the November 2021 Release in Adit 3. The Pump Station is located within the Facility's (b) (3) (A) tunnel system associated with the Adit 3 Tunnel, at approximately (b) (3) (A) amsl. Prior to the November 2021 Release, the Pump Station supplied the Joint Base Pearl Harbor-Hickam (JBPHH) Water Distribution System. The average pumping rate at RHS ranged from 3.0 million to 5.9 million gallons per day (mgd). RHS was shut down on November 28, 2021, following the observation of organic odor in residential water systems served by RHS.

The Pump Station draws groundwater from its (b) (3) (A) water development tunnel (also called an infiltration gallery). The RHS water development tunnel extends (b) (3) (A) the basal water table (between (b) (3) (A) amsl) to approximately (b) (3) (A) of the Pump Station. The water development tunnel is approximately (b) (3) (A) directly (b) (3) (A) the access tunnels in the following two locations, which are vulnerable to petroleum releases in the Study Area:

- In the Pearl Harbor Tunnel, (b) (3) (A) of the intersection of the Adit 3 and Pearl Harbor Tunnels
- In the Adit 3 Tunnel, (b) (3) (A) of the Pump Station entrance portal. This location is, directly (b) (3) (A) of the November 20, 2021 valve rupture that resulted in the JP-5 release to the Adit 3 and Pearl Harbor Tunnels.

At approximately (b) (3) (A) of the release area in the Adit 3 Tunnel is an Adit 3 stormwater sump (Adit 3 Sump) and Adit 3 sanitary sewage collection tank, which are located at the low point of the Adit 3 Tunnel floor (approximately (b) (3) (A) amsl). The Adit 3 Sump has an outfall from the Hume drain that conveys storm water and RHS pump cooling water to the sump. The Hume drain line extends from the sump (b) (3) (A) approximately (b) (3) (A) between (b) (3) (A) below the tunnel floor (btf), to a point approximately (b) (3) (A) of the Pump Station portal, where blockage was observed in a piping video, though design drawings indicate it may extend into the Adit 3 wye. Design drawings also show the Hume drain extending (b) (3) (A) from the Adit 3 Sump, though this section appears to be more steeply dipping toward the sump in this location. The Hume drain utility corridor was located along the (b) (3) (A) wall of the Adit 3 Tunnel (b) (3) (A) to the Pump Station portal. The Hume drain utility corridor was a likely migration pathway for JP-5 during the release and thereafter.

A 4-inch drain line discharges water used to cool the RHS production pumps. This discharge drain line extends (b) (3) (A) the concrete floor from RHS within the Pump Station through the Pump Station portal, then (b) (3) (A) to a discharge point. The Navy has indicated that this cooling water discharge line is perforated and likely releases water into the Hume drain line corridor, where it is transported into the Adit 3 Sump via the Hume drain line or infiltrates back into the vadose zone perched water system.

The perched water table exists between (b) (3) (A) beneath the Adit 3 Tunnel floor, extending from (b) (3) (A) of the Adit 3 Sump to (b) (3) of the RHS Pump Station portal. (b) (3) (A) of the Pump Station portal, the elevation of the perched water table is observed to fluctuate directly with large precipitation

events. (b) (3) (A) of the Pump Station portal, the perched water table varies with RHS pumping activity, which is evidence that RHS pump cooling water that is transported to the sump via the Hume drain is a contributing source of the perched water.

During the initial phase of the investigation, a Site-specific coordinate system was developed to delineate stations and sampling locations within each tunnel and the wye, as follows.

Adit 3 Tunnel:

- Stations and sample locations within the Adit 3 Tunnel are designated with an initial two characters "A3".
- The origin is designated as "A3+000", and is located in Adit 3, aligned with the (b) (3) (A) edge of the Pump Station portal.
- The units are in feet and are positive (+) in the (b) (3) (A) direction, toward the Adit 3 entrance; and negative (-) in the (b) (3) (A) direction, toward the tank farm.
- For example: Station A3-375 is located (b) (3) (A) of the Pump Station, at the November 20, 2021 JP-5 release location.

Pearl Harbor Tunnel:

- Stations and sample locations within the Pearl Harbor Tunnel are designated with an initial two characters "2S".
- The origin is designated as "2S+000", and is located at the intersection of the Adit 3 and Pearl Harbor Tunnels at the (b) (3) (A) spur of the wye.
- The units are in feet and are positive (+) in the (b) (3) (A) direction, toward Adit 2 and Pearl Harbor.
- For example: Station 2S+075 is located (b) (3) (A) of the Adit 3/Pearl Harbor Tunnel intersection, approximately (b) (3) (A) the RHS water development tunnel

Pearl Harbor Tunnel:

- Stations and sample locations within the Pearl Harbor Tunnel are designated with an initial two characters "2S".
- The origin is designated as "2S+000" and is located at the intersection of the Adit 3 and Pearl Harbor Tunnels at the (b) (3) (A) spur of the wye.
- The units are in feet and are positive (+) in the (b) (3) (A) direction, toward Adit 2 and Pearl Harbor.
- For example: Station 2S+075 is located (b) (3) (A) of the Adit 3/Pearl Harbor Tunnel intersection, approximately (b) (3) (A) the RHS water development tunnel.

(b) (3) (A) spur of the Adit 3/Pearl Harbor Tunnel wye:

- Stations and sample locations within the (b) (3) (A) spur of the wye between the Adit 3 Tunnel and the Pearl Harbor Tunnel (Approximately (b) (3) (A) extent) are designated with an initial two characters "1S".
- The origin is designated as "1S+000", and is located at the intersection of the Adit 3 and (b) (3) (A) spur of the wye.
- The units are in feet and are positive (+) in the (b) (3) (A) direction, toward Adit 2 and Pearl Harbor.
- For example: Station 1S+075 is located (b) (3) (A) of the Adit 3 Tunnel/(b) (3) (A) spur intersection, approximately (b) (3) (A) the RHS water development tunnel.

2.1.1 Climate

Climatological conditions in the area of Red Hill consist of warm to moderate temperatures and low to moderate rainfall. The average annual precipitation is approximately 40 inches, which occurs mainly between November and April (Giambelluca, Nullet, and Schroeder 1986). Average temperatures range from the low 60s to high 80s (degrees Fahrenheit) (Juvik and Juvik 1998).

During the investigation, the Navy monitored annual accumulated precipitation for the Study Area on a 15-minute reporting frequency from a National Oceanic and Atmospheric Administration (NOAA) rain gauge MOAH1, located in Moanalua Valley at 239 ft amsl elevation. Figure 2-3 presents a chart documenting the accumulated precipitation from December 2021 through January 2023 from the MOAH1 rain gauge.[1]

2.1.2 Geology

Red Hill is located within the Koʻolau Volcanic series. The Koʻolau formation consists of the basaltic lava flows that erupted from a fissure line approaching 30 miles in length and trending in a northwest rift zone (Wentworth and Macdonald 1953). Pāhoehoe and aʻā lava flows are present in the Koʻolau formation. The presence of nearly horizontal beds of lava flows with variable strike and dip and alternately greater and lesser resistance to erosion at the site has been described in previous investigations and observed during site drilling. The flows within the Study Area appear discontinuous, undulating, and uneven.

Also observed in core holes within the Study Area is aʻā clinker, which is composed of gravel- and cobble-size rubble that resembles a conglomerate. It is usually loosely held together unless it has been welded together by heat. Aʻā clinker is extremely permeable and is subject to more rapid chemical weathering processes. Vertical fractures present within individual lava flows of aʻā are

[1] https://www.pwsweather.com/station/mid/moah1?timespan=month&date=2021-12-01

also subject to rapid weathering. Similarly, the nearly horizontal contacts between pāhoehoe lava flows, which are absent of aʻā clinker, are susceptible to weathering. Rock layers with denser, more closely spaced intra-flow fracturing appear more extensively weathered.

Although extensive shallow hammer drilling (up to 6 ft btf) has been conducted the for delineation of fuel contamination and installation of monitoring wells, lithologic observations were minimal from the resulting drill cuttings; however, three deep borings were cored within the Study Area. These data will be presented in the OU-2 site characterization report.

Exterior soils in the vicinity of the Red Hill Adit 3 Tunnel entrance are mapped as Helemano-Wahiawā association consisting of well-drained, moderately fine-textured and fine-textured soils (USDA SCS 1972). The surfaces of the basaltic flows have been weathered to form reddish-brown clayey silt, which is the basis for the local name "Red Hill." These soils typically range from nearly level to moderately-sloping and occur in broad areas dissected by very steep gulches, which typically formed in material weathered from basalt to a depth of approximately 10 ft below ground surface (bgs). Along the slopes, the basaltic bedrock is covered with 10–30 ft of Koʻolau residuum. These soils were derived from weathering of the underlying basalt bedrock or were deposited as alluvium/colluvium. The younger alluvium/colluvium deposits were derived from fractured basalts and tuff. Beneath the surficial soils, alternating layers of clay and basalts are encountered at depth. The northwestern slope of Red Hill is generally barren of soil and consists of outcropping basalt lava flows to the valley floor. While these soils are not observed under the Adit 3 Tunnel floor, they do form the basis of the perched water system observed at the Oily Waste Disposal Facility (OWDF), a system which appears to extend under the [redacted] (b) (3) (A) section of the Adit 3 Tunnel floor.

2.1.3 Surface Water

South Hālawa Stream is an ephemeral stream [redacted] (b) (3) (A) of the Red Hill Adit 3 Tunnel entrance that flows in a concrete-lined channel in the vicinity of the site. In Hālawa Valley, stream flow may contribute water to perched groundwater systems within alluvial material (valley fill) and to clinker zones observed within the Study Area. South Hālawa stream runs along the northern perimeter of the Facility, approximately [redacted] (b) (3) (A) at its nearest point to the section of the Adit 3 Tunnel that was impacted by the November 2021 Release. This is less than the 150-meter threshold that is used to estimate the potential for adverse effects to aquatic habitat (see Figure 2-4).

2.1.4 Groundwater

The Red Hill basal aquifer groundwater table lies between 15 and 20 ft amsl. Regional groundwater flows toward Pearl Harbor (mauka to makai), although potential exists for variability in localized flow directions depending on geologic formations and other factors, including localized pumping. The underlying aquifer is classified as a basal, unconfined, flank-type aquifer and is currently used as a drinking water source.

The Red Hill Facility is located at the administrative boundary between the Waimalu Aquifer System of the Pearl Harbor Aquifer Sector and the Moanalua Aquifer System of the Honolulu Aquifer Sector. The Facility is upgradient of the Hawai‘i State Underground Injection Control (UIC) Line, which delineates potable groundwater from non-potable groundwater. The nearest drinking water supply well was the Navy’s RHS, located within the Study Area, until it was deactivated following the November 2021 Release. The nearest Honolulu Board of Water Supply (BWS) public drinking water supply well (BWS Hālawa Shaft Well 2354-01) is located hydraulically cross-gradient of the Facility approximately (b) (3) (A) to the (b) (3) (A) of the November 2021 release site, and pumps water from the same basal aquifer.

During the current investigation, a perched water system was identified under the Adit 3 Tunnel floor. This perched water table has been measured at elevations ranging from approximately (b) (3) (A) amsl just (b) (3) (A) of the Adit 3 stormwater sump to approximately (b) (3) (A) amsl in (b) (3) (A) of the Pump Station. Shallow boreholes (limited to (b) (3) (A)) (b) (3) (A) of the Pump Station show evidence of sporadic groundwater, indicating that the water table may be deeper in these areas, or may be transient. This perched system is in heterogeneous strata including massive a‘ā and clinker a‘ā. Continuous water elevation measurements between September 15 and December 30, 2022 showed a clear relationship between water flowing through the 6-inch cooling water drainpipe, which drains into the Hume drain line utility corridor, and water levels in temporary wells located (b) (3) (A) the Pump Station and the Adit 3 Sump. This relationship verifies that water from the cooling water drainpipe contributes to the perched water system, although there are likely other environmental sources, such as infiltrating rainwater.

2.2 Historical Land Use

Prior to the 1940s, the surface of Red Hill supported sugar cane and pineapple agriculture. Navy archive images show that the Red Hill ground surface was exposed and modified during construction of the tank farm beginning in 1940. A 1952 aerial photograph shows unmaintained land on the ridge of Red Hill and agriculture on the lower reaches of Red Hill north of the Moanalua Golf Course (DON 2019).

2.3 Current Land Use

The Red Hill Facility is located on land zoned by the County as a mix of F-1 Federal and Military and P-1 Restricted Preservation districts. All major structures at the Facility are located underground. Populated areas closest to the Facility are ‘Aiea to the west and Honolulu to the south and east. Honolulu is heavily urbanized and densely populated. .See Section 1, Figure 1-1, which provides a general depiction of land use in the vicinity of the Facility.

Preservation land is located east and northeast of the Facility boundary. To the southeast are residential single-family homes in Moanalua Valley; a high cliff face with a 100–200 ft elevation difference exists between the Facility and this residential area. Southwest of the Facility on the lower southwest flank of Red Hill are the public Red Hill Elementary School and residential apartments, and further west is U.S. Army Housing on F-1 Military land. North of the western

segment of the Facility boundary in South Hālawa Valley is the State Animal Quarantine Station, private businesses in Hālawa Industrial Park, and the State-operated Hālawa Correctional Facility. To the north of the Correctional Facility at the lower reaches of an inter-valley ridge that forms the north wall of South Hālawa Valley is the open-pit Hālawa Quarry, operated by the Hawaiian Cement Company.

The H-201 Moanalua Freeway transits 350–700 ft beyond the Facility's southwest boundary and intersects with the H-1 and H-3 Freeways at the Hālawa Interchange, approximately 1,800 ft west of the Facility. The H-3 Freeway transits northeast from the interchange through North Hālawa Valley and on to O'ahu's windward side.

3.0 Summary of Investigation History

The history of investigation associated with the November 2021 Release in the Adit 3 Tunnel for OU-1 and OU-2 is summarized below and on Figure 3-1, which summarizes the site characterization field activities in a timeline schematic.

In December 2021, the Navy identified the discharge point of water and JP-5 product that had accumulated in the Adit 3 Sump located approximately (b) (3) (A) from the Adit 3 entrance in the lower access tunnel. It was determined that the fuel-water mixture was pumped by an automatic float pump activated during the release to a Holding Tank and Leach Tank located outside the Adit 3 entrance via a 4-inch cast iron discharge line that runs along the (b) (3) (A) side of the tunnel wall to the Adit 3 entrance, then was later found to extend underground from the Adit 3 entrance under the pavement to the Holding Tank and Leach Tank. This release site is documented under separate reporting requirements and schedule (DON 2022c; 2022d; 2022g; 2022i).

Between December 13 and 17, 2021, 47 subslab soil vapor monitoring points (SVMPs) were installed through the concrete floor of the Adit 3 and Pearl Harbor Tunnels in the Study Area to monitor the magnitude and extent of the impact of the JP-5 release to the underlying bedrock and to monitor changes in vapor concentrations over time. Between December 17, 2021 and January 1, 2023, these SVMPs were sampled 44 times using handheld organic vapor detectors and real-time multi-gas meters for oxygen (O_2) and carbon dioxide (CO_2). Five additional subslab SVMPs were installed on January 10, 2022.

On January 13 and June 14–15, 2022, the Navy deployed a remotely operated vehicle (ROV) into the RHS water development tunnel (DON 2022b; 2022h). The ROV visually documented the condition of the ceiling and sidewalls with an upward-looking video camera, and the condition of the water within the water development tunnel with a forward-looking video camera.

Between January 28 and February 2, 2022, geophysical surveys were conducted in the Study Area, including:

- Surface electrical resistivity and induced polarity (ER/IP) using:

  - 130 electrodes at 10-ft spacing (1,300 ft total survey extent) in the Adit 3 Tunnel
  - 43 electrodes at 10-ft spacing (430 ft total survey extent) in the upper Pearl Harbor Tunnel
- Low-frequency (50, 100, 200 MHz), unshielded ground-penetrating radar (GPR) to evaluate deeper anomalies at lower resolution in the Adit 3 and upper Pearl Harbor Tunnels

The Navy and their contractors presented a description of the geophysical survey results to the Regulatory Agencies (RAs) on April 19, 2022 and provided recommendations for further studies, which included additional higher-frequency shielded GPR surveys to be conducted. A second high multi-frequency shielded GPR survey (250, 500, 1,000 MHz) was conducted during November 10 and 12, 2022 in the Adit 3 Tunnel to acquire higher-resolution imagery in the shallow subsurface (less than 10 ft btf).

In February and March 2022, six concrete cut-out trenches and associated shallow soil borings were excavated, and soil samples collected and analyzed for middle distillate chemicals of potential concern (COPCs) based on hotspots identified during the initial subslab SVMP sampling. These activities identified:

- A perched water body in three of the five soil borings
- JP-5 light nonaqueous-phase liquid (LNAPL) detected in a boring in (b) (3) (A) of the RHS Pump Station
- Verification of the Hume drain line location below the tunnel floor along the (b) (3) (A) sidewall of the Adit 3 Tunnel

Between June 24, 2022, and January 18, 2023, the Navy drilled and selectively sampled 28 soil borings with a hand-held hammer drill, completing 20 of these borings to 6 ft btf using 1.5-inch-diameter drill bits. The other eight borings encountered obstructions and were abandoned. Soil borings (b) (3) (A) of A3-040, including A3-040-BH, were evaluated as potential temporary wells for assessment of the shallow perched water and JP-5 LNAPL under this section of the Adit 3 Tunnel. Seven borings were reamed to 2.5-inch diameter, and prepacked 5-ft screens were installed as temporary wells to access the perched water for sampling for COPCs and for monitoring water levels and LNAPL thickness and mobility.

On September 12, 2022, groundwater samples were collected from the seven temporary wells for COPCs, including total petroleum hydrocarbons (TPH) gasoline range organics (TPH-g), diesel range organics (TPH-d), and residual oil range organics (TPH-o); naphthalene (N), 1-methylnapthalene (1MN); and benzene, toluene, ethylbenzene, and total xylenes (BTEX).

On September 15, 2022, pressure transducers were installed in each temporary well and continuously collected water pressure data for continuous monitoring of water levels of the

perched water system throughout the reporting period, which extends from November 21, 2021 to January 31, 2023. Transducer data were periodically downloaded throughout the reporting period.

4.0 Summary of Data Quality Objectives

The data quality objectives (DQOs) for the intrusive assessments are designed to identify areas in the shallow bedrock, the subsurface zone above the water development tunnel, and utility corridors that have been impacted by JP-5.

The principal study questions to be considered in this report are as follows:

- What are the extent and magnitude of JP-5 that remains in the environment within the Study Area that would have the potential to threaten human health and the environment?
- What is the risk to human health and the environment, and what are the COPCs that pose that risk?
- What are the migration pathways that would transport COPCs from the environment to receptors at concentrations that pose unacceptable risk?
- What are the primary and secondary media of concern that can be treated to mitigate the migration of COPCs to receptors at concentrations that pose an unacceptable risk?
- Who/what are the human and environmental receptors that may be at unacceptable risk from COPCs that remain in the environment from the November 2021 Release?

The Navy used a phased approach to answer these principal study questions that included a combination of semi-quantitative techniques such as geophysical surveys, and highly quantitative techniques such as multi-increment sampling (MIS) to develop the conceptual site model (CSM; see Section 9.0) that will assess the threat to human health and the environment and identify technologies and remedial alternatives for mitigation. Table 4-1 summarizes the DQOs for each set of data collected during this investigation. While these DQOs are relevant for both OU-1 and OU-2, the data discussed herein are solely for OU-1.

Chemicals of Potential Concern. DOH's technical perspective and regulatory guidance on the characterization of petroleum-impacted soil and groundwater are described in Section 6 (Soil, Soil Vapor and Groundwater Action Levels for TPH) of the DOH document *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater* (DOH 2017). That section is summarized as follows:

- Petroleum is a complex mixture of compounds that degrade into potentially toxic metabolites.
- Non-specific aliphatic and aromatic compounds and related degradation compounds compose the overwhelming majority of the mass collectively referred to as TPH (refer to Volume 1, Section 2.6.1).

- Risk to human health and the environment posed by petroleum releases is evaluated in terms of both TPH and individual "indicator" compounds such as BTEX as well as N, 1MN, and 2-methylnaphthalene (2MN) and other targeted polyaromatic [i.e., polynuclear] hydrocarbons (PAHs). The latter compose only a small percentage of the total mass in fuels and vapors but can pose a significant risk due to their higher toxicity.
- Concentrations of individually targeted compounds such as BTEX and PAHs should be subtracted from the reported concentration of TPH. This includes soil, vapor, and water samples but is most important for water, since dissolved-phase hydrocarbons are anticipated to be dominated by more soluble aromatics. This can only be reliably done, however, if the same analytical method is used for both TPH and individual compounds.
- For risk evaluation, samples should also be evaluated for additives known or suspected to have been pre-blended into the fuel stored in the Red Hill tanks, as well as cleaning agents that might have been used to clean the tunnel after the May 6, 2021 Release. Fuel additives, including antioxidants, biocides, and fuel system ice inhibitors, are normally pre-blended into stored jet fuel or added during fueling of an aircraft.

Appendix A, Section 4.1.6 (LNAPL Plume Delineation) of the DOH guidance (DOH 2017) identifies soil borings as part of the LNAPL characterization process, including the following delineation methods for soil:

- If the depth of the source of a release is known, then the approximate upper extent of that release can be inferred.
- Headspace measurements for volatile organics will typically show an increase in concentration within the LNAPL zones. Plotting these on a simple chart of depth against concentration will typically show the inferred bulk LNAPL zone (mobile or residual).
- Visual and olfactory observations are typically logged as well, giving another indication of the presence of LNAPL.
- Soil samples are often collected and analyzed chemically, which will give another set of clear LNAPL indications. In general, TPH analytical results (for the appropriate fuel carbon range) greater than 250 milligrams per kilogram (mg/kg) are indicative of residual LNAPL (because soil has a limited absorptive capacity).

Target petroleum-related analytes identified in the above guidance and relevant DOH Environmental Action Levels (EALs) are listed in Table 4-2.

5.0 Field Activities

The field activities during the site characterization investigation were conducted in a phased manner. Field activities were guided by the *Preliminary Site Characterization Plan* (DON 2022a) and *Preliminary Site Characterization Plan Addendum* (DON 2022e). However, field

investigation results were used to adaptively determine procedural adjustments and additions in a stepwise fashion. Any deviations or additions from the original plans are documented.

Table 5-1 presents a summary of Hawaii State Plane (Zone 3) coordinates for Adit 3 sample locations. A localized elevation survey was conducted on September 23, 2022 using the Adit 3/ Pearl Harbor railway intersection at (b) (3) (A) amsl as the reference point. This survey was conducted using a level transit and stadia rod to develop a relative survey loop linking sampling locations in the tunnel to estimate water levels and well construction details referenced to mean sea level. A more definitive survey will be conducted and reported in the OU-2 report after the completion of OU-2 field work.

5.1 Soil Vapor Sampling and Analysis

Two procedures were used to monitor soil vapor in subslab SVMPs based on the DQOs:

- Initially, subslab vapor monitoring was conducted using real-time screening instruments with the intent of delineating the extent and magnitude of the fuel migration through the tunnel floor and into the environment. While these semi-quantitative, real-time monitoring events continue past the current reporting period, the importance of these results have diminished over time as concentrations have continued to decrease at all subslab locations without any clearly definable change in hotspot locations that would indicate lateral movement of volatile components of the COPCs .
- Secondarily, selected subslab and shallow SVMPs were sampled four times during the reporting period for laboratory analysis (TO-3 for TPH; TO-15 for selected volatile organic compounds [VOCs]; and ASTM1946/C3 for helium, CO_2, and O_2).

5.1.1 Real-Time Semi-Quantitative Screening

Between December 15 and 17, 2021, 47 subslab SVMPs were installed into petroleum-impacted segments of the Adit 3 and Pearl Harbor Tunnels (Figure 5-1). Results from hand-held photoionization detectors (PIDs) that sampled these SVMPs between December 17 and 24, 2021 indicated elevated petroleum vapor concentrations under the concrete tunnel floors. Organic vapor maxima, or hotspots, were noted directly over the water development tunnel in the vicinity of the release area and just below the intersection of the Adit 3 and Pearl Harbor Tunnels. Organic vapor concentrations were also elevated throughout the lower portion of the Adit 3 Tunnel, with the highest levels surrounding the Adit 3 Sump. On January 12, 2022, five more subslab SVMPs were installed to fully capture the lateral extent of the November 2021 Release along the Adit 3 and Pearl Harbor Tunnels.

Subslab SVMPs were monitored weekly with hand-held real-time vapor monitors until July 11, 2022. The readings showed a site-wide decrease in VOC concentrations over time, and a request was made to DOH to reduce the monitoring frequency from weekly to monthly. The request was granted with a qualification that if a rain event of 1 inch within a 24-hour period occurred in the

Red Hill vicinity outside the monthly monitoring event, then two additional monitoring events would be conducted to determine if rain events were an impacting factor in the subsurface conditions. The first event would be conducted within 5 days of the 1-inch recorded rain event, and the second would be conducted the following week.

- Subslab SVMPs (Vapor Pin technology) were installed into holes drilled through the tunnel floor with a 1.5-inch diameter hammer drill bit in accordance with the standard operating procedure (SOP) Installation and Extraction of the Vapor Pin.[2]
- Periodic and out-of-frequency subslab vapor monitoring included collecting VOC measurements (parts per million by volume [ppmv]) with a PID; and O_2 (%), CO_2 (%), and carbon monoxide (%) with a multi-gas meter, as described in Section 6.0.

5.1.2 Selected Sampling for Laboratory Analysis

During the current reporting period, the Navy conducted four soil vapor sampling events in Adit 3 for laboratory analysis.

On February 18, 2022, three subslab locations were sampled using Summa canisters, including three normal samples and one duplicate sample. The samples were shipped to Eurofins-Air Toxics laboratory for analysis (TO-3, TO-15, ASTM 1946). Sample results have been validated and uploaded into the JBPHH Red Hill Environmental Data Management System (EDMS) database[3] for Navy and Regulatory review.

Three additional soil vapor sampling events from nine subslab SVMPs occurred on December 15 and 16, 2022; January 17, 2023; and February 20 and 21, 2023.

5.2 Geophysical Surveys

Two geophysical surveying events were conducted within the Adit 3 and Pearl Harbor Tunnels to evaluate subsurface conditions that may provide information on JP-5 migration in the vadose zone beneath the tunnel floors.

5.2.1 Multi-Method Geophysical Pilot Study (January and February 2022)

From January 28 through February 2, 2022, a multi-method geophysical pilot study was conducted by subcontractor hydroGEOPHYSICS, Inc. (HGI) to evaluate ER/IP and low-frequency unshielded GPR as a means to identify JP-5 migration pathways and obstructions to migration through the vadose zone above the basal aquifer. An additional objective was to determine whether data from the subslab SVMPs in combination with the geophysical data could identify areas where

[2] https://www.vaporpin.com/wp-content/uploads/2023/01/01-Standard-Operating-Procedure-VP.pdf

[3] https://www.synectics.com/

additional subsurface investigation should be focused. The geophysical report documenting activities and findings from this pilot study are presented in Appendix A.1 (HGI 2022). Figure 5-2 shows these survey lines in reference to the tunnel features.

The ER/IP activities in Adit 3 included installation of approximately 130 electrodes in 1.5-inch holes drilled through the tunnel floor at intervals of 10 ft, from the Adit 3 entrance to approximately (b) (3) (A) of the entrance. This included approximately (b) (3) (A) of tunnel (b) (3) (A) of the release area. In the Pearl Harbor Tunnel, the ER/IP activity included installation of approximately 43 electrodes at 10-ft intervals, from the Adit 3 merge with the (b) (3) (A) spur of the Pearl Harbor wye (b) (3) (A)

- Results include two-dimensional profiles of resistivity and induced polarity along these survey lines to an approximate depth of 60 ft btf.
- Interference was encountered from what was believed to be short-circuiting into the concrete slab, including rebar, as well as metal beneath the tunnel floor.
- It was noted that the ability to resolve specific features decreased with depth using these techniques, and that the signal was dispersed radially; therefore, the surrounding sidewalls and overhead material in the tunnel also produced interference to the vertically down signal.

The GPR survey consisted of a large unshielded antenna to support frequencies of 50, 100, and 200 megahertz (MHz). GPR surveys were conducted on either side of the train track rails and in the middle of the rails These low frequencies were used because of the greater penetration depth associated with the lower-frequency GPR signals. Antennae were unshielded to allow increased power to the signal and due to the larger size of the antennae.

- The GPR survey was focused on the ability of GPR to identify changes in electrical properties of subsurface strata, including dielectric permittivity and electrical conductivity, which are a function of soil and rock material and associated pore fluids.
- The data evaluation also included use of Fourier transforms of the frequency data to develop power spectra analysis. Studies have shown that the introduction of hydrocarbons into a sand tank results in an observable shift in the power spectra of the GPR signal.

5.2.2 High-Frequency GPR Follow-up Study (November 2022)

Based on results from the January and February 2022 survey and comments from the RA subject matter experts (SMEs), a second high multi-frequency GPR survey (250, 500, 1,000 MHz) was conducted during November 10 and 12, 2022 in the Adit 3 Tunnel. The objective was to get higher-resolution imagery in the shallow subsurface (less than 10 ft btf). This survey was conducted with shielded antennae to mitigate interference from the tunnel infrastructure. The report documenting this activity is presented in Appendix A.2 (HGI 2023).

5.3 Shallow Soil and Rock Sampling

Shallow soil and rock sampling occurred in two phases of the investigation. In March 2022, the Navy installed a shallow trench and associated soil borings with the following objectives:

- Locate a drain corridor that was identified on original design drawings as a 6-inch concrete Hume drain that was shown under the middle of the Adit 3 Tunnel floor and connecting to the Adit 3 Sump. This drain and associated gravel corridor were anticipated to be a migration pathway for JP-5 to and from the stormwater sump.
- Trenches were located in areas where subslab SVMP data indicated elevated VOCs in soil vapor, and thus were expected to be related to elevated hydrocarbon concentrations in soil.

Based on the results of the first phase, a second phase of soil boring installation and sampling was conducted between June 24, 2022 and January 18, 2023.

5.3.1 Trench MIS and Trench Boring Soil Sampling

Between March 1 and 5, 2022, five shallow trenches were excavated and sampled for COPCs. Following the trench excavation and sampling, five trench borings were advanced (one within each trench) to install shallow SVMPs (Figure 5-3).

Shallow SVMPs were installed in two of the boreholes. Perched water was identified in the remaining three boreholes and JP-5 free product in one borehole. Shallow volcanic bedrock was observed in all five trenches instead of the anticipated Hume drain utility corridor and piping. However, a previously excavated concrete section was removed along the (b) (3) (A) edge of the tunnel at A3+225, and a drainpipe was observed at approximately 3 ft btf, suggesting that the drain corridor ran along the (b) (3) (A) tunnel wall:

- Five shallow trenches (A3-375-TR, A3-150-TR, A3-000-TR, A3+215-TR, 2S+075-TR) were excavated in the tunnel floor, each including 1.5-inch-diameter soil borings ranging from 4 to 6 ft btf to install near-surface SVMPs. Two SVMPs (A3-375-TR and 2S+075-TR) were installed as planned and backfilled with a concrete finish. In the remaining three locations, perched water was encountered plus free product, resulting in no SVMP installations.
- LNAPL, ranging from a sheen to 0.4 ft thick, was observed in A3+000-BH associated with the trench at the same location (b) (3) (A) to the Pump Station .
- Three 1.5-inch-diameter step-out borings (A3-010-BH, A3+015-BH, and A3+325-BH) were installed as a response to the perched water and LNAPL discovered during the trench excavations.

The Hume drain was encountered on March 31, 2022 and was investigated as follows:

- An existing core located around A3+225 was re-opened into the tunnel floor along the (b) (3) (A) side of the tunnel. After excavation, the Hume drain line was observed at approximately 3 ft btf.
- An additional trench (A3-110-TR) was excavated that uncovered the Hume drain line (b) (3) (A) to the Pump Station at approximately 3 ft btf along the (b) (3) (A) side of the tunnel.
- A 3-inch boring was cut into the Hume drain line, and a down-pipe video camera collected imagery of the interior of the drainpipe.
- On April 12, 2022 down-pipe videos were recorded using a pipe and sewer camera in both directions once an access point was opened in the pipe. In the (b) (3) (A) direction (toward the release site), the camera encountered a grout plug approximately (b) (3) (A) of the entranceway. In the (b) (3) (A) direction (toward the Adit 3 entrance), the camera encountered an obstruction at approximately (b) (3) (A) that it could not navigate past (see Figure 5-3). On May 11, 2022, additional tooling was used to get past the (b) (3) (A) obstruction, and the camera was pushed until friction stopped the ability to push further at approximately (b) (3) (A) from camera entrance. These locations are shown on Figure 5-3.
- On June 15, 2022, a Hume drain vault was installed to facilitate future access to the Hume drain line.

5.3.2 LNAPL Step-Out Boring Soil Sampling

Following the findings of perched water and JP-5 product (LNAPL) in borings advanced in March 2022, a second phase of soil sampling was conducted with the drilling of step-out borings to characterize the shallow subsurface. These borings were advanced with a hammer drill in areas identified by subslab SVMP and previous soil samples as being potentially impacted (Figure 5-4).

Twenty seven additional 6-ft step-out boreholes were drilled between June 23 and January 18, 2023 to delineate the extent of free product and contaminated perched groundwater. Table 5-2 provides the borehole construction details for these borings:

- Twenty-three 1.5-inch-diameter borings were drilled in the tunnel with a hammer drill to an approximate total depth of 6 ft btf.
- Four 1.5-inch boreholes (A3+200-BH, A3-050-BH, PS+095-BH, and PS+095-BHO) were drilled to only less than 4 ft btf due to difficult drilling conditions. These four locations were abandoned with grout to the surface of the tunnel floor.

Between March 11 and August 29, 2022, 25 discrete soil samples were collected from soil borings in trenches and step-out borings. Due to limited soil produced during hammer drilling activities, 22 soil samples were analyzed for TPH-d, TPH-o, N, 1MN, and 2MN. Three soil borings (A3-010-BH, A3-225-HL, and A3-015-BH) produced enough material for a complete set of COPC analyses, including TPH-g and BTEX.

5.4 Groundwater and LNAPL Sampling Activities

Groundwater samples were collected in two phases. During the first phase in March 2022, the perched water table was encountered between [redacted] (b) (3) (A) while advancing borings that were associated with two (A3+215-BH and A3+000-BH) of the five trench locations (see Figure 5-3). Groundwater samples were collected from the undeveloped boreholes, in small volumes. These samples were collected for rapid semi-quantitative delineation of groundwater quality to better understand the extent of JP-5 migration. Following the drilling of LNAPL step-out borings that more definitively delineated the lateral extent of JP-5-impacted media, including the perched water table and LNAPL, temporary wells were installed, developed, and sampled for a quantitative data set for decision-making.

5.4.1 Semi-Quantitative Borehole Sampling

Groundwater and LNAPL were identified in trench borings and the initial step-out borings in March 2022. Initial groundwater samples were collected from undeveloped borings as grab samples (semi-quantitative) with the objective of identifying the extent of petroleum-impacted groundwater. LNAPL samples were analyzed by forensic methods to link the observed fuel to the known JP-5 release and to assess LNAPL degradation. Groundwater samples were collected from 1.5-inch-diameter borings associated with the trench excavations, step-out borings, and temporary wells (Figures 5-3 and 5-4). In March 2022, groundwater samples were collected from 5-ft borings in A3+000-TR and A3+215-TR, and a step-out boring (A3+000-BH, A3+215-BH, and A3+325-BH):

- Due to the limited amount of water in A3+215-BH, and A3+325-BH, these samples were analyzed only for TPH-d, N, 1MN, and 2MN.
- LNAPL was observed in A3+000-BH, and the sample underwent forensic analysis for saturated hydrocarbon (SHC) analysis.

In April and May 2022, groundwater samples were collected from step-out boring A3+015-BH and analyzed for TPH-g, TPH-d, TPH-o, BTEX, N, 1MN, and 2MN.

5.4.2 Quantitative Temporary Well Sampling

Based on the results of water evaluation in borings advanced as part of the LNAPL step-out activity, seven boreholes were converted to temporary wells (A3+375-TW, A3+325-TW, A3+210-TW, A3+050-TW, A3+015-TW, A3-010-TW, and A3-040-TW) between August 8 and September 9, 2022. The purpose of these temporary wells was to provide standardized sampling points for the collection of groundwater samples for COPC analysis and LNAPL measurements, relative and absolute water level measurements, and headspace VOC measurements over time from the perched water beneath the tunnel floor (Figure 5-4). Table 5-3 presents well construction details for these temporary wells.

5.5 Water Level, Organic Vapor, and Product Gauging Activities

Free product gauging, groundwater monitoring, and PID headspace measurements were initiated in March 2022 as borings were installed in the Adit 3 and Pearl Harbor Tunnels. Weekly measurements were initiated in May 2022 and continued through the February 2023 reporting period (not including the de-packing activities between October 4 and November 6, 2022). The current monitoring program consists of 23 step-out borings, including seven locations that have been converted to temporary wells. Water and free product levels were monitored with an oil/water interface probe. Pressure transducers were installed in each temporary well to collect continuous water levels from September 15, 2022 through the end of the reporting period.

As described above, continuous water level monitoring in seven temporary wells was conducted using in-well pressure transducers (Micro-Diver - Van Essen Instruments) and atmospheric barometric pressure transducers to reduce the effects of barometric pressure from the water level data set.

On September 15, 2022, Micro-Divers were placed in A3+375-TW, A3+325-TW, A3+210-TW, A3+050-TW, A3+015-TW, A3-010-TW, and A3-040-TW and began logging changes in water levels. Data were downloaded monthly, and the data sets were combined to form a continuous water level data set from September 15, 2022 through the reporting period.

5.6 Sample Handling Methodology

Subsurface soil and groundwater samples for laboratory analysis were placed on ice and taken to the AECOM shipping facilities at the end of each sampling day, where they were placed in dedicated refrigerated units or on ice in dedicated shipping coolers to ensure their arrival at the laboratory within the acceptable temperature range. Custody seals were applied, and chain of custody (CoC) forms were completed for each cooler. A trip blank was included with each cooler containing samples for VOC analysis. All samples were received at the contract laboratory within specified limits and were analyzed on a 4-business-day expedited turnaround time (TAT) or 7-business-day standard TAT, with Level II and Level IV data packages and electronic data.

5.7 Sample Containers and Preservation

The containers, preservatives, and holding times are specified in the respective United States Environmental Protection Agency (EPA) SW-846 methods. The analytical laboratories selected for the site characterization supplied the required sample containers and preservatives.

5.8 Chain of Custody

CoC documentation was maintained for samples during all phases of sample collection and transport, consistent with laboratory sample preservation procedures and are provided as part of the Level II and Level IV data reports.

6.0 Field Observations During Sampling

Figure 2-1 shows the Adit 3 Tunnel orientation, Adit 3 entrance, Adit 3 Sump, water development tunnel, Pump Station, high-density polyethylene (HDPE) water pipeline that discharges to the granular activated carbon (GAC) system, Pearl Harbor Tunnel intersection with Adit 3, and the November 2021 Release location. Figures 5-1 through 5-4 show the locations of the abandoned trenches, Hume drain line vault, step-out boreholes, and temporary wells, which are presented using approximated locations pending future surveying results. The HDPE water pipeline to the GAC runs (b) (3) (A) of the tunnel floor out of the Pump Station to the (b) (3) (A) toward the Adit 3 entrance. The pipeline has an (b) (3) (A) once out of the Pump Station and is confined within a cement thrust block (b) (3) (A) A3-010-TW and A3+015-TW.

6.1 Soil Vapor Sampling Observations

As described in Section 5.1, two procedures were used to collect soil vapor:

1. Real time semi-quantitative screening from the subslab and shallow SVMPs using handheld PIDs and multi-gas meters (see Appendix B for results). These data were collected during frequent periodic sampling events (weekly, progressing to monthly), and out-of-frequency sampling events (associated with rain events that exceeded 1 inch within a 24-hour period).
2. Laboratory analysis of selected subslab, and shallow SVMPs using Summa canister sampling methods.

6.1.1 Real-Time Semi-Quantitative Screening Observations

Results for semi-quantitative screening events were reported after each sampling event in a cumulative manner to allow investigators to assess temporal and area-wide changes in field measurements. Figure 6-1 provides the organic vapor results over the reporting period from the ppbRAE PIDs, which were calibrated and bump-tested multiple times during each sampling event. Out-of-frequency sampling events are noted with asterisks. Figure 6-2 presents the 24-hour precipitation accumulation measured at the NOAA MOAH1 rain gauge located in Moanalua Valley directly (b) (3) (A) of the Facility. Observations noted from these data include:

1. Some locations could not be sampled due to blockages, moisture buildup, or low-permeability soil. Soil moisture blockages have varied over time.
2. Organic vapor concentrations have varied systematically over time and space, likely due to:
    a. Rain events in December 2021 and early January 2022 that occurred soon after the release. These events appeared to mobilize JP-5 that was likely still present at high concentrations directly beneath the tunnel floor.

b. Diminishing concentrations over time, likely due to infiltration, degradation, and volatilization, leading to lower JP-5 concentrations in the shallow subsurface directly beneath the tunnel floors.

c. Figure 6-3 presents a map of five sections of the tunnel floors that have been evaluated over time. Figure 6-4 presents a bar graph chart that presents the monthly averages of VOC vapor concentrations shown in the figure. These data show how concentrations in these sections vary, and specifically how present concentrations are exceptionally low in most locations.

3. Precipitation data have been collected from the MOAH1 rain gauge since June 22, 2022, following agreement between the Navy and the RAs to reduce the sampling frequency from weekly to monthly. This agreement included the collection of two sample sets following any rain event that exceeded 1 inch within 24 hours at the MOAH1 rain gauge (DON 2022f).

6.1.2 Selected Sampling for Laboratory Analysis Observations

Soil vapor for laboratory analysis has been sampled in two distinct phases:

1. An initial sampling of three subslab SVMPs in February 2022.
2. An ongoing phase in which up to 20 subslab, shallow, and deep nested SVMPs (DSVMPs) were sampled monthly beginning in December 2022, and as of the reporting period includes samples collected in January 2023.

Field data show similar observations as presented in Section 6.1.1 for subslab and shallow SVMPs.

6.2 Geophysical Survey Observations

Two geophysical surveying events were conducted within the Adit 3 and Pearl Harbor Tunnels, as described in Section 5.2:

1. A multi-method survey in January and February 2022 featuring ER/IP and low-frequency, unshielded GPR data collection (Appendix A.1) (HGI 2022)
2. A high-frequency shielded GPR data collection effort, conducted in November 2022 (Appendix A.2) (HGI 2023)

Specific observations are presented below; the HGI technical reports that include a description of the geophysical methods, geophysical data collected, and data sets along with the context and limitations are presented in Appendix A.

6.2.1 Multi-Method Geophysical Survey Observations (January and February 2022)

A summary of the findings presented in the contractor report (HGI 2022) include:

- The multi-method geophysical surveys were affected by tunnel infrastructure including at least 14 specific locations where tunnel infrastructure produced interference that severely degraded the geophysical signal, with worst impact being to GPR and IP data sets. These included both metallic and electrical interference, as well as tunnel geometry degradation of signal.
- GPR was most effective in the highest frequency (200 MHz), with coherent reflections from strata to approximately 30 ft btf. The 200 MHz antenna also provided the better power spectra, resulting in detailed profiles and trends.
- Infrastructure responses were identified in the electrical resistivity and GPR power spectra profiles, many of which correlated to high chargeability regions in the IP, indicating metallic infrastructure. These locations are in the contractor report (Appendix A.1).
- Additional regions that could represent increased moisture or fuel product responses were identified in electrical resistivity and GPR power spectra profiles. Typically, these are responses present as conductive region in the electrical resistivity profiles and lower power regions within the power spectra of the 200 MHz antenna GPR profiles. Many of these responses correlated to elevated VOC concentrations from the soil vapor measurements. A summary of the locations of the responses is presented in Appendix A.1, Table 9.

Following RA review, their SMEs provided the following observations in comments dated April 18, 2022:

- The surveys were thoroughly planned and executed given the logistical limitations that exist at the site.
- The resistivity and IP data are unlikely to prove especially useful simply because there is interference from the metallic infrastructure present at the site.
- GPR surveys suffered strong interference from reflections off the tunnel wall as well as utilities. For logistical reasons, the antennas were unshielded, which made interference worse. The 50 MHz and 100 MHz were the most affected, while the 200 MHz was least affected.
- Inferences regarding possible nonaqueous-phase liquid (NAPL) presence seems possible when evaluating the power spectra of the GPR signal, although this would need to be confirmed with borings/sampling.
- Recommended an antenna in the 800 MHz range if looking for the presence of NAPL directly beneath the floor. The 250 and 500 MHz antennas would be useful to identify potential fracture zones/pathways deeper in the bedrock. Shielded antennas will still suffer from interference issues.
- Recommended cross-borehole geophysics to characterize the bedrock in this environment. Electrical resistivity as well as cross-hole seismic would provide a good method to map potential fracture zones, orientation, density, and other parameters.

- Recommended performing tracer testing (e.g., saltwater) and tracking the saltwater movement using cross-borehole resistivity to provide a good method to map fractures and estimate groundwater travel times in the bedrock.

6.2.2 High-Frequency GPR Survey (November 2022)

A multi-frequency GPR geophysical investigation, including the use of shielded 250, 500, and 1,000 MHz antennae, was conducted between November 10 and 12, 2022. The GPR method was applied to investigate sections of the lower access tunnel at the Facility. Three coincident lines of GPR were collected in the sections of the lower access tunnel in proximity to the fuel leak, including (b) (3) (A), and (b) (3) (A) lines placed on the tunnel floor. For reference, the (b) (3) (A) line was collected between parallel metal train rails. Details of the investigation are provided in the geophysical report (Appendix A.2) (HGI 2023) and summarized as follows:

- The radargrams provided detailed information on the depth of geological layers beneath the tunnel floor, including the water table when it was within the imaging depth of each frequency.
- The raw amplitudes, color-contoured to show differences between positive and negative reflected arrivals, were fairly uniform across the tunnel. For example, the peak of the first arrival for the 250 MHz data occurred from 1 to 1.2 ft below surface. The difference, however, was in the amplitude of the peak, which was higher in the portions of the tunnel closer to Adit 3. Other exceptions were observed where there was noted metal on the ground, mostly due to rails or switches. The release point also showed an intense earlier arrival, above the bottom of the concrete floor, likely due to the metal.
- For all the frequencies and methods of processing and investigation, the middle line between the rails was unusable. This is due to periodically placed metal cross beams below the rails.
- The radargrams showed high attenuation at depths beyond 6 ft, obscuring geological details at greater depths.
- The 500-MHz antenna was especially useful for verifying subtle variations in the subsurface below the concrete tunnel. The frequency was a good tradeoff in signal attenuation, detail, and depth of investigation.
- The data obtained using the 1,000-MHz antenna had limited visibility and depth penetration, making the data of less value than the 250 and 500 MHz antennae.
- Within the 250 and 500 MHz data, HGI identified exploration anomalies in the text and summarized their locations in Table 3 of the report (Appendix A.2).

6.3 Shallow Soil and Rock Sampling Observations

As described in Section 5.3, shallow soil was collected initially from six shallow trenches cut through the tunnel floors and from borings installed within these trenches (Figure 5-3) to be

developed into shallow SVMPs (approximately 3–5 ft btf) in March and April 2022. Following the completion of the shallow SVMPs, a more comprehensive set of LNAPL step-out borings (Figure 5-4) were installed to better delineate the JP-5 conditions in the shallow soil and rock under the tunnel floors.

6.3.1 Trench MIS and Trench Boring Soil Sampling Observations

An initial objective of excavating trenches through the concrete beneath the tunnel floors was to identify a utility corridor that was expected to be between the train rails based on inferences from tunnel design drawings (circa 1943). One drawing, presented as Figure 6-5, indicated the Hume drain as an "open joint pipe" that was installed beneath the tunnel floor. The drawing shows the Hume drain extending [redacted] beyond the Adit 3 wye (but not to the release area) and [redacted] to the Adit 3 Sump. The Hume drain was anticipated to be in a gravel-filled utility corridor, which would be highly permeable and allow water to infiltrate into the upper unsealed open joints of the pipe. The bottom of the joints are sealed to allow fluid to be transported through the pipe to the sump.

6.3.1.1 Trench Excavation and MIS Sampling Observations

Between March 2 and 9, 2022, five trenches were cut through the tunnel floor between the rails to expose the shallow subslab material (Figure 5-3) (A3+215-TR, A3+000-TR, A3-150-TR, A3-375-TR, and 2S+075-TR). Observations included:

- At all locations except A3-375-TR, thin layers of fill sand and gravel were observed on bedrock outcrops of fractured a‘ā, each with irregular surfaces.
  - No utility corridor was observed.
  - A3-375-TR, located at the release area, encountered a concrete foundation along the [redacted] rail, and loose sediments to approximately 2 ft btf along the [redacted] rail.
- Maximum soil organic vapor headspace measurements:
  - 2S+075-TR 3/4/2022 108.8 ppmv
  - A3+000-TR 3/4/2022 352.2 ppmv
  - A3+215-TR 3/4/2022 479.2 ppmv
  - A3-150-TR 3/4/2022 397.2 ppmv

On March 29, 2022, a sixth trench was cut through the tunnel floor along the [redacted] side of the tunnel [redacted] to the pump station (A3-110-TR), in the Hume drain utility corridor.

- The gravel-filled Hume drain utility corridor was encountered, and the Hume drain was uncovered (top at approximately 3 ft btf).
- The maximum soil organic vapor headspace measurement of 595 ppmv was collected at approximately 3 ft btf.

6.3.1.2 TRENCH BORING OBSERVATIONS

Between March 2 and 9, 2022, five borings were drilled inside the trenches to install shallow SVMPs (A3+215-BH, A3+000-BH, A3-150-BH, A3-375-BH, and 2S+075-BH). Observations included:

- Perched water was observed in three borings (each total depth of 5 ft btf):
  - A3+215-BH 3/10/2022 2.9 ft btf No organic odor
  - A3+000-BH 3/10/2022 3.4 ft btf Strong organic odor
  - A3-150-BH 3/10/2022 4.9 ft btf Minor organic odor
- LNAPL observed in A3+000-TR 3/10/2022:
  - LNAPL collected in a bailer estimated at 0.3 ft thick
- Two dry borings were completed as shallow SVMPs to 5 ft depth:
  - 2S+075-SVMP-5.0
  - A3-375-SVMP-5.0

6.3.2 LNAPL Step-Out Boring Soil Sampling Observations

Following the discovery of LNAPL in A3+000-BH and organic odors in A3-150-BH, as well as water in these two borings plus in boring A3+215-BH, the Navy developed a plan to drill and sample up to 20 shallow step-out borings. Eight additional borings were drilled based on refusal or inability to collect samples. These shallow step-out borings would delineate the lateral extent of JP-5, based on LNAPL within soil and on the perched water surface, as well as dissolved constituents detected in perched water. Table 5-2 provides the LNAPL step-out boring construction summary for 28 borings. These include a hand-excavated boring at A3+225 from a pre-existing 7-inch concrete core, where the Hume drain was first observed, and 27 additional borings that were drilled with a 1.5-inch bit on a hammer drill with a maximum achievable depth of 6 ft btf, with limited soil recovery. Borings that were used as temporary wells were later reamed to 2.5 inches in diameter.

The hammer drilling process and the highly variable lithology resulted in no recovery in one or more intervals from 19 of 25 LNAPL borings. When drilling was in rock, no soil was recovered, and no samples were collected for screening or laboratory analysis. When soil cuttings were available, 1-foot intervals were screened for organic vapor with a PID, and intervals with the highest headspace measurements were analyzed both by a certified laboratory and using field screening tools, including hydrocarbon test kits (Oil in Soil[4]). Table 5-2 indicates which boings

[4] https://www.oil-in-soil.com/

were sampled for subsurface soil and which indicated positive results for LNAPL via the hydrocarbon test kit.

Table 6-1 presents the PID organic vapor headspace measurements collected during drilling in 25 borings as a heat map, which shows sections of the shallow subsurface with the highest organic vapors as red and the lowest concentrations as green. Three borings identified in Table 5-2 did not undergo the PID screening process and are not included in Table 6-1:

- Two borings drilled in the Pump Station (PS+095-BH and PS+095-BHO) did not recover any soil for analysis. Indications were that the subsurface materials were loose, likely sand or gravel fill.
- A3+225-BH was hand excavated from a previous 7-inch-diameter concrete core that had been replaced along the (b) (3) (A) tunnel wall. During the excavation of the trench at A3+215-TR, this concrete core was identified, and removed manually to investigate the subsurface. It was hand-excavated to approximately 3 ft depth and resulted in location of the Hume drain along the (b) (3) (A) tunnel wall.

Observations:

- The highest organic vapors are associated with A3-100-BH (maximum 647.9 ppmv), A3-050-BHOffset (maximum 501.1 ppmv), 2S+025-BH (maximum 588.9.9 ppmv), and A3-050-BH (maximum 501.1 ppmv). All these locations are (b) (3) (A) of the Pump Station.
- The following borings indicated positive for LNAPL using the Oil in Soil test kit:
  - A3-300-BH 8/4/2022 Positive
  - A3-240-BH 8/5/2022 Positive
  - 2S+025-BH 8/2/2022 Positive
  - A3-110-BH 8/29/2022 Positive
  - A3-100-BH 7/29/2022 Positive
  - A3-090-BH 8/29/2022 Positive
  - A3-050-BH Offset 6/30/2022 Positive
  - PS+095BH Offset 6/30/2022 Positive
  - A3+087-BH 6/29/2022 Positive
- Lithologic logging could not be completed due to the drilling method.

6.4 Groundwater Sampling Observations

Perched groundwater below the tunnel floor was first observed during the subsurface investigation of the Hume drain line in the trench boreholes. This perched water has been the subject of

investigation activities to provide a better understanding of the CSM for the nature and extent of JP-5 impacts and contaminant fate and transport. All information gathered on the perched water will be used to develop robust remedial alternatives. Table 6-2 provides the results of groundwater, LNAPL, and organic vapor headspace monitoring in Site Characterization borings.

- In March 2022, perched groundwater was observed in trench boreholes A3+215-BH (no odor), A3+000-BH (strong organic odor and LNAPL), and A3-150-BH (organic odor). Step-out borings were drilled at A3+325-BH (no odor) on March 9, 2022, and at A3+015-BH (strong odor, PID measurement of 123.1 ppmv) on April 1, 2022.
- Beginning in May 2022, a systematic approach was taken to collecting groundwater levels, headspace measurements, and LNAPL measurements in all borings, with new borings added to the weekly monitoring and gauging as they were drilled.
- Organic vapor headspace measurements collected from the top of each borehole over time are presented in Table 6-3 as a heat map, where higher concentrations are shown in red and lower concentrations are shown in green. These results show elevated organic headspace concentrations from the shallow (less than 6 ft btf) subsurface between A3+015-BH and A3-110-BH, which corresponds to soil and groundwater sample results presented in Section 8.0.
- Perched water level elevations were observed to have a steep hydraulic gradient from (b) (3) (A) to (b) (3) (A) between closely spaced locations at A3+015-BH/TW and A3-010-BH/TW observed as a water table mound. In addition, water level elevations in boreholes between the Adit 3 Sump and the RHS Pump Station did not appear to vary as much as did locations (b) (3) (A) of the Pump Station:
  - The RHS pump cooling water drain line extends from a drain in the Pump Station (b) (3) (A) under the Pump Station floor into Adit 3 through the Pump Station portal (between A3+015-BH/TW and A3-010-BH/TW), and discharges into the Hume drain utility corridor.

Seven shallow (approximately 6 ft btf) temporary wells were installed into the perched water in September 2022 to monitor contaminant concentrations as well as hydraulic properties of the perched water for fate and transport evaluation and remedial design purposes (Table 5-3 and Figure 5-4). Pressure transducers were placed into these wells following their development, and continuous water levels have been collected from September 2022 through the end of the reporting period. Figure 6-6 presents a chart showing the reduced transducer data from each well over the reporting period in conjunction with rolling 24-hour precipitation accumulation from the NOAA rain gauge MOAH1, located in Moanalua Valley. Observations include:

- During the September through mid-December 2022 period, water elevation in A3-010-TW was approximately 2 ft lower (approximately 95.7 ft amsl) compared to A3+015-TW (approximately 97.8 ft amsl), then decreased (b) (3) (A) in elevation to A3+050-TW and

A3+215-TW (approximately 97.1 ft amsl), then increased again toward the sump with highest water levels measured at A3+375-TW (approximately 98.2 ft amsl).

- A mounded water table was observed based on the data between A3-010-TW and A3+015-TW, with a maximum elevation centered on the Pump Station portal where the pump cooling pipe enters the Adit 3 Tunnel and proceeds (b) (3) (A) The effect would be to stop (b) (3) (A) migration of LNAPL and potentially mobilize migration of LNAPL (b) (3) (A) on the decreasing gradient. Additional evidence of this is observed in the elevated organic vapor measurements shown in Table 6-2, and in positive LNAPL Oil in Soil test kit measurements documented in Section 6.3.2.
- Two distinct decreases in water levels are observed in the four temporary wells located between the Pump Station and the sump: between November 4 and 11, 2022; and between November 25 and 29, 2022. These periods coincide with periods where the RHS pump was not operating and not producing cooling water through the drainpipe in the Adit 3 Tunnel. This is direct evidence that the pump cooling water is a source for the perched water system in the area between the Pump Station and the sump.
- On December 22, 2022, water levels begin increasing (b) (3) (A) of the Pump Station, as observed in the data from A3-010-TW and A3-040-TW:
  - This is likely from previous rain events, culminating on the maximum rain event to date that occurred during the December 18–20, 2022 period, with a maximum accumulation per 24 hours of 1.56 inches as measured at the MOAH1 rain gauge in Moanalua Valley.
  - Water levels continued to increase in these two wells for approximately 6.5 days, during a period of minimal rain, which may be associated with the period of drainage and transport through overburden.
- A similar increase is observed in these wells beginning on February 5, 2023 in response to two exceptionally large rain events that occurred between January 26 and February 9, 2023, both exceeding 2 inches per 24 hours of accumulated precipitation.
- The A3-010-TW water level increased steadily from February 5, 2023 over a period of 10 days, for a total increase of 1.34 ft.
- The A3-040-TW water level increased over a much shorter period of 2.3 days by a total of 1.99 ft.

6.5 LNAPL Activity Observations

In March 2022, LNAPL was observed in boreholes drilled into the perched water associated with trench A3+000-TR. Based on these observations, the Navy consulted with the RAs on March 16, 2022 and presented a plan to conduct additional LNAPL step-out characterization throughout the Adit 3 and Pearl Harbor Tunnels, with activities described in Section 5.3.2. Beginning in May 2022, periodic monitoring of groundwater levels, organic vapors, and LNAPL thickness was

conducted in borings as they were completed, which has continued throughout the reporting period. The following bullets describe observations associated with LNAPL activities:

- On March 3, 2022, the concrete floor was removed at A3+000-TR between the train rails, (b) (3) (A) to the RHS Pump Station portal. On March 4, 2022, a soil sample was collected using MIS methodology from 0 to 0.5 ft btf, which had an organic headspace reading of 352.2 ppmv. On March 9, 2022, a boring was advanced to approximately 5 ft btf within the A3+000-TR trench. On March 10, 2022, LNAPL was observed, and approximately 2 ounces (0.016 gallon) of LNAPL was removed from the 1.5-inch (0.125 ft) diameter boring. A water sample from the boring with a sheen was sent for forensic analysis. On June 15, 2022, the A3+000 trench and borehole were backfilled and resurfaced.
- On March 30, 2022, an adjacent boring (A3-010-BH) was drilled; elevated organic vapor measurements (685 ppmv) in cuttings from that boring were recorded on March 31, 2022. A3-010-BH and later A3-010-TW have been monitored for LNAPL periodically (weekly) through the reporting period.
- On May 23, 2022, a bail-down recovery test was conducted in A3-010-BH. Product thickness ranged from 0.11 ft following the initial drawdown to 0.35 ft 20.28 hours later when fully recovered. Figure 6-7 presents the recovery of the perched water table and LNAPL in a log-linear chart, along with the data used to generate the chart.

These observations resulted in a step-out boring being drilled on April 1, 2022 (A3+015-BH) approximately (b) (3) (A) of the trench, just (b) (3) (A) of the concrete thrust block installed to stabilize the 24-inch HDPE pipe to the external GAC system. Results from this step-out were as follows:

- Organic vapors from soil headspace were elevated (123.1 ppmv).
- Diesel range organics (C10–C24) (DRO) concentrations from two groundwater samples exceeded the solubility limit for JP-5 (approximately 5 milligrams per liter [mg/L]), which suggests that sheen was present in the sample:
  - DRO on April 1, 2022 (A3015-WGN01-002.0) was 390 mg/L.
  - DRO on May 23, 2022 (A3015-WGN01-052322) was 130 mg/L.
- A3+015-BH was reamed to 2.5-inch diameter, filled with a prepack screen, and developed and sampled as temporary well A3+015-TW. DRO in one groundwater sample approached the solubility limit. DRO on September 12, 2022 (A3015TW-PRN01-WK2) was 4.6 mg/L.
- On August 3, 2022, A3-040-BH was completed with a hammer drill to approximately 6 ft total depth at a location approximately (b) (3) (A) of A3-010-BH.
  - The maximum organic vapor result from soil headspace testing was measured at the 5- to 6-ft interval (275.7 ppmv); the Oil in Soil test kit indicated positive results for LNAPL.

- Between August 8 and 22, 2022, LNAPL was observed at thicknesses between 0.01 and 0.03 ft.
- On September 6, 2022, following reaming of the hole to 2.5-inch diameter and installation of a prepacked well screen for the completion of temporary well A3-040-TW, LNAPL was measured at a thickness of 0.56 ft.
- On September 12, 2022, product was measured at a thickness of 0.41 ft. This product was removed and submitted (A3-040TW-PRN01-WK2) to Alpha Analytical laboratory for forensic analysis (Appendix C.2, GSI Tech Memo, Alpha report L2250426), which identified the fuel as similar to kerosene or JP-5. Forensics also suggested that the fuel was not degraded but had lost several of the more soluble constituents, likely dissolved in the perched water. Since the September 12, 2022 bail-down, LNAPL has not exceeded 0.1 ft.

6.6 Laboratory Sample Preservation Procedures

All laboratory soil and groundwater samples were placed on wet ice immediately after collection and maintained temperature control through delivery to the laboratory. Soil vapor samples were collected in Summa canisters and shipped after all samples completed.

7.0 Data Quality

Quality assurance/quality control (QA/QC) procedures were employed with the goal of maintaining method compliance and meeting the project measurement quality objectives. The measurement quality objectives are objective performance requirements defined by the analytical methods or applicable guidance documents.

7.1 Laboratory QA/QC

QA/QC procedures were performed by the laboratory in accordance with their SOPs and the cited analytical methods. Laboratory QC differs somewhat for each method, but in general includes the following:

- Batch and Sample QC
  - Method blanks
  - Laboratory control samples (LCSs)
  - Matrix spikes/matrix spike duplicates (MS/MSDs) or LCS duplicates (LCSDs)
  - Surrogates (organic analyses)
- Instrument QC
  - Initial and continuing calibration blanks
  - Initial and continuing calibration verifications

- Internal standards (gas chromatography/mass spectrometry [GC/MS] analyses)
- Mass tuning checks (GC/MS analyses)

The procedure, frequency, and measurement quality objectives for each of these QC elements are defined in the individual determinative methods, the Department of Defense (DoD) *Quality Systems Manual (QSM) for Environmental Laboratories* (DoD and DOE 2021) or statistically derived by the laboratory (for surrogates, spikes and LCSs).

The analytical data were reported by the laboratory in a summary format ("Level II report") (see Appendix D) including: a narrative discussing any QA/QC nonconformances; definitions of data qualifiers used; the CoC and sample receiving forms; analytical results by sample; summaries for each of the batch and sample QC elements listed above, as appropriate; and electronic data deliverable (EDD) file(s). In addition, the laboratory provided instrument QC information and raw data, including extraction logs and instrument printouts, in a comprehensive "Level IV report" for each sample delivery group (SDG).

Each Level II report underwent an initial cursory review to verify that the requested analyses were performed, holding times were met, and any data qualifiers applied by the laboratory were defined. Common qualifiers appearing in the Level II reports included:

U = Analyte was not detected. The limit of detection (LOD) is shown.

J = Analyte was detected at an estimated concentration between the method detection limit and the limit of quantitation (LOQ).

Q = One or more QC criteria were exceeded.

M = Analyte was manually integrated (the mass chromatography analyst manually redefined the baseline or the peak boundaries for an analyte when the peak was inappropriately identified or measured by the instrument software).

Level II reports, Level IV reports, and EDDs were uploaded into the JBPHH Red Hill EDMS, where they can be accessed by authorized users for viewing, querying, and validation.

7.2 Field QA/QC

During field sampling activities, collection and decontamination procedures were in place to minimize cross-contamination. Pre-cleaned and pre-preserved containers were provided by the laboratory and are traceable by manufacturer and production batch. Field duplicates were collected at a frequency of 10% or greater dependent on the quantity of material produced during field activities. MIS triplicate samples were collected at four of the eight trench locations. Trip blanks provided by the laboratory were included in each cooler containing samples for VOC analyses.

The results for the field duplicates and triplicates demonstrated acceptable precision and no analytes were detected in the trip blanks above the LOD. No qualifiers were applied based on field QC results.

7.3 Data Validation

The objective of data validation is to provide data of known quality for project decisions. Data validation reports are presented in Appendix E. Data quality is judged in terms of precision, accuracy, representativeness, comparability, sensitivity, and completeness:

- Precision – the reproducibility of replicate measurements. Evaluated by the relative percent difference (RPD) of LCS/LCSD, MS/MSD, field duplicate (FD), and laboratory duplicate results.
- Accuracy – the degree of conformity of a measurement to a standard or true value. Evaluated through measurement of the percent recovery (%R) of an analyte in a reference standard or spiked sample.
- Representativeness – the degree to which data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is promoted by using regulator-approved, industry-standard sampling and analysis protocols specific to the sampled medium, adhering to method holding times, and monitoring blank samples for contamination.
- Comparability – the confidence with which one data set can be compared to another and, by extension, to regulatory criteria. Data sets with acceptable precision and accuracy are considered comparable if collection techniques, sample handling, analytical methods, and reporting limits are equivalent.
- Sensitivity – the ability to meet the detection limits and quantitation limits needed to satisfy project objectives.
- Completeness – the overall percentage of valid analytical results (including estimated results) compared to the total number of analytical results reported by the analytical laboratory. In general, a percentage of 90% or better is desirable.

The analytical laboratory data for the site characterization sampling events beginning in June 2022 were submitted to a third-party data validator, Environmental Data Services, Ltd. (EDS), for data validation and assessment. Due to a high sample volume and slow turnaround times at the third-party validation companies during early 2022, validation was conducted by AECOM chemists (not otherwise associated with Red Hill) for samples collected in February through May 2022. All reports were validated at a Stage 2B level, as defined in the DoD QSM (DoD and DOE 2021), which includes evaluation of the CoC; sample receiving documents; batch, sample, and instrument QC summaries; and extraction logs. At least 10% of the samples were further validated at Stage 4, which adds evaluations of the raw data, all manual integrations, and standards traceability logs, and includes recalculation of selected sample results.

During data validation, a nonconforming practice in the quantitation of TPH-g was identified, which affected all the trench MIS and trench boring soil samples. Specifically, the area of the chromatography peaks had not been integrated in accordance with the analytical method. The

laboratory was instructed to reprocess the existing TPH-g instrument data to establish an appropriate baseline and integrate the entire area of the unresolved "hump" as well as any discrete peaks falling within the gasoline range, rather than only the area of individual peaks between adjacent valleys. Upon completion of the reprocessing, many of the detected TPH-g concentrations were significantly higher than previously reported. The revised concentrations are more representative of the total petroleum constituents in the range analyzed.

Based on validation findings, analytical data may be left unqualified, qualified as estimated (J or UJ), estimated with a low or high bias (J- or J+), below detection (U), or recommended to be excluded from the data set (X). A data point flagged "X" indicates a serious deficiency in meeting QC criteria and is considered unusable. The findings and qualifiers are summarized below.

7.3.1 Subsurface Soil Samples

Subsurface soil samples included trench MIS samples, trench boring samples, and step-out boring samples. Data validation concluded that only minor deviations from established criteria for precision and accuracy were observed in the soil data sets, resulting in the qualification of selected values as estimated (flagged J, J-, J+, or UJ). Results for VOCs and TPH-g in one sample (A3325H-SON01-001.0) were qualified as estimated (J or UJ) due to an exceedance of the holding time, but the overall representativeness and comparability were considered acceptable. The LODs were at or below the regulatory criteria for the reported analytes. No results were flagged as unusable; therefore, the completeness percentage for the soil samples is 100%.

7.3.2 Groundwater Samples

Groundwater samples included trench boring water samples, initial step-out boring water samples, and temporary well water samples. Data validation concluded that only minor deviations from established criteria for precision and accuracy were observed in the groundwater data sets, resulting in the qualification of selected values as estimated (flagged J, J-, J+, or UJ). Results for TPH-d and TPH-o in one sample (A3015-WGN01-002.0) were qualified as estimated (J) due to an exceedance of the extraction holding time, but the overall representativeness and comparability were considered acceptable. The LODs were at or below the regulatory criteria for the reported analytes. No results were flagged as unusable; therefore, the completeness percentage for the groundwater samples is 100%.

7.3.3 Soil Vapor Samples

Soil vapor samples collected in February and December 2022 have undergone data validation; however, samples collected in January and February 2023 have not been validated as of this report date and are not included in this report. Data validation concluded that only minor deviations from established criteria for precision and accuracy were observed in the soil vapor data sets, resulting in the qualification of selected values as estimated (flagged J, J-, J+, or UJ). Results for N in all December 2022 samples were qualified as estimated (J or UJ) due to an exceedance of the Method TO-15 initial calibration criteria. Five samples for TO-15 VOC analysis and six samples for TO-3

TPH-g analysis were analyzed beyond the recommended holding time and were qualified as estimated (J- or UJ). The observed exceedances of QC criteria and holding times were not extreme, and the overall representativeness and comparability of the data sets were considered acceptable. The LODs were below the regulatory criteria for the reported analytes. No results were flagged as unusable; therefore, the completeness percentage for the soil vapor samples is 100%.

8.0 Analytical Results

Petroleum-impacted soil, perched groundwater and LNAPL, and soil vapor results for this investigation are described in detail in this section. Table 8-1 summarizes the multi-media samples and analytical test methods analyzed by the project laboratories.

8.1 Shallow Subsurface Soil Analytical Results

This subsection presents a comprehensive summary of the analytical laboratory results from tests performed on shallow subsurface soil samples (less than 12 ft btf) collected from trenches and shallow boreholes in the study area. Samples were analyzed by Eurofins, Seattle for the COPCs recommended in the DOH TGM for middle distillates representing JP-5, the contaminant of concern at the site. Analytical methods and COPCs analyzed were:

- TPH-g (C6–C10) by Method 8260_CALUFT
- TPH-d (C10–C24) by Method 8015D-DRO
- TPH-o (C24–C40) by Method 8015D-DRO
- PAHs (N, 1MN, and 2MN) by Method 8270E Selected Ion Monitoring (SIM)
- VOCs (BTEX) by Method 8260D

Laboratory analytical results were compared to DOH EALs in Table 4-2, which were taken from the DOH Hazard Evaluation and Emergency Response (HEER) Surfer Table A-2, Soil Action Levels (potentially impacted groundwater is a current or potential drinking water source; surface water body is located within 150 meters of the release site) (DOH 2017). Soil EALs were used to compare results to the following risk drivers:

- Leaching to groundwater that is a potential source of drinking water
- Direct exposure impact to human health
- Gross contamination (e.g., odor)

8.1.1 Shallow Subsurface Soil Analytical Results in Trenches

Shallow subsurface soil samples from trenches were collected within each trench using MIS methodology to provide a result for each trench as a decision unit (DU). In one trench, MIS consisted of three replicate samples. Each MIS sample consisted of 30 increments and 5 cubic centimeters of soil (Table 8-2, Table 8-3 and Table 8-4, and Figure 8-1).

8.1.1.1 Total Petroleum Hydrocarbons

TPH-g was analyzed in 15 subsurface soil samples and detected in 67% of those samples:

- The Leaching to Groundwater EAL was not exceeded in subsurface soil samples.
- The Direct Exposure EAL was not exceeded in subsurface soil samples.
- The Odor Threshold EAL was exceeded in five subsurface soil samples.

TPH-d was analyzed in 15 subsurface soil samples and detected in 100% of those samples:

- The Leaching to Groundwater EAL was exceeded in five subsurface soil samples.
- The Direct Exposure EAL was exceeded in ten subsurface soil samples.
- The Odor Threshold EAL was exceeded in eight subsurface soil samples.

TPH-o was analyzed in 15 subsurface soil samples and detected in 100% of those samples:

- No EALs were exceeded in subsurface soil samples.

***8.1.1.2** PAHs (N, 1MN, and 2MN)*

N was analyzed in 15 subsurface soil samples and detected in 80% of those samples:

- The Leaching to Groundwater EAL was exceeded in one subsurface soil sample.
- No Odor Threshold EAL was exceeded in subsurface soil samples.

1MN was analyzed in 15 subsurface soil samples and detected in 80% of those samples:

- The Leaching to Groundwater EAL was exceeded in three subsurface soil samples.
- No Odor Threshold EAL was exceeded in subsurface soil samples.

2MN was analyzed in 15 subsurface soil samples and detected in 80% of those samples:

- The Leaching to Groundwater EAL was exceeded in one subsurface soil sample.
- No Odor Threshold EAL was exceeded in subsurface soil samples.

***8.1.1.3** VOCs (BTEX)*

Benzene was analyzed in 15 subsurface soil samples and detected in 13% of those samples:

- The Leaching to Groundwater EAL was exceeded in two subsurface soil samples where detection limits exceeded the EAL due to dilution.
- The Direct Exposure EAL was exceeded in one subsurface soil sample.

- No Odor Threshold EAL was exceeded in subsurface soil samples.

Toluene was analyzed in 15 subsurface soil samples and detected in one sample:

- The Leaching to Groundwater EAL was exceeded in one subsurface soil sample where detection limits exceeded the EAL due to dilution.
- The Direct Exposure EAL and Odor Threshold EAL were not exceeded.

Ethylbenzene was analyzed in 15 subsurface soil samples and detected in one sample.

- The Leaching to Groundwater EAL was exceeded in one subsurface soil sample, where detection limits exceeded the EAL due to dilution.
- The Direct Exposure EAL and Odor Threshold EAL were not exceeded.

M-Xylene and p-xylene were analyzed in 15 subsurface soil samples and detected in 33% of those samples:

- The Leaching to Groundwater EAL was exceeded in one subsurface soil sample.
- The Direct Exposure EAL and Odor Threshold EAL were not exceeded.

8.1.2 Shallow Subsurface Soil Analytical Results in Boreholes

Borehole shallow subsurface soil samples were collected as discrete grab samples from a selected 1-ft interval based on PID VOC headspace readings during hammer drilling (Table 8-5, Table 8-6, and Table 8-7; and Figure 8-2).

8.1.2.1 Total Petroleum Hydrocarbons

Only a selected set of borehole samples were analyzed for TPH-g because of the limited quantity of soil produced as a result of the drilling method.

TPH-g was analyzed in three subsurface soil samples and detected in 67% of those samples:

- The Leaching to Groundwater EAL was not exceeded in subsurface soil samples.
- The Direct Exposure EAL was not exceeded in subsurface soil samples.
- The Odor Threshold EAL was exceeded in two subsurface soil samples.

TPH-d was analyzed in 25 subsurface soil samples and detected in 80% of those samples:

- The Leaching to Groundwater EAL was exceeded in nine subsurface soil samples.
- The Direct Exposure EAL was exceeded in 13 subsurface soil samples.
- The Odor Threshold EAL was exceeded in ten subsurface soil samples.

TPH-o was analyzed in 25 subsurface soil samples and detected in 44% of those samples:

- No EALs were exceeded in subsurface soil samples.

8.1.2.2 PAHs (N, 1MN, AND 2MN)

N was analyzed in 25 subsurface soil samples and detected in 72% of those samples:

- The Leaching to Groundwater EAL was exceeded in six subsurface soil samples.
- Direct Exposure EAL was exceeded in one subsurface soil sample.
- No Odor Threshold EAL was exceeded in subsurface soil samples.

1MN was analyzed in 25 subsurface soil samples and detected in 84% of those samples:

- The Leaching to Groundwater EAL was exceeded in ten subsurface soil samples.
- No Direct Exposure EAL or Odor Threshold EAL was exceeded in subsurface soil samples.

2MN was analyzed in 25 subsurface soil samples and detected in 84% of those samples:

- The Leaching to Groundwater EAL was exceeded in eight subsurface soil samples.
- Direct Exposure EAL was exceeded in one subsurface soil sample.
- No Odor Threshold EAL was exceeded in subsurface soil samples.

8.1.2.3 VOCs (BTEX)

Only a selected set of borehole samples were analyzed for BTEX because of the limited quantity of soil produced as a result of the drilling method.

Benzene was analyzed in three subsurface soil samples, and all results were below the laboratory detection limit:

- Two samples had detection limits that exceeded the Leaching to Groundwater EAL (0.3 mg/kg) in the subsurface soil due to dilution.
- No Direct Exposure EAL or Odor Threshold EAL was exceeded.

Toluene was analyzed in three subsurface soil samples and detected in one sample:

- The Leaching to Groundwater, Direct Exposure, and Odor Threshold EALs were not exceeded in subsurface soil samples.

Ethylbenzene was analyzed in three subsurface soil samples and detected in 67% of the samples.

- The Leaching to Groundwater EAL was exceeded in one subsurface soil sample.
- No Direct Exposure EAL or Odor Threshold EAL was exceeded.

M-Xylene and p-xylene were analyzed in 15 subsurface soil samples and detected in 100% of those samples:

- The Leaching to Groundwater EAL was exceeded in two subsurface soil samples.
- No Direct Exposure EAL or Odor Threshold EAL was exceeded.

8.2 Groundwater Sampling Analytical Results

Although the perched water sampled beneath the tunnel floor during this investigation is not a drinking water resource, there is the potential that it may be hydraulically connected to the underlying Pearl Harbor basal aquifer, which is currently used as a drinking water source.

This subsection presents a comprehensive summary of the analytical laboratory results from tests performed on groundwater samples collected from temporary wells and grab samples from boreholes. Analyses were conducted by Eurofins, Seattle for the COPCs defined in the DOH TGM for middle distillates that represent JP-5 fuel, the contaminant of concern at the site:

- TPH:
  - TPH-g (C6–C10) by Method 8260_CALUFT
  - TPH-d (C10–C24) by Method 8015D-DRO
  - TPH-o (C24–C40) by Method 8015D-DRO
- PAHs (N, 1MN, and 2MN) by Method 8270E SIM
- VOCs (BTEX) by Method 8260D

Laboratory analytical results were compared to DOH groundwater EALs from HEER Surfer (DOH 2021a). Groundwater EALs were used to compare results to the following risk drivers:

- Drinking Water Toxicity (Surfer Table D-3a)
- Chronic Freshwater Aquatic Habitat (Surfer Table D-4a)
- Gross Contamination (e.g., taste/ odor) (Surfer Table G-3)

8.2.1 Groundwater Analytical Results in Boreholes

Groundwater samples were collected from boreholes as unfiltered grab samples with a bailer as part of the initial investigation (Table 8-8, Table 8-9 and Table 8-10; and Figure 8-3).

8.2.1.1 Total Petroleum Hydrocarbons (TPH-g, TPH-d, TPH-o)

TPH-g was analyzed in two groundwater samples and detected in 100% of those samples:

- The Drinking Water Toxicity EAL was exceeded in two groundwater samples (A3+015-BH sampled 4/1/2022 and 5/23/2022).
- The Chronic Aquatic Habitat and Taste/Odor Threshold EALs were exceeded in one groundwater sample (A3+015-BH sampled 4/1/2022).

TPH-d was analyzed in four groundwater samples and detected in 100% of those samples:

- The Drinking Water Toxicity and Taste/Odor Threshold EALs were exceeded in three groundwater samples (A3+325-BH, and A3+015-BH sampled 4/1/2022 and 5/23/2022).
- The Chronic Aquatic Habitat EAL was exceeded in two groundwater samples (A3+015-BH sampled 4/1/2022 and 5/23/2022).

TPH-o was analyzed in four groundwater samples and detected in 50% of those samples.

- The Drinking Water Toxicity EAL was not exceeded in groundwater.
- The Chronic Aquatic Habitat EAL was exceeded in one groundwater sample (A3+015-BH sampled 5/23/2022).
- The Taste/ Odor Threshold EAL was exceeded in two groundwater samples (A3+325-BH, and A3+015-BH sampled 5/23/2022).

8.2.1.2 PAHs (N, 1MN, AND 2MN)

N was analyzed in four groundwater samples and detected in 50% of those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/ Odor Threshold EALs were exceeded in two groundwater samples (A3+015-BH sampled 4/1/2022 and 5/23/2022).

1-MN was analyzed in four groundwater samples and detected in 75% of those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/Odor Threshold EALs were exceeded in two groundwater samples (A3+015-BH sampled 4/1/2022 and 5/23/2022).

2-MN was analyzed in four groundwater samples and detected in 50% of those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/Odor Threshold EALs were exceeded in two groundwater samples (A3+015-BH sampled 4/1/2022 and 5/23/2022).

8.2.1.3 VOCs (BTEX)

Benzene was analyzed in two groundwater samples and detected in 50% of those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/ Odor Threshold EALs were not exceeded in groundwater samples.

Toluene was analyzed in two groundwater samples and detected in 50% of those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/ Odor Threshold EALs were not exceeded in groundwater samples.

Ethylbenzene was analyzed in two groundwater samples and detected in 100% of those samples:

- The Drinking Water Toxicity and Chronic Aquatic Habitat EALs were not exceeded in groundwater samples.
- The Taste/ Odor Threshold EAL was exceeded in one groundwater sample (A3+015-BH sampled 4/1/2022).

Total xylene was analyzed in two groundwater samples and detected in 100% of those samples:

- The Drinking Water Toxicity EAL was not exceeded in groundwater samples.
- The Chronic Aquatic Habitat EAL was exceeded in one groundwater sample (A3+015-BH sampled 4/1/2022).
- Taste/ Odor Threshold EAL was exceeded in two groundwater samples (A3+015-BH sampled 4/1/2022 and 5/23/2022).

8.2.2 Groundwater Analytical Results in Temporary Wells

Groundwater samples were collected from temporary wells completed greater than 3 days after development using low-flow methods. Seven temporary wells were installed and sampled on September 12, 2022. Of those seven wells, four wells (Table 8-11, Table 8-12 and Table 8-13; and Figure 8-3) had groundwater unaffected by LNAPL.

8.2.2.1 Total Petroleum Hydrocarbons (TPH-g, TPH-d, TPH-o)

TPH-g was analyzed in four groundwater samples and was not detected in those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/ Odor Threshold EALs were not exceeded in groundwater samples.

TPH-d was analyzed in four groundwater samples and detected in 75% of those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/Odor Threshold EALs were exceeded in one groundwater sample (A3+050-TW).

TPH-o was analyzed in four groundwater samples and was detected in 50% of those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/Odor Threshold EALs were not exceeded in groundwater samples.

8.2.2.2 PAHs (N, 1MN, AND 2MN)

N was analyzed in four groundwater samples and was not detected in those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/Odor Threshold EALs were not exceeded in groundwater samples.

1-MN was analyzed in four groundwater samples and was not detected in those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/Odor Threshold EALs were not exceeded in groundwater samples.

2-MN was analyzed in four groundwater samples and was not detected in those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/Odor Threshold EALs were not exceeded in groundwater samples.

8.2.2.3 VOCs (BTEX)

BTEXs were analyzed in four groundwater samples and results were non-detected in those samples:

- The Drinking Water Toxicity, Chronic Aquatic Habitat, and Taste/Odor Threshold EALs were not exceeded in groundwater samples.

8.3 Soil Vapor Sampling Analytical Results

Soil gas for laboratory analysis was collected in two phases during the OU-1 site characterization activities. In February 2022, subslab vapor samples were collected from three locations that represented hot spots based on handheld organic vapor measurements from 53 subslab sampling pins located in the Adit 3 and Pearl Harbor Tunnel floors.

The second phase of subslab sampling began in December 2022, and will continue monthly for 6 months, through May 2023. The second phase consists of samples collected from up to nine subslab sampling locations and includes up to 11 DSVMPs. DSVMP results are not presented in this OU-1 report but will be documented comprehensively in the future OU-2 report. Although the second phase is planned to continue through May 2023, this report only evaluates data through the end of the reporting period, which includes monthly results from December 2022 and January 2023.

The February 2022 samples were analyzed by Eurofins, Air Toxics, and included TO-3 for TPH (C5–C12), TO-15 (BTEX and N), and ASTM D1946 (O_2, CO_2, and methane). Samples were

collected in Summa canisters from A3+250, A3-150-B, and 2S-075 (Table 8-14, Table 8-15, and Table 8-16; and Figure 8-4).

TPH-g was analyzed by TO-3 in four soil vapor samples and detected in 100% of those samples.

- The Commercial Indoor Air EAL was exceeded in all four soil vapor samples
- The Shallow Soil Vapor EAL was not exceeded in any soil vapor sample.

BTEX and N were analyzed by TO-15 in four soil vapor samples and every compound was detected in at least two samples (50–75 percent). Although each soil vapor sample exceeded one or more Indoor Air EALs, none exceeded their Shallow Soil Vapor EALs.

Summa canister soil gas samples were collected monthly during phase 2 from nine subslab vapor pins including two duplicates. During this reporting period, samples were collected in December 2022 and January 2023 and were analyzed by American Analytics laboratory for TO-3 TPH (C4–C12), TO-15 (BTEX and N), and C3 (O_2, CO_2, and methane).

Results for soil vapor samples collected in December 2022 are presented in Table 8-17, Table 8-18, Table 8-19, and Figure 8-5.

- TPH-g was analyzed by TO-3 in nine soil vapor samples and detected in 100% of those samples. All nine samples exceeded the Commercial Indoor Air EAL for TPH-g, but none exceeded the more relevant Shallow Soil Vapor EAL.
- BTEX and N were analyzed by TO-15 in nine soil vapor samples, and the rate of detections ranged from benzene at 18% to total xylenes at 92%. Similar to the February 2022 event, benzene, ethylbenzene, xylenes, and N exceeded their Commercial Indoor Air EALs in one or more samples, but none exceeded the more relevant Shallow Soil Vapor EAL. Toluene was detected but did not exceed any EAL.

Results for soil vapor samples collected in January 2023 are presented in Table 8-20, Table 8-21, and Table 8-22; and Figure 8-6.

- TPH-g was analyzed by TO-3 in ten soil vapor samples and detected in 100% of those samples. Similar to December 2022, all ten samples exceeded the Commercial Indoor Air EAL for TPH-g, but none exceeded the more relevant Shallow Soil Vapor EAL.
- BTEX and N were analyzed by TO-15 in ten soil vapor samples, and the rate of detections ranged from benzene at 10% to total xylenes at 90%. Similar to the December 2022 event, BTEX and N exceeded their Commercial Indoor Air EALs in one or more samples, but none exceeded the more relevant Shallow Soil Vapor EAL. Toluene was detected but did not exceed any EAL.

8.4 LNAPL Sampling Analytical Results

As previously described, LNAPL in the subsurface was discovered during trench excavation activities while investigating the location of the Hume drain line (b) (3) (A) the Pump Station entrance in Adit 3 Tunnel. Although the LNAPL observed during this investigation beneath the tunnel floor on top of the perched water is not a drinking water resource, there is the potential that it may be hydraulically connected to the underlying Pearl Harbor basal aquifer, which is a currently used drinking water source.

The laboratory analyses on product samples in temporary wells and boreholes were performed by Alpha Analytical for saturated hydrocarbons (SHC; EPA 8015) and paraffins, isoparaffins, aromatics, naphthalenes, and olefins (PIANO) (EPA 8260) – the COPCs recommended in the DOH TGM for JP-5 fuel that was released to the environment on November 20, 2021 within the Adit 3 Tunnel:

- TPH-d (C10–C24); SHC
- TPH-o (C24–C40); SHC
- N, 1MN, and 2MN; PIANO
- BTEX; PIANO

9.0 Conceptual Site Model Evaluation

9.1.1 November 20, 2021, JP-5 Release

On November 20 and 21, 2021, JP-5 was released from a broken valve located in the ventilation corridor of the Adit 3 lower access tunnel. JP-5 flowed (b) (3) (A) from the release location approximately (b) (3) (A) to the Adit 3 Sump and Adit 3 sanitary sewer tank located at the low point of the tunnel. JP-5 migrated through cracks and openings in the tunnel floor during transit into the underlying fractured and heterogeneous basalt flows under the tunnel floor. Initially, at the sumps, float-activated pumps in the Adit 3 Sump and sanitary sewer tank pumped the excess fuel into a Holding Tank and Leach Tank system and to a Collection, Holding and Transfer Tank, both located outside the Adit 3 entrance to the (b) (3) (A) Once the pumps were disabled, fuel ponded around the sump and likely entered the natural environment below the tunnel floor through subsurface utility corridors and subsurface openings in the concrete sump walls.

JP-5 also flowed along the Adit 3 Tunnel floor through the switch systems at the Pearl Harbor Tunnel intersection wye and, to a lesser extent, (b) (3) (A) down the Pearl Harbor Tunnel. Cracks in the tunnel floor and openings from any switch penetrations allowed JP-5 to migrate into the underlying fractured and heterogeneous basalt flows directly (b) (3) (A) of the water development tunnel (b) (3) (A) (b) (3) (A) of RHS.

At the release area, JP-5 migrated through cracks and openings in the tunnel floor into the underlying fractured and heterogeneous basalt flows directly (b) (3) (A) the water development tunnel approximately (b) (3) (A) of RHS.

JP-5 was observed in the RHS water development tunnel in December 2021 and January 2022 between RHS and (b) (3) (A) of the shaft, indicating that JP-5 migrated through the tunnel floor and approximately (b) (3) (A) of heterogeneous basalt. In January and June 2022, the Navy used a ROV to navigate the water development tunnel and collect video of the conditions of the tunnel ceiling and sidewalls, the water within the water tunnel, and the tunnel floor. The ROV documented fluid dripping from the ceiling and sidewalls, and evidence of fluorescence (evidence of LNAPL) (DON 2022b; 2022h).

In March and April 2022, shallow hammer-drill borings were advanced in hotspots identified in subslab SVMPs. JP-5 was observed on a perched water table located between 3 and 4 ft btf just (b) (3) (A) of the Pump Station portal in the Adit 3 Tunnel, and elevated dissolved concentrations of JP-5 were observed in the perched water just (b) (3) (A) of the Pump Station portal. It is reasonable to believe that the perched water has limited the vertical migration of JP-5 below the perched groundwater in those areas where the perched groundwater is present. Additional data collection is planned via drilling and sampling beneath the perched water body to validate this hypothesis. Figure 9-1 illustrates the preliminary hydrogeologic and contaminant migration Conceptual Site Model (CSM) based on the current OU-1 information. This CSM will be updated in the future Adit 3 OU-2 Site Characterization Report, as more information becomes available.

9.1.2 Chemicals of Potential Concern

DOH's technical perspective and regulatory guidance on the characterization of petroleum-impacted soil and groundwater are described in Section 6 (Soil, Soil Vapor and Groundwater Action Levels for TPH) of the DOH document *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater* (DOH 2017). This section is summarized as follows:

- Petroleum is a complex mixture that degrades into potentially toxic metabolites.
- Non-specific aliphatic and aromatic compounds and related degradation compounds compose the overwhelming majority of the mass collectively referred to as TPH (TGM Volume 1, Section 2.6.1).
- Risk to human health and the environment posed by petroleum releases is evaluated in terms of both TPH and individual "indicator" compounds such as BTEX as well as N, 1MN, and 2MN and other targeted PAHs. The latter compose only a small percentage of the total mass in fuels and in vapors but can pose a significant risk due to their higher toxicity.
- Concentrations of individually targeted compounds such as BTEX and PAHs should be subtracted from the reported concentration of TPH. This includes soil, vapor, and water samples but is most important for the latter, since dissolved-phase hydrocarbons are

anticipated to be dominated by more soluble aromatics. This can only be reliably done, however, if the same analytical method is used for both TPH and individual compounds.

- For risk evaluation, samples should also be evaluated for additives known or suspected to have been pre-blended into the fuel stored in the Red Hill tanks, as well as cleaning agents that might have been used to clean the tunnel after the initial May 6, 2021 Release. Additives, including antioxidants, biocides, and fuel system ice inhibitors, are normally pre-blended into stored jet fuel or added during fueling of a plane.

Appendix A, Section 4.1.6 (LNAPL Plume Delineation) of the DOH guidance (DOH 2017) identifies soil borings as parts of the LNAPL characterization process, including the following delineation methods for soil:

- If the depth of the source of a release is known, then the approximate upper extent of that release can be inferred.
- Headspace measurements for volatile organics will typically show an increase in concentration within the LNAPL zones. Plotting these on a simple chart of depth against concentration will typically show the inferred bulk LNAPL zone (mobile or residual).
- Visual and olfactory observations are typically logged as well, giving another indication of the presence of LNAPL.
- Soil samples are often collected and analyzed chemically, which will give another set of clear LNAPL indications. In general, TPH analytical results (for the appropriate fuel carbon range) greater than 250 mg/kg are indicative of residual LNAPL (because soil has a limited absorptive capacity).

Target petroleum-related analytes identified in the above guidance, and relevant DOH Environmental Action Levels (EALs) are listed in Table 4-2.

9.1.3 Potential Migration Pathways

The tunnel floor in the Adit 3 and Pearl Harbor Tunnel Study Area has cracks, holes, and other penetrations associated with under-floor utilities, such as cleanout piping, unsealed concrete core holes, train switching system penetrations, and previously uncompleted tunnel work. JP-5 migrated from above the tunnel floor to below the tunnel floor into the volcanic stratigraphy and utility corridors associated with the Hume drain and Pump Station cooling water drain line discharge. It is likely that cracks and holes in the Adit 3 Tunnel floor were migration pathways for JP-5 to migrate into the underlying basalt.

Organic vapors were detected from SVMPs installed in the Adit 3 and Pearl Harbor Tunnel floors that have provided evidence of where JP-5 migrated through penetrations through the tunnel floors and into the underlying stratigraphy and perched water. Those organic vapors have the potential to migrate back through the tunnel floors to impact indoor-air quality for workers in the Adit 3 and Pearl Harbor Tunnels.

Perched water between the Adit 3 Sump and the area (b) (3) (A) of the RHS Pump Station near A3-150-BH likely prevented vertical migration of JP-5 to the underlying basalt due to the buoyancy of the JP-5 on water. However, if sufficient head or thickness of JP-5 LNAPL was developed to sufficiently exceed the thickness of the perched water saturated zone, the pressure of the overhead LNAPL could penetrate the perched water system under the force of gravity. Between the RHS Pump Station and the Adit 3 Sump, the depth to the perched water is expected to be less than 4 ft btf; therefore, LNAPL would not be expected to penetrate the perched water body by more than 4 ft below the water table due to the lower density of LNAPL compared to water. The perched water system is not a potable water resource, although it may be a secondary source of soluble JP-5 compounds to the underlying basal aquifer, which is a source of potable water for residential and commercial receptors.

Along the Adit 3 Tunnel floor (b) (3) (A) of the Pump Station portal, the perched water appears to pinch out at depths greater than 6 ft btf. In addition, at an unknown location (b) (3) (A) of the Adit 3 and Pearl Harbor Tunnels wye, the perched water system is no longer observed. Where the perched water system is thin or nonexistent, LNAPL would migrate downward under the force of gravity through fractures, voids, and high-permeability zones toward the underlying basal aquifer. Conversely, in areas of low-permeability massive a‘ā, JP-5 may be retained or forced to migrate along horizontal bedding planes until vertical fractures or higher-permeability zones allow further downward migration.

There is evidence that the perched water system is leaky, potentially allowing water from the bottom of the perched water system to migrate through fractures and permeable zones to the underlying basal aquifer, which is a source of drinking water to residential receptors. Compounds related to the November 2021 release of JP-5 have been detected in the perched water system in the dissolved phase, which have the potential to migrate downward with the infiltrating perched water.

South Hālawa Stream runs (b) (3) (A) of the study area between (b) (3) (A) from the Adit 3 Tunnel at approximately (b) (3) (A) in the (b) (3) (A) Study Area to (b) (3) (A) in the (b) (3) (A) Study Area. This segment of South Hālawa Stream is a concrete channel, the bottom surface of which is estimated to be above the perched water system throughout its extent and is not expected to be a gaining segment of the stream except in periods of localized flooding. It is not expected to be a migration pathway for JP-5 or JP-5-impacted groundwater related to the November 2021 release.

Following the November 2021 release, JP-5 was observed to accumulate in the Adit 3 Sump and the Adit 3 sanitary sewer holding tank adjacent to the Adit 3 Sump. Pumps internal to both systems were designed to transport stormwater from the Adit 3 Sump and sewage from the Adit 3 sanitary sewage holding tank via pipelines running along the (b) (3) (A) sidewall of the Adit 3 Tunnel to holding tanks and a stormwater leach tank located (b) (3) (A) of the Adit 3 entrance. During the release, JP-5 filled these systems and activated the pumps, resulting in JP-5 being transported to their respective tanks outside the Adit 3 entrance. Investigations related to potential secondary

releases external to the Adit 3 and Pearl Harbor Tunnels are being evaluated and reported as separate study areas.

As described in preceding paragraphs, JP-5 and related chemicals from the November 2021 release migrated through the overlying vadose zone onto the basal water table directly underlying the impacted Adit 3 and Pearl Harbor Tunnels. Within 1 week of the release, JP-5 was observed in components of the JBPHH drinking water system, resulting in potential and anecdotal exposure of commercial/industrial and residential human receptors to JP-5-related chemicals dissolved in tap water. Upon discovery, the RHS Pump Station was turned off to eliminate it as a source of potable water to the JBPHH Water Distribution System, and the systems were flushed. RHS was isolated from the JBPHH Water Distribution System on November 28, 2021. However, due to the concern that JP-5 impacted groundwater in the basal aquifer may also be drawn into surrounding municipal water supply wells if pumping and related drawdown from RHS did not continue, the Navy restarted RHS in January 2022 to maintain a cone of depression within the basal water table that would mitigate offsite migration of LNAPL and dissolved-phase petroleum constituents in the basal aquifer. Currently, water pumped from RHS is treated by a GAC filtration process and discharged into South Hālawa Stream. The closest other water supply wells to the study area include:

- Board of Water Supply (BWS) Hālawa Shaft located approximately [redacted] (b) (3) (A) to the [redacted] (b) (3) (A) (hydraulically cross-gradient) of the Study Area
- BWS Moanalua 1, located approximately [redacted] (b) (3) (A) (hydraulically cross gradient) of the Study Area
- Navy ʻAiea Hālawa Shaft located approximately [redacted] (b) (3) (A) (hydraulically downgradient) of the Study Area.

9.1.4 Potential Receptors

Potential receptors from the November 2021 release are expected to be limited to the following:

- Onsite workers in the Adit 3 and Pearl Harbor Tunnels who may become exposed to JP-5 COPCs in indoor air via inhalation, or during periods of excavation below the tunnel floor via inhalation, direct exposure or ingestion of soil particles.
- Human residential and commercial/industrial consumers of impacted basal groundwater because the underlying basal aquifer is a source of potable water to the surrounding population.

10.0 Conclusions and Recommendations

This Adit 3 site characterization report is prepared to meet the specifications and the objectives of the HEER TGM Site Investigation Report, including accurate and thorough documentation of the sampling plan design, sample collection and handling procedures, laboratory analyses, data assessment, and a summary of the data collected. The objectives of the site characterization phase of the Navy's activities are to:

1. Identify whether chemicals released to the environment during the November 2021 release may pose a threat to human health or the environment.
2. Develop a complete data set to support treatability studies that will mitigate current and future threats to human health and the environment.
3. Meet the regulatory requirements for characterization, documentation, and notification.

This report is focused on OU-1 of the Adit 3 subsurface investigation, which includes the shallow subsurface (between the tunnel floor and the bottom of the perched water, approximately 12 ft btf) hydrogeologic media that have been impacted by the November 2021 release inside Adit 3. These media include:

- Subslab soil vapor from 53 SVMPs installed through the Adit 3 and Pearl Harbor Tunnel floors
- Shallow soil vapor from two vapor monitoring probes installed 5 ft btf in the Pearl Harbor Tunnel directly over the RHS water development tunnel (2S+075-SVMP-5.0) and at the release area within the Adit 3 Tunnel, also over the RHS water development tunnel (A3-375-SVMP-5.0)
- Shallow soil and rock cuttings collected from six shallow trenches using incremental samples, and grab samples from hammer drill cuttings where material was available to sample from trench borings and LNAPL step-out borings
- Perched water that was identified between 2 and 6 ft btf in the Adit 3 Tunnel along its first 600 ft and observed to pinch out (b) (3) (A) as observed in a DSVMP in the Adit 3 Tunnel and (b) (3) (A) as observed in a DSVMP in the Pearl Harbor Tunnel (these borings had no water). These points will be discussed in more detail in the future OU-2 report.
- JP-5 product remaining in the shallow media as LNAPL, which has been observed in temporary wells A3-010-TW, and A3-040-TW Evidence of JP-5 has also been noted from "Oil in Soil" test kit results in shallow soil borings, especially those drilled between the RHS Pump Station and the release area.

10.1 Conclusions

The results of the OU-1 Study are detailed in Section 6.0, Field Observations During Sampling, and Section 8.0, Analytical Results. These results identify the OU-1 area that represents a potential

threat to human health and the environment as bounded to the (b) (3) (A) by A3-050-BH/TW (see Figure 8-3); to the (b) (3) (A) by A3-375-SVMP/TR/BH; and to the (b) (3) (A) by 2S+100-BH (see Figure 8-2).

To the (b) (3) (A) A3-050-BH/TW is located approximately (b) (3) (A) of the observed groundwater mounding associated with the RHS pump cooling water pipeline:

- This borehole soil sample did not have a positive response from the "Oil in Soil" test kit, but analytical results for TPH-d in soil (1,200 mg/kg) exceeded the DOH Leaching to Groundwater EAL (940 mg/kg).
- The groundwater sample collected on September 12, 2022 also had a result for TPH-d (1,200 micrograms per liter [µg/L]) that exceeded the DOH Drinking Water Toxicity EAL (401 µg/L).
- Borings and temporary wells directly (b) (3) (A) of A3-050-BH/TW show compelling evidence of LNAPL, and borings and temporary wells directly (b) (3) (A) have lower concentrations of COPCs in soil and groundwater.
- Perched water at A3+050-BH/TW is influenced by the RHS pump cooling water drainpipe, which has created a perched water mound near the RHS Pump Station at A3+015-BH/TW. This groundwater mound is likely impeding the migration of LNAPL (b) (3) (A) on the perched water table. The perched water table is also a barrier for the migration of LNAPL to the basal water table, thus limiting impacts to dissolved-phase hydrocarbon constituents that are readily degraded aerobically.

To the (b) (3) (A) A3-375-SVMP/TR is located directly under the release area, and was characterized with a subslab SVMP, a shallow SVMP at 5 ft btf, and a trench with multi-level MIS results.

- MIS trench samples showed elevated PAHs N, 1MN, and 2MN at 5 mg/kg, 15 mg/kg, and 16 mg/kg, respectively, and TPH-d (6,200 mg/kg), all which exceed their DOH Leaching to Groundwater EALs.
- Coring results from the A3-375 (to be presented in the OU-2 SCR report at a later date) shows evidence of migration below the OU-1 boundaries, as a fuel product pathway to the basal aquifer. There was no evidence of perched water at this location, which would function as a barrier for fuel migration to the basal aquifer. For this reason, it is likely that COPCs migrated as product to the basal aquifer at this location.
- Subslab vapor pins located within the tunnel floor located directly (b) (3) (A) of the release area have consistently shown the absence of soil vapor organic constituents (b) (3) (A) of the release area, which occurred within a concrete walled ventilation room, with a doorway threshold to the (b) (3) (A) and a sloping tunnel floor to the (b) (3) (A) No evidence of significant migration to the (b) (3) (A) from the release area has been observed during this investigation.

As described above, the impacted OU-1 area is best parsed into: 1) the area that is underlain by a semi-permanent perched water table; and 2) the area where perched water is not a semi-permanent feature. Semi-permanent perched water is currently identified as starting at between A3-040-BH/TW and A3-010-BH/TW and extending (b) (3) (A) toward the Adit 3 Tunnel entrance. This perched water likely pinches out, or is temporal, based on seasonal precipitation (b) (3) (A) of A3-040-BH/TW. LNAPL and saturated hydrocarbon concentrations in perched water samples between A3-040-TW and A3+015-BH/TW are amenable to remedial options, such as air sparging within the perched water system, with monitoring to the (b) (3) (A) at A3+050-BH/TW.

Evidence of a permanent perched water system is less consistent (b) (3) (A) of A3-040-BH/TW and was not observed at the (b) (3) (A) boundary at A3-375-TR/DSVMP, nor at the (b) (3) (A) boundary at 1S-075-DSVMP:

- The subsurface stratigraphy in this area is expected to have been impacted by fuel due to migration points around penetrations for train rail switches associated with the Adit 3 and Pearl Harbor Tunnel wye.
- "Oil in Soil" test kit results in shallow borings in this area were generally positive for saturated oil.
- Lacking a perched water barrier to LNAPL migration downward provides a concern that LNAPL may be found at depth within the vadose. This area is expected to be where LNAPL passed through the vadose zone, into the RHS water development tunnel.

Based on the Navy's OU-1 site characterization, this report presents the following conclusions:

1. JP-5 as fresh fuel product (LNAPL) has been observed and verified forensically on perched groundwater approximately 75 ft above the basal aquifer.
2. JP-5 LNAPL was previously observed in the basal drinking water aquifer within the RHS water development tunnel through the use of submersible ROVs with video camera documentation.
3. LNAPL currently observed in the upper perched water has the potential to migrate to the basal aquifer by the same transport pathways that previously transported LNAPL to the RHS water development tunnel.
4. LNAPL in soil or rock beneath the study area floor, and to a lesser degree, petroleum-contaminated soil and groundwater may also impact the underlying basal aquifer through vertical migration through the vadose zone. This impact may result as mobile JP-5 constituents become dissolved in infiltrating meteoric groundwater, which is observed passing through the vadose zone within the Study Area. Although Leaching to Groundwater EALs are exceeded in trench and boring soil samples, these EALs are based on conservative fate and transport parameters that are not addressed in this report.

5. Although soil vapor measurements from subslab SVMPs have exceeded Indoor Air EALs, they have not exceeded Shallow Soil EALs, which take into account the fate and transport mechanisms for vapors to migrate into the indoor air breathing zone. This indicates that construction activities that would require excavation of the underlying soil should include measures to mitigate inhalation risks.

10.2 Recommendations

The Navy recommends the completion of a comprehensive investigation of the deep vadose zone (OU-2) to characterize potential secondary sources of LNAPL that may present an unacceptable risk to human health and the environment. In addition, the comprehensive OU-1 and OU-2 findings should be focused on filling data gaps that are required to address ongoing treatability studies in both OUs. The OU-2 SCR will provide comprehensive recommendations for both OU-1 and OU-2.

The Navy is currently conducting the OU-2 investigation. Pilot studies to determine if remediation technologies, such as soil vapor extraction (SVE) for the unsaturated portion of the vadose zone and air sparging for the LNAPL and associated dissolved-phase compounds observed in the perched water system (b) (3) (A) to the RHS Pump Station, could be used inside the tunnels. OU-2 characterization includes installation of up to six DSVMPs with nested vapor probes installed in permeable zones, identified as a‘ā clinker. Currently, three DSVMPs have been installed with a total of 11 probes that are monitoring organic vapors O_2, CO_2, and methane throughout the subsurface. It is anticipated that up to three additional DSVMPs will be installed throughout OU-2. These nested soil vapor probes will each include a thermocouple to correlate organic vapor, O_2, CO_2, methane, and temperature throughout the implementation of the treatability measures.

Following the completion of the OU-2 documentation, the Navy recommends that an Environment Hazard Evaluation (EHE) report be produced in accordance with the DOH TGM. The collection of site data and the identification of potential environmental hazards are iterative processes. EHEs as well as CSMs should stress fate and transport of chemicals of concern. As initial site data indicate potential environmental hazards, the need for additional data to fully define and evaluate the hazards and develop appropriate response actions must be evaluated. The identification of potential hazards early on during site investigation activities, even at a cursory level, can help guide the progression of field work and reduce the need for continual remobilization and collection of additional data. Applying this type of dynamic and iterative approach to the site investigation process will expedite completion of the investigation and support approval by the DOH HEER Office. Screening preliminary data up front allows for a more complete site investigation to be prepared and submitted.

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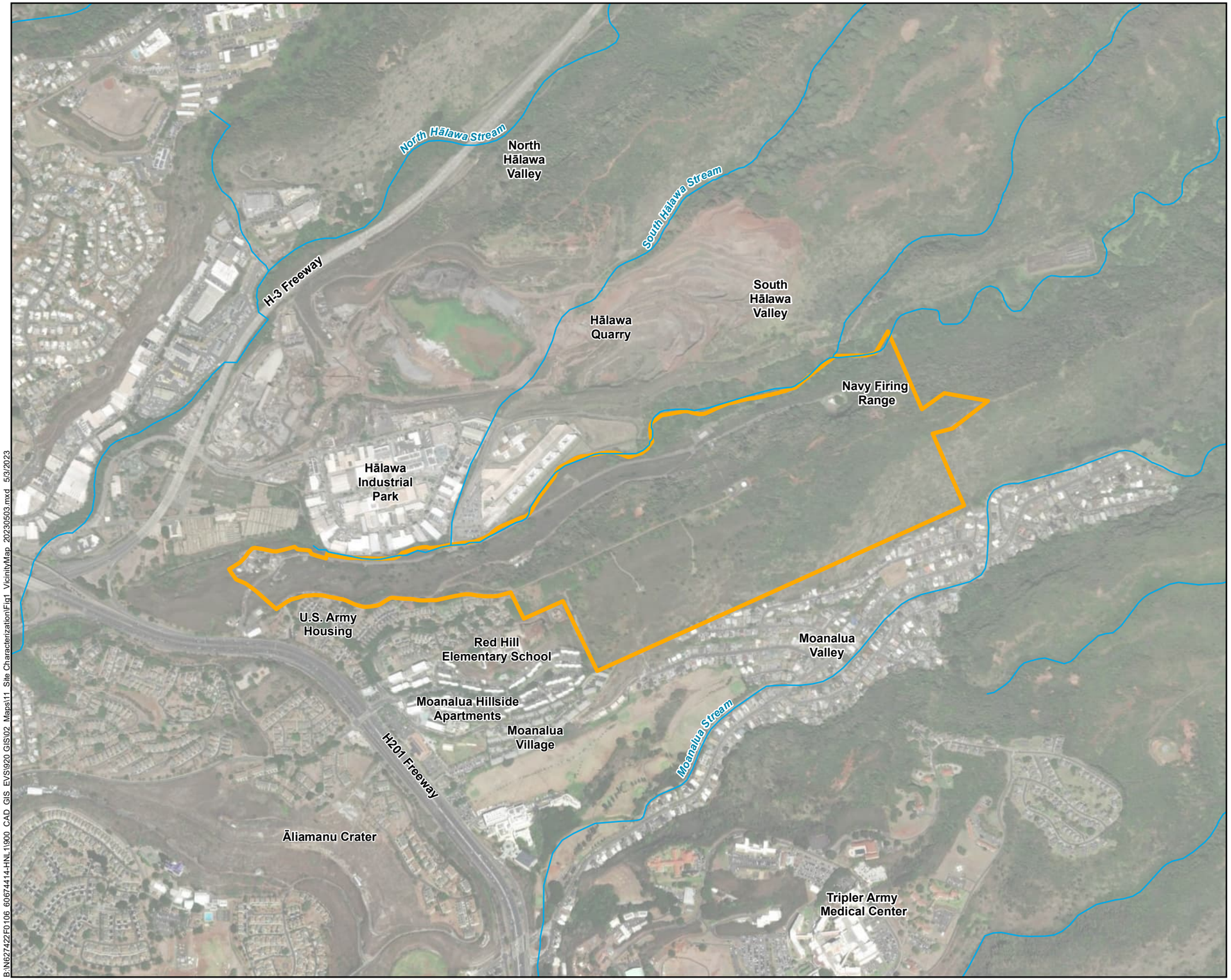
Figures



Location Map

Legend

Red Hill Facility Boundary

Stream

Notes

1. Map projection: NAD 1983 Hawaii State Plane Z3 ft
2. Basemap Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

N

0 600 1,200 2,400 Feet

Figure 1-1
Vicinity Map
Adit 3 Site Characterization Report
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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(b) (3) (A)

[redacted]

Figure 2-1
Site Features Map for
Adit 3 Tunnel
Red Hill Bulk Fuel Storage Facility
JBPHH, O‘ahu, Hawai‘i

(b) (3) (A)

[redacted]

Figure 2-2
Site Features Map, Cross-Section
Adit 3 Site Characterization Report
JBPHH, O'ahu, Hawaii

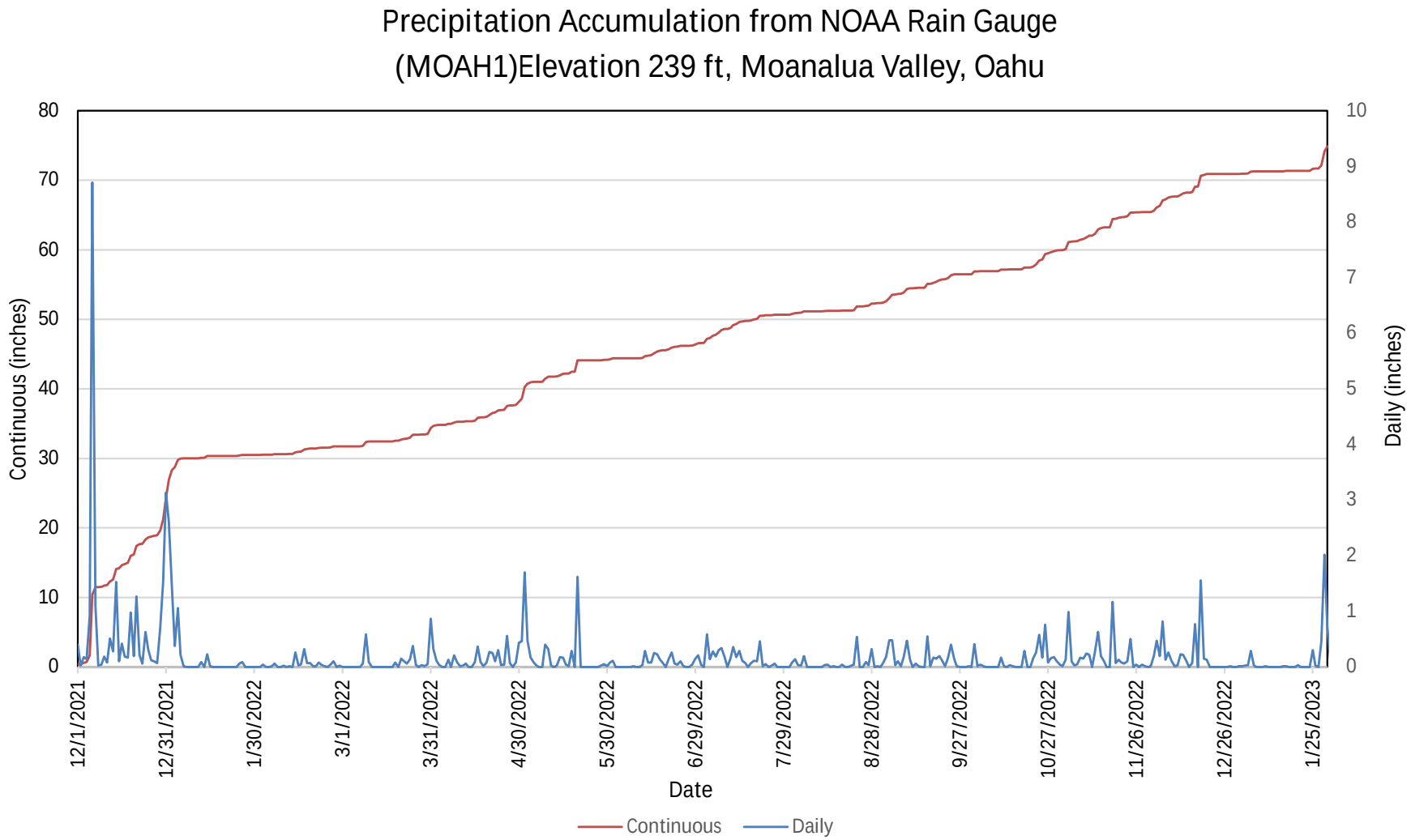


Figure 2-3
Site Precipitation Chart
Adit 3 Site Characterization Report
JBPHH, O'ahu, Hawaii

(b) (3) (A)

[redacted]

Figure 2-4 South Halawa stream Within (b) (3) (A) of the November 20, 2021 JP-5 Release Location

Reporting Period: November 20, 2021 to January 31, 2023

Monday, November 20, 2021	JP-5 Release in Adit 3 Tunnel.
Monday, December 13, 2021 – Monday, January 10, 2022	Subslab soil vapor probes installed in Adit 3 and Pearl Harbor Tunnel floor, which have been sampled periodically throughout the reporting period.
Thursday, January 13, 2022	First deployment of a remotely operated vehicle (ROV) into the RHS water development tunnel.
Friday, January 28, 2022 – Wednesday, February 2, 2022	Phase 1 geophysical surveys conducted in Adit 3 and Pearl Harbor Tunnel floor.
Monday, February 28, 2022 – Tuesday, March 29, 2022	Five trenches and five shallow soil borings excavated in Adit 3 and Pearl Harbor Tunnel floor. Perched water and JP-5 identified at some locations. Soil, groundwater, and JP-5 sampled where available.
Tuesday, June 14, 2022 – Wednesday, June 15, 2022	Second deployment of an ROV into the RHS water development tunnel.
Friday, June 24, 2022 – Wednesday, January 18, 2023	28 step-out borings drilled to a maximum depth of 6 ft below tunnel floor (btf) to evaluate the extent of JP-5 in the shallow subsurface soil and perched water in the Adit 3 and Pearl Harbor tunnels.
Monday, August 22, 2022 – Monday, September 12, 2022	Seven temporary wells were installed into the shallow perched water in the Adit 3 tunnel, and groundwater was sampled for petroleum constituents.
Thursday, September 15, 2022 – Tuesday, January 31, 2023	Pressure transducers installed in seven temporary wells and continuous water levels recorded in each well throughout the period.

Figure 3-1: OU-1 Site Characterization Activity Timeline

(b) (3) (A)

[redacted]

Figure 5-1
Subslab Soil Vapor Monitor Points

Adit 3 Site Characterization Report
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

(b) (3) (A)

[redacted]

Figure 5-2
Geophysical Survey, February 2022
Adit 3 Site Characterization Report
JBPHH, O'ahu, Hawaii

(b) (3) (A)

[redacted]

Figure 5-3
Shallow Trench Sampling Locations
Adit 3 Site Characterization Report
Red Hill Bulk Fuel Storage Facility
JBPHH, O‘ahu, Hawai‘i

(b) (3) (A)

[redacted]

Figure 5-4
LNAPL Step-Out Boring, Temporary Wells
Adit 3 Site Characterization Report
Red Hill Bulk Fuel Storage Facility
JBPHH, O‘ahu, Hawai‘i

(b) (3) (A)

[redacted]

Figure 6-1. Soil Vapor Monitoring Point Results
December 17, 2021 - January 9, 2023
Adit 3 Tunnel and Pearl Harbor Tunnel

Figure 6-2
Rain Gauge Precipitation Chart, NOAA Gauge MOAH1
Moanalua Valley, Oahu, Hawaii

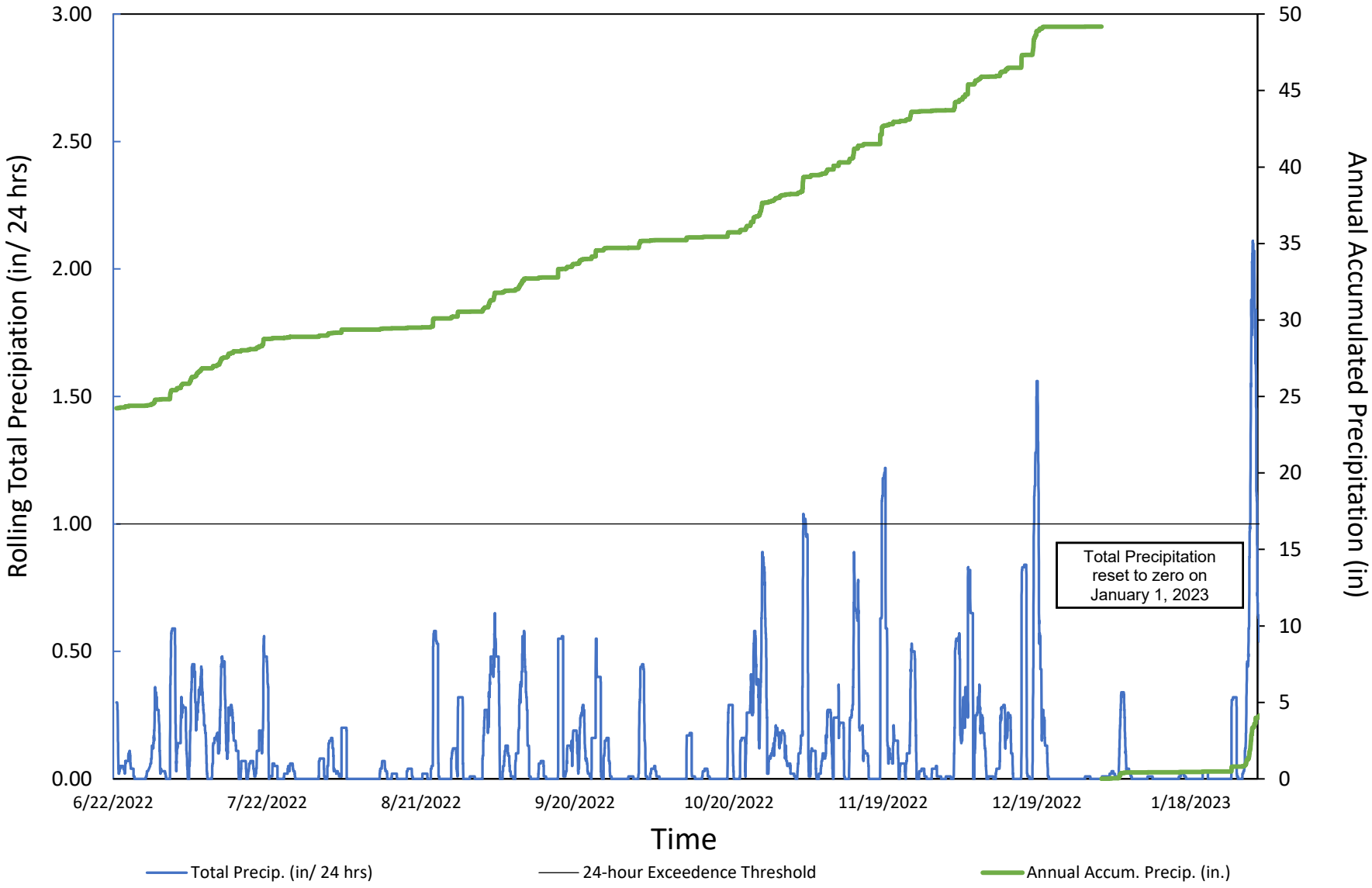
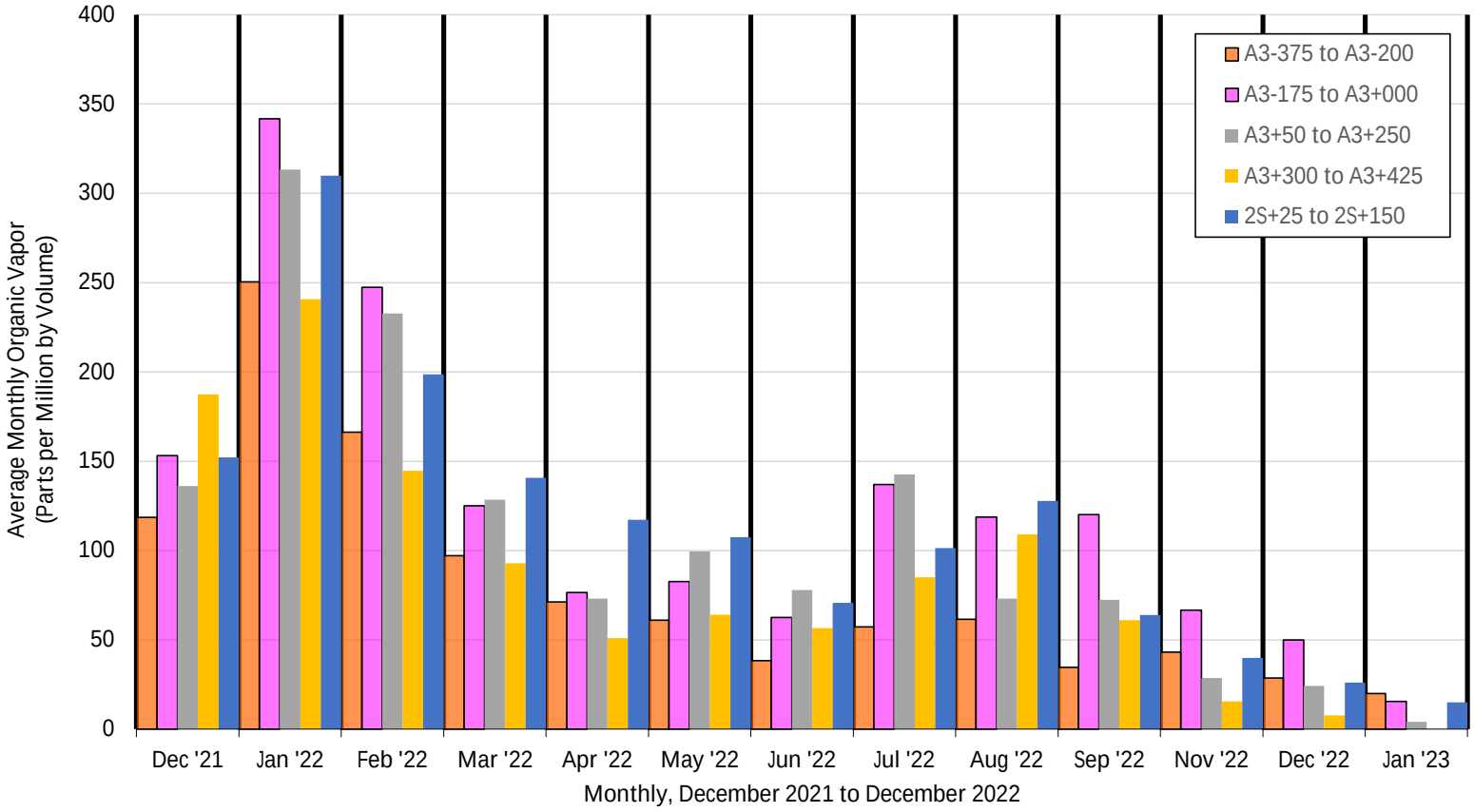


Figure 6-3
Map of Five Adit 3 Sections Evaluated for Average Monthly Organic Vapor In Subslab SVMPS
December 2021 through Jaunuary 2023
(b) (3) (A)

[redacted]

Figure 6-4
Average Monthly Organic Vapor Readings for Five Selected Sections of the Adit 3 Tunnel Using Handheld Photoionization Detectors (PIDs)



Average Monthly Organic Vapor Values (Parts per Million by Volume) for Selected Adit 3 Sections

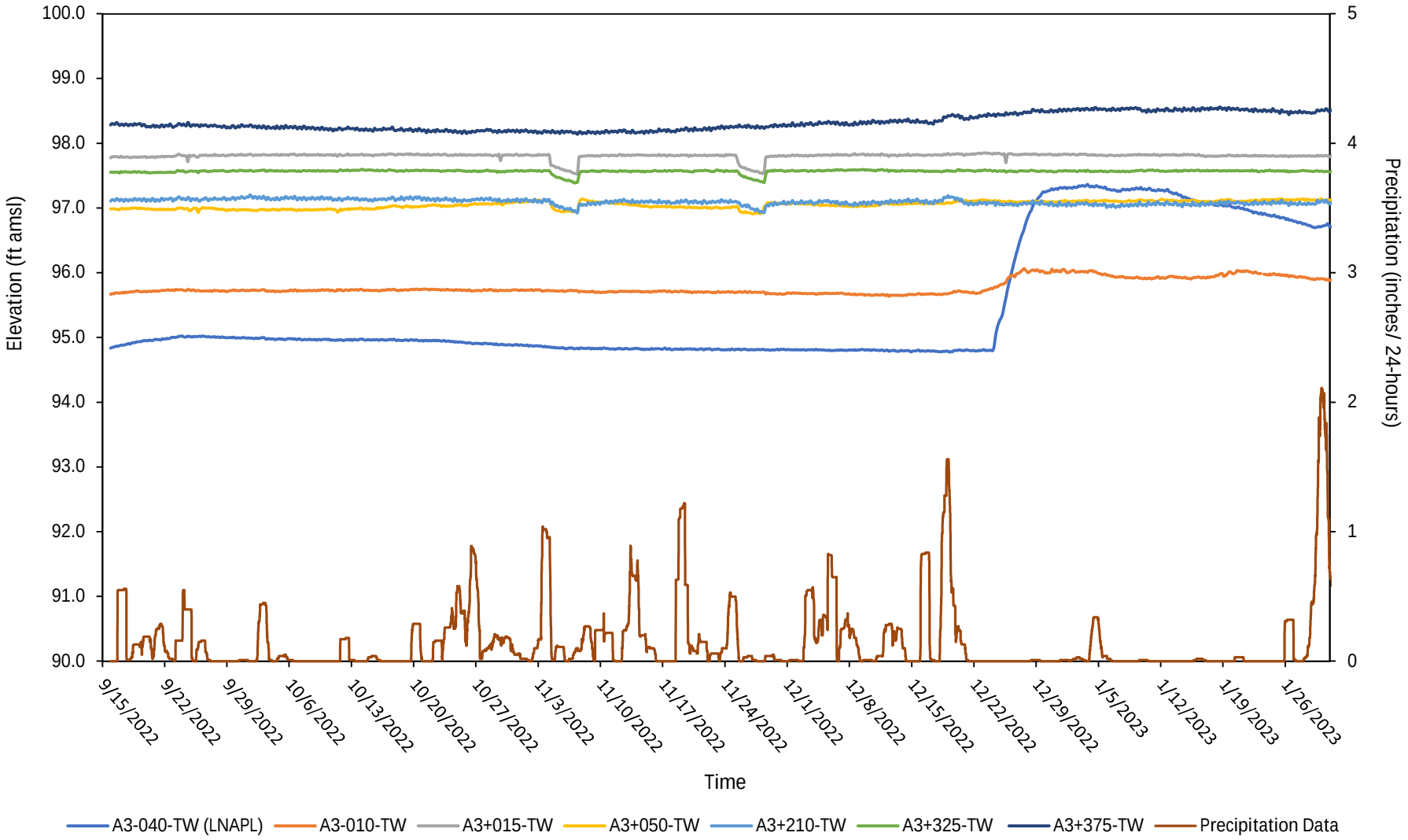
Adit 3 Sections	Dec '21	Jan '22	Feb '22	Mar '22	Apr '22	May '22	Jun '22	Jul '22	Aug '22	Sep '22	Nov '22	Dec '22	Jan '23
A3-375 to A3-200	119	250	166	97	71	61	38	57	62	35	43	29	20
A3-175 to A3+000	153	342	247	125	77	83	63	137	119	120	67	50	16
A3+50 to A3+250	136	313	233	129	73	99	78	143	73	72	29	24	4
A3+300 to A3+425	187	241	145	93	51	64	57	85	109	61	16	8	0
2S+25 to 2S+150	152	310	199	141	117	108	71	101	128	64	40	26	15

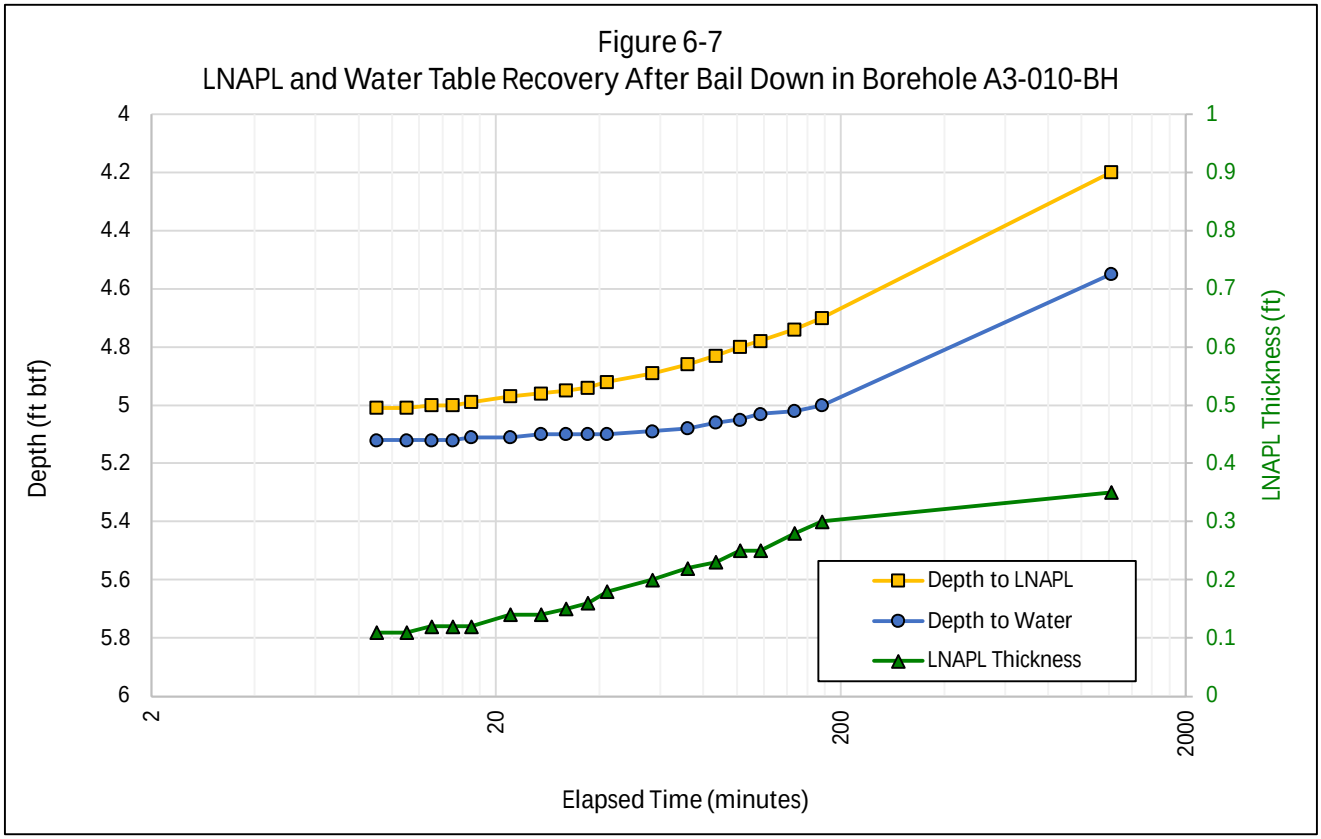
(b) (3) (A)

[redacted]

Figure 6-5
Tunnel Design Drawing, circa 1943

Figure 6-6
Continuous Water Elevation Time Series in Temporary Wells
Perched Groundwater vs Rain Gauge Data (MOAH1)





Date/ Time	Elapsed Time (min)	Product ft (btf)	Water ft (btf)	Product Thickness (ft)
5/23/2022 11:45	0	4.91	5.12	0.21
5/23/2022 11:54	9	5.01	5.12	0.11
5/23/2022 11:56	11	5.01	5.12	0.11
5/23/2022 11:58	13	5.00	5.12	0.12
5/23/2022 12:00	15	5.00	5.12	0.12
5/23/2022 12:02	17	4.99	5.11	0.12
5/23/2022 12:07	22	4.97	5.11	0.14
5/23/2022 12:12	27	4.96	5.10	0.14
5/23/2022 12:17	32	4.95	5.10	0.15
5/23/2022 12:22	37	4.94	5.10	0.16
5/23/2022 12:27	42	4.92	5.10	0.18
5/23/2022 12:42	57	4.89	5.09	0.20
5/23/2022 12:57	72	4.86	5.08	0.22
5/23/2022 13:12	87	4.83	5.06	0.23
5/23/2022 13:27	102	4.80	5.05	0.25
5/23/2022 13:42	117	4.78	5.03	0.25
5/23/2022 14:12	147	4.74	5.02	0.28
5/23/2022 14:42	177	4.70	5.00	0.30
5/24/2022 8:02	1217	4.20	4.55	0.35

Notes:

btf - below tunnel floor

ft - feet

min - minute

(b) (3) (A)

[redacted]

(b) (3) (A)

[redacted]

Figure 8-2
Soil Sample Results From Tunnel Floor Boreholes
Adit 3 Site Characterization

[redacted]

(b) (3) (A)

[redacted]

Figure 8-3
Groundwater Sample Results From Tunnel Floor Boreholes and Temporary Wells
Adit 3 Site Characterization

[redacted]

(b) (3) (A)

[redacted]

Figure 8-4
Soil Vapor Sample Results From Selected
Subslab Soil Vapor Monitoring Points (February 2022)
Adit 3 Site Characterization

(b) (3) (A)

[redacted]

Figure 8-5
Soil Vapor Sample Results From Selected
Subslab Soil Vapor Monitoring Points (December 2022)
Adit 3 Site Characterization

(b) (3) (A)

[redacted]

Figure 9-1 Conceptual Site Model

Tables

Table 4-1. Summary of Data Quality Objectives by Task

Medium and Location Sampled	Sampling Methodology	Parameters Measured and Rationale	Quality Criteria/ Standard Operating Procedure	Data Quality Objective
Groundwater from RHMW2254-01	Submersible Low Flow Pump	Dissolved concentrations of COPCs in potable water well	Anlytical methods as per the DOD QSM	Detection limits less than Action Levels DOD QSM requirements for PARCC parameters.
LNAPL from RHMW2254-01	Bailer	LNAPL on water table in potable water well.	Visual Observations/ semiquantitative forensics methods	Qualitative observation of severe impact, forensic identification of fuel source, determination of fuel additives.
LNAPL From Adit 3 Sump Impacted \by JP-5 release	Bailer	LNAPL on water surface in Sump	Visual Observations/ semiquantitative forensics methods	Qualitative observation of severe impact, forensic identification of fuel source, determination of fuel additives.
Subslab soil vapor below tunnel floor throughout the impacted area	Soil Vapor Pins at 50 to 25 ft intervals. Approximately 1,000 ft in Adit 3 and 400 ft in Pearl Harbor tunnels	Semi-quantitative organic vapor magnitude and mobility.	Calibrated handheld instruments	Semi-quantitative observations of relative concentration of organic vapors for hotspot determination (areal) and changes over time (temporal)
Stratigraphic native material and LNAPL	Electrode arrays, 1t 10 ft intervals transmitters and recievers, data processors	Resolve changers in resistivity and induced polarity	Signal proocessing techniques	Resolve targets whose size is 10% to 20% of it depth. Bedock is resistive, LNAPL is resistive, water is conductive.
Soil samples in shallow trenches excavated through the tunnel floors in Soil Vapor Pin hotspots	MIS of surface soil over bedrock directly beneath the tunnel floor	Mean soil concentration of DOH EAL COPCs specific to middle distillate hydrocarbons (JP-5)	Anlytical methods as per the DOD QSM	Detection limits less than Action Levels DOD QSM requirements for PARCC parameters
Soil in shallow borings located witin shallow trenches	Drill cuttings and sidewall scrapings from five 1.5-inch hammer-drill borings	Incremental grab sample soil concentrations of DOH EAL COPCs specific to middle distillate hydrocarbons (JP-5) limited to TPH-d,o, and naphthalenes, due to available soil volume	Anlytical methods as per the DOD QSM	Detection limits less than Action Levels DOD QSM requirements for PARCC parameters
Groundwater in shallow borings located within shallow trenches	Grab samples from groundwater observed in two 1.5-inch hammer-drill borings (undeveloped).	Grab groundwater samples from shallow boreholes for semi-quantitative analysis of perched water impact from JP-5 limited to TPH-d,o, and naphthalenes due to available water volume.	Anlytical methods as per the DOD QSM	Detection limits less than Action Levels DOD QSM requirements for PARCC parameters
Soil in shallow borings associated with step-out delineation sampling	Drill cuttings and sidewall scrapings from 1.5-inch hammer-drill borings	Incremental grab sample soil concentrations of DOH EAL COPCs specific to middle distillate hydrocarbons (JP-5) limited to TPH-d,o, and naphthalenes, due to available soil volume	Anlytical methods as per the DOD QSM	Detection limits less than Action Levels DOD QSM requirements for PARCC parameters

Table 4-**1.** Summary of Data Quality Objectives by Task

Medium and Location Sampled	Sampling Methodology	Parameters Measured and Rationale	Quality Criteria/ Standard Operating Procedure	Data Quality Objective
Groundwater in shallow borings associated with step-out delineation sampling	Grab samples from groundwater observed in 1.5-inch hammer-drill borings (undeveloped).	Grab groundwater samples from shallow boreholes for semi-quantitative analysis of perched water impact from JP-5 limited to TPH-d,o, and naphthalenes due to available water volume from undeveloped borings	Anlytical methods as per the DOD QSM	Detection limits less than Action Levels DOD QSM requirements for PARCC parameters
Groundwater in temporary wells associated with step-out delineation.	Groundwater collected in 2.5-inch borings and prepacked 1-inch and 1.5-inch well screens to 6 ft btf, developed.	Low-flow groundwater samples from developed temporary wells for quantitative analysis of perched water impact from JP-5 DOH EAL COPCs specific to middle distillate hydrocarbons	Anlytical methods as per the DOD QSM	Detection limits less than Action Levels DOD QSM requirements for PARCC parameters
Water levels/organic vapors/LNAPL thickness in stepout borings and temporary wells	Weekly collection of field parameters using field instrumentation including oil water interface probe and PID	Areal and temporal variations in water levels, organic vapors and LNAPL and corellations with rain gauge data to evaluate contaminat mobility in the shallowe subsurface	Calibrated handheld instruments	Water levels and product thickness measured to ± 0.01 ft Product sheen measured qualitatively Organic Vapor measured to ± 0.1 ppmv

Notes	Description
COPCs -	Compounds of Potential Concern
DOD QSM -	Department of Defense, Quality Systems Manual for Environmental Laboratories
DOH EALs -	Hawaii Department of Health Environmental Action Levels
ft -	feet
JP-5 -	Jet propellant number 5
LNAPL -	Light non-aqueuos phase liquid, such as JP-5 which floats on water
MIS -	Multi incremental sampling
PARCC -	Precision, accuracy, representativeness, completeness, comparability
PID -	Photo-ionization detector
TPH-d -	Total petroleum hydrocarbons , diesel range organics
TPH-g -	Total petroleum hydrocarbons, gasoline range organics
TPH-o -	Total petroleum hydrocarbons, residual range organics

Table 4-2. DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m^3) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6
	TPH-o	500 / 9,400 / 1,000	500 / 2,400	N/A

Notes:

Source: (DOH 2017) Hawai'i Department of Health Environmental Action Level Surfer (Fall 2017)

N/A Not applicable; EAL not provided

TPH-d TPH-diesel range organics

TPH-g TPH-gasoline range organics

[a] Soil EALs = (Gross Contamination) / (Direct Exposure) / (Leaching to Groundwater) in milligrams per kilogram (mg/kg)

[b] Groundwater EALs = (Odor Taste Threshold) / (Drinking Water Toxicity) in micrograms per liter (µg/L)

[c] Soil Vapor EALs = (Commercial/Industrial Shallow Soil Vapor Action Levels) (Table C) in micrograms per cubic meter (µg/m^3)

Table 5-1. Sample Location Coordinates Elevations, Internally Survey**ed** or Estimated

Location ID	Location Type	X SP (ft)	Y SP (ft)	Elevation (ft amsl)
A3+225-BH	BH	[redacted]	(b) (3) (A)	[redacted]
A3+215-BH	BH	[redacted]	[redacted]	[redacted]
A3+200-BH	BH	[redacted]	[redacted]	[redacted]
A3+150-BH	BH	[redacted]	[redacted]	[redacted]
A3+087-BH	BH	[redacted]	[redacted]	[redacted]
PS+095-BH	BH	[redacted]	[redacted]	[redacted]
PS+095-BHO	BH	[redacted]	[redacted]	[redacted]
A3-050-BH	BH	[redacted]	[redacted]	[redacted]
A3-050-BHO	BH	[redacted]	[redacted]	[redacted]
A3-090-BH	BH	[redacted]	[redacted]	[redacted]
A3-100-BH	BH	[redacted]	[redacted]	[redacted]
A3-110-BH	BH	[redacted]	[redacted]	[redacted]
A3-150-BH	BH	[redacted]	[redacted]	[redacted]
A3-200-BH	BH	[redacted]	[redacted]	[redacted]
A3-240-BH	BH	[redacted]	[redacted]	[redacted]
A3-250-BH	BH	[redacted]	[redacted]	[redacted]
A3-300-BH	BH	[redacted]	[redacted]	[redacted]
A3-350-BH	BH	[redacted]	[redacted]	[redacted]
2S+025-BH	BH	[redacted]	[redacted]	[redacted]
2S+100-BH	BH	[redacted]	[redacted]	[redacted]
2S+150-BH	BH	[redacted]	[redacted]	[redacted]
1S+025-BH	BH	[redacted]	[redacted]	[redacted]
2S+075-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+500-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+475-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+450-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+425-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+400-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3a+375-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3b+375-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+300-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+250-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+150-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+100-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+050-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3a+000-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3b+000-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-025-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3a-050-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3b-050-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-075-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-100-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-125-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3a-150-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3b-150-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-175-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3a-200-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3b-200-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-225-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-250-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-275-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3a-300-SVMP	SVMP	[redacted]	[redacted]	[redacted]

Table 5-1. Sample Location Coordinates Elevations, Internally Survey or Estimated

Location ID	Location Type	X SP (ft)	Y SP (ft)	Elevation (ft amsl)
A3b-300-SVMP	SVMP	[redacted]	(b) (3) (A)	[redacted]
A3-325-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3a-350-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3b-350-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-375-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-400-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-425-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3-450-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+025-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+050-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+075-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+100-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+125-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+150-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+175-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+200-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+225-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+250-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+275-SVMP	SVMP	[redacted]	[redacted]	[redacted]
2S+300-SVMP	SVMP	[redacted]	[redacted]	[redacted]
1S+038-SVMP	SVMP	[redacted]	[redacted]	[redacted]
1S+068-SVMP	SVMP	[redacted]	[redacted]	[redacted]
A3+375-BH/TW	TW	[redacted]	[redacted]	[redacted]
A3+325-BH/TW	TW	[redacted]	[redacted]	[redacted]
A3+210-BH/TW	TW	[redacted]	[redacted]	[redacted]
A3+050-BH/TW	TW	[redacted]	[redacted]	[redacted]
A3+015-BH/TW	TW	[redacted]	[redacted]	[redacted]
A3-010-BH/TW	TW	[redacted]	[redacted]	[redacted]
A3-040-BH/TW	TW	[redacted]	[redacted]	[redacted]
A3+215-TR	TR	[redacted]	[redacted]	[redacted]
A3+000-TR	TR	[redacted]	[redacted]	[redacted]
A3-010-TR	TR	[redacted]	[redacted]	[redacted]
A3-150-TR	TR	[redacted]	[redacted]	[redacted]
A3-375-TR	TR	[redacted]	[redacted]	[redacted]
2S+075-TR	TR	[redacted]	[redacted]	[redacted]

Notes:

BH/ BHO - Borehole/ Borehole Offset
ft, amsl - Feet above mean sea level
NM - Not Measured
SVMP - subslab or shallow soil vapor monitoring point
TW - Temporary Well
TR - Trench sampling location
X SP (ft) - Hawaii State Plane, Zone 3, X coordinate, feet
Y SP (ft) - Hawaii State Plane, Zone 3, Y coordinate, feet
[1] -Survey stopped at A3-400. Extrapolated by using a gradiant of 0.01 ft per 10 ft

Table 5-2. LNAPL Step-Out Boring Construction Summary

Location ID	Complete (Date)	Drilled Total Depth (ft btf)	Borehole Diameter (inch)	Soil Sample Collected (Date)	Oil in Soil Test Kit Results (P/N)	Temporary Well Installed (Yes/No)
1S+025-BH	8/2/2022	6.0	1.5	8/2/22	N	No
2S+025-BH	8/2/2022	6.0	1.5	8/2/22	P	No
2S+100-BH	1/18/2023	6.0	1.5	NC	NC	No
2S+150-BH	8/26/2022	6.0	1.5	NC	NC	No
A3+015-BH/TW	9/20/2022	6.0	2.5	4/1/22	NC	Yes
A3+050-BH/TW	9/20/2022	6.0	2.5	6/27/22	N	Yes
A3+087-BH	6/29/2022	5.8	1.5	6/29/22	P	No
A3+150-BH	6/27/2022	5.8	1.5	6/27/22	N	No
A3+200-BH	6/24/2022	2.0	1.5	NC	NC	No
A3+210-BH/TW	9/20/2022	5.8	2.5	6/24/22	N	Yes
A3+225H-BH	3/4/2022	2.5	7.0	3/30/22	NA	No
A3+325-BH/TW	9/20/2022	6.0	2.5	9/20/22	NC	Yes
A3+375-BH/TW	9/20/2022	6.0	2.5	8/26/22	N	Yes
A3-010-BH/TW	9/20/2022	6.0	2.5	3/31/22	NC	Yes
A3-040-BH/TW	9/20/2022	6.0	2.5	8/3/22	N	Yes
A3-050-BH	6/30/2022	1.5	1.5	NC	NC	No
A3-050-BHO	6/30/2022	6.0	1.5	6/30/22	P	No
A3-090-BH	8/29/2022	6.0	1.5	8/29/22	P	No
A3-100-BH	7/29/2022	6.0	1.5	7/29/22	P	No
A3-110-BH	8/29/2022	6.0	1.5	8/29/22	P	No
A3-150-BH	7/29/2022	6.0	1.5	7/29/22	N	No
A3-200-BH	8/1/2022	6.0	1.5	8/1/22	N	No
A3-240-BH	8/5/2022	6.0	1.5	8/5/22	P	No
A3-250-BH	8/1/2022	6.0	1.5	NC	NC	No
A3-300-BH	8/4/2022	6.0	1.5	8/4/22	P	No
A3-350-BH	8/5/2022	6.0	1.5	8/5/22	N	No
PS+095-BH	6/30/2022	4.0	1.5	NC	NC	No
PS+095-BHO	6/30/2022	4.0	1.5	6/30/22	P	No
28						

Notes:

ft btf - Feet below tunnel floor

NC - Sample/ test not collected, likely insufficient material

N - Soil in Oil test was negative

P - Soil in Oil test was positive

Table 5-3. Temporary Well Construction Details

Temporary Well ID	(a) Tunnel Floor (ft amsl)	(b) Top of Blank PVC (ft btf)	(c) Top of Pre-Packed Screen (ft btf)	(d) Bottom of Pre-packed Screen (ft btf)	(e) Bottom of Well Casing (ft btf)	(f) Borehole Diameter (in)	(g) Casing/Screen Inner Diameter (in)	(h) Casing Cover Type	(I) Surface Cover Type
A3+015-TW	100.67	0.31	0.88	5.46	5.96	2.5	1.5	Koby tourquer J-plug	Cherne Industries 2.5" pipe plug
A3+050-TW	100.65	0.26	0.87	5.45	5.95	2.5	1.5	Koby tourquer J-plug	Cherne Industries 2.5" pipe plug
A3+210-TW	100.13	0.28	1.12	5.66	6.18	2.5	1.0	Koby tourquer J-plug	Cherne Industries 2.5" pipe plug
A3+325-TW	99.70	0.34	1.26	5.80	6.32	2.5	1.0	Koby tourquer J-plug	Cherne Industries 2.5" pipe plug
A3+375-TW	100.22	0.35	1.31	5.85	6.37	2.5	1.0	Koby tourquer J-plug	Cherne Industries 2.5" pipe plug
A3-010-TW	100.78	0.23	0.96	5.50	6.02	2.5	1.0	Koby tourquer J-plug	Cherne Industries 2.5" pipe plug
A3-040-TW	100.91	0.34	1.05	5.59	6.11	2.5	1.0	Koby tourquer J-plug	Cherne Industries 2.5" pipe plug

Notes

TW - Temporary well

ft btf - feet below tunnel floor

ft amsl - feet above mean sea level

in - inches

Table 6-1. Organic Vapor Headspace Measurements During Drilling

Depth Interval (ft btf)	A3+375-BH	A3+325-BH	A3+210-BH	A3+200-BH	A3+150-BH	A3+087-BH	A3+050-BH	A3+015-BH	A3-010-BH	A3-040-BH	A3-050-BH	A3-050-BH Offset	A3-090-BH
Date	8/26/2022	3/9/2022	6/24/2022	6/24/2022	6/27/2022	6/29/2022	6/30/2022	8/3/2022	3/28/2022	8/3/2022	6/30/2022	8/3/2022	8/29/2022
Ambient	NM	0	0.6	NM	0.1	0.3	0.3	NM	0.2	0.8	NM	0.8	NM
0 to 1	1.8	NM	4.6	NR	145.7	3.8	NR	NM	NM	NR	14.7	NR	91.8
1 to 2	0.5	NM	5.5	NR	92.7	4.5	6.7	29.8	NM	8.3	NA	NR	34.7
2 to 3	0.3	NM	10.8	NA	23.6	50	22.9	29.8	NM	8.8	NA	NR	132.7
3 to 4	0.1	NM	6.2	NA	34.3	24.9	47.2	29.8	11.3	6.5	NA	501.1	**132.9**
4 to 5	0.2	NM	4.6	NA	12.3	**57.3**	54	29.8	8.8	166.7	NA	152.6	26.2
5 to 6'	0.2	NM	2.4	NA	6.7	41.1	7.8	**140.4**	NM	**275.7**	NA	**184.6**	7.1

Depth Interval (ft btf)	A3-100-BH	A3-110-BH	1S+025-BH	2S+025-BH	2S+100BH	2S+150-BH	A3-150-BH	A3-200-BH	A3-240-BH	A3-250-BH	A3-300-BH	A3-350-BH
Date	7/29/2022	8/29/2022	8/2/2022	8/2/2022	1/18/2023	8/26/2022	7/29/2022	8/1/2022	8/5/2022	8/1/2022	8/4/2022	8/5/2022
Ambient	0.7	NM	0.9	0.5	0.0	0.6	1.2	0.8	0	0.8	0.1	NM
0 to 1	134.7	NM	NR	NR	0.0	52.7	NR	NR	NR	NR	NR	NR
1 to 2	453.3	35.2	NR	4.8	0.0	2.2	38.3	5.7	1.1	NR	NR	2.7
2 to 3	556.9	72.4	NR	451.2	0.0	1.3	13.4	5	1.4	NR	NR	17.5
3 to 4	**647.9**	246.9	NR	**588.9**	0.0	9.4	6.4	5.6	4.1	NR	102	2.8
4 to 5	526.5	**393.7**	3.3	322.4	0.0	2.2	20.5	27.8	**294.8**	NR	**201.6**	8.9
5 to 6'	423.0	293.6	4.2	123.5	0.0	0.7	11.5	18.7	64.5	NR	174.4	12.9

ppmv Scale
650
450
250
50
1

Notes:
NA - Not Applicable
NM- Not Measured
NN-No notes
NR- No Recovery
Oil in Soil Test Kit Positive Result
ppmv - parts per million by volume

Table 6-2. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring in Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
1S+025-BH	NM	8/2/2022	0.9	5.2	Dry	NA	NA	NA	NA	NA	NM
1S+025-BH	NM	8/8/2022	0	0.0	Dry	NA	NA	NA	NA	NA	5.90
1S+025-BH	NM	8/15/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.83
1S+025-BH	NM	8/22/2022	0	0.0	Dry	NA	NA	NA	NA	NA	5.80
1S+025-BH	NM	8/29/2022	0.4	0.4	Dry	NA	NA	NA	NA	NA	5.74
1S+025-BH	NM	9/6/2022	0.6	0.6	Dry	NA	NA	NA	NA	NA	5.73
1S+025-BH	NM	9/12/2022	0	0.0	Dry	NA	NA	NA	NA	NA	5.65
1S+025-BH	NM	9/19/2022	1	1.2	Dry	NA	NA	NA	NA	NA	5.50
1S+025-BH	NM	9/26/2022	0.5	0.7	Dry	NA	NA	NA	NA	NA	5.49
1S+025-BH	NM	10/3/2022	0.6	0.7	Dry	NA	NA	NA	NA	NA	5.48
1S+025-BH	NM	11/7/2022	1.7	1.9	Dry	NA	NA	NA	NA	NA	5.45
1S+025-BH	NM	11/14/2022	1	1.3	Dry	NA	NA	NA	NA	NA	5.39
1S+025-BH	NM	11/21/2022	2.8	2.7	Dry	NA	NA	NA	NA	NA	5.39
1S+025-BH	NM	11/28/2022	1.9	2.0	Dry	NA	NA	NA	NA	NA	5.44
1S+025-BH	NM	12/5/2022	0.8	0.9	Dry	NA	NA	NA	NA	NA	5.39
1S+025-BH	NM	12/12/2022	1.1	1.1	Dry	NA	NA	NA	NA	NA	5.40
1S+025-BH	NM	12/19/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.39
1S+025-BH	NM	12/27/2022	1.1	1.4	Dry	NA	NA	NA	NA	NA	5.39
1S+025-BH	NM	1/3/2023	0	0.5	Dry	NA	NA	NA	NA	NA	5.38
1S+025-BH	NM	1/9/2023	0.5	0.6	Dry	NA	NA	NA	NA	NA	5.38
1S+025-BH	NM	1/16/2023	0.6	0.6	Dry	NA	NA	NA	NA	NA	5.37
1S+025-BH	NM	1/23/2023	0.2	0.2	Dry	NA	NA	NA	NA	NA	5.36
1S+025-BH	NM	1/30/2023	0.2	0.3	Dry	NA	NA	NA	NA	NA	5.36
2S+025-BH	NM	8/8/2022	0.1	0.5	Dry	NA	NA	NA	NA	NA	5.80
2S+025-BH	NM	8/15/2022	0.5	1.0	Dry	NA	NA	NA	NA	NA	5.79
2S+025-BH	NM	8/22/2022	0.7	1.4	Dry	NA	NA	NA	NA	NA	5.73
2S+025-BH	NM	8/29/2022	0.5	1.5	Dry	NA	NA	NA	NA	NA	5.73
2S+025-BH	NM	9/6/2022	0.5	18.1	Dry	NA	NA	NA	NA	NA	5.68
2S+025-BH	NM	9/12/2022	0	17.2	Dry	NA	NA	NA	NA	NA	5.69
2S+025-BH	NM	9/19/2022	0.9	32.1	Dry	NA	NA	NA	NA	NA	5.69
2S+025-BH	NM	9/26/2022	0.5	13.7	Dry	NA	NA	NA	NA	NA	5.66
2S+025-BH	NM	10/3/2022	0.5	30.3	Dry	NA	NA	NA	NA	NA	5.67
2S+025-BH	NM	11/7/2022	1.8	16.0	Dry	NA	NA	NA	NA	NA	5.67
2S+025-BH	NM	11/14/2022	1	18.6	Dry	NA	NA	NA	NA	NA	5.66
2S+025-BH	NM	11/21/2022	3	4.6	Dry	NA	NA	NA	NA	NA	5.65
2S+025-BH	NM	11/28/2022	2	19.4	Dry	NA	NA	NA	NA	NA	5.68
2S+025-BH	NM	12/5/2022	0.8	16.5	Dry	NA	NA	NA	NA	NA	5.65
2S+025-BH	NM	12/12/2022	0.7	14.1	Dry	NA	NA	NA	NA	NA	5.64
2S+025-BH	NM	12/19/2022	0.5	1.8	Dry	NA	NA	NA	NA	NA	5.64
2S+025-BH	NM	12/27/2022	0.8	14.3	Dry	NA	NA	NA	NA	NA	5.64
2S+025-BH	NM	1/3/2023	0	1.2	Dry	NA	NA	NA	NA	NA	5.63

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
2S+025-BH	NM	1/9/2023	0.5	3.8	Dry	NA	NA	NA	NA	NA	5.62
2S+025-BH	NM	1/16/2023	0.5	2.5	Dry	NA	NA	NA	NA	NA	5.61
2S+025-BH	NM	1/23/2023	0.2	0.6	Dry	NA	NA	NA	NA	NA	5.61
2S+025-BH	NM	1/30/2023	0.3	0.7	Dry	NA	NA	NA	NA	NA	5.60
2S+075-TR	NM	3/2/2022	NM	7.0	NM	NA	NA	NA	NA	NA	NM
2S+075-TR	NM	3/4/2022	NM	108.8	NM	NA	NA	NA	NA	NA	NM
2S+100-BH	NM	1/23/2023	0.2	0.0	Dry	NA	NA	NA	NA	NA	5.99
2S+100-BH	NM	1/30/2023	0.3	0.5	Dry	NA	NA	NA	NA	NA	5.82
2S+150-BH	NM	8/29/2022	0.4	0.5	Dry	NA	NA	NA	NA	NA	5.97
2S+150-BH	NM	9/6/2022	0.6	1.1	Dry	NA	NA	NA	NA	NA	5.98
2S+150-BH	NM	9/12/2022	0	0.0	Dry	NA	NA	NA	NA	NA	5.98
2S+150-BH	NM	9/19/2022	1	1.1	Dry	NA	NA	NA	NA	NA	5.95
2S+150-BH	NM	9/26/2022	0.5	0.6	Dry	NA	NA	NA	NA	NA	5.95
2S+150-BH	NM	10/3/2022	0.6	0.6	Dry	NA	NA	NA	NA	NA	5.97
2S+150-BH	NM	11/7/2022	1.8	1.8	Dry	NA	NA	NA	NA	NA	5.96
2S+150-BH	NM	11/14/2022	1	1.1	Dry	NA	NA	NA	NA	NA	5.95
2S+150-BH	NM	11/21/2022	2.8	2.8	Dry	NA	NA	NA	NA	NA	5.96
2S+150-BH	NM	11/28/2022	2.1	2.4	Dry	NA	NA	NA	NA	NA	5.97
2S+150-BH	NM	12/5/2022	0.8	0.8	Dry	NA	NA	NA	NA	NA	5.94
2S+150-BH	NM	12/12/2022	1.1	1.1	Dry	NA	NA	NA	NA	NA	5.94
2S+150-BH	NM	12/19/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.96
2S+150-BH	NM	12/27/2022	1.1	1.0	Dry	NA	NA	NA	NA	NA	5.93
2S+150-BH	NM	1/3/2023	0	0.2	Dry	NA	NA	NA	NA	NA	5.92
2S+150-BH	NM	1/9/2023	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.92
2S+150-BH	NM	1/16/2023	0.5	0.6	Dry	NA	NA	NA	NA	NA	5.91
2S+150-BH	NM	1/23/2023	0.1	0.0	Dry	NA	NA	NA	NA	NA	5.91
2S+150-BH	NM	1/30/2023	0.3	0.3	Dry	NA	NA	NA	NA	NA	5.90
A3+000-TR	100.43	3/3/2022	NM	4.0	NM	NA	NA	NA	NA	NA	NM
A3+000-TR	100.43	3/4/2022	NM	352.2	NM	NA	NA	NA	NA	NA	NM
A3+000-TR	100.43	3/10/2022	NM	NM	3.40	97.03	NA	NA	NA	NA	NM
A3+015-BH	100.67	5/11/2022	NM	10.6	3.10	97.57	NA	NA	NA	NA	NM
A3+015-BH	100.67	5/23/2022	0.3	2.0	NM	NA	NA	NA	NA	NA	NM
A3+015-BH	100.67	5/24/2022	0.1	45.3	2.80	97.87	NA	NA	NA	NA	4.61
A3+015-BH	100.67	6/1/2022	0.0	28.2	2.80	97.87	NA	NA	NA	NA	NM
A3+015-BH	100.67	6/7/2022	0.0	5.4	2.83	97.84	NA	NA	NA	NA	NM
A3+015-BH	100.67	6/14/2022	0.0	38.3	2.83	97.84	NA	NA	NA	NA	NM
A3+015-BH	100.67	6/15/2022	0.0	2.2	NM	NA	NA	NA	NA	NA	NM
A3+015-BH	100.67	6/21/2022	0.3	1.2	2.82	97.85	NA	NA	NA	NA	NM
A3+015-BH	100.67	6/22/2022	0.0	2.2	NM	NA	NA	NA	NA	NA	NM
A3+015-BH	100.67	6/27/2022	0.4	30.8	2.86	97.81	NA	NA	NA	NA	NM
A3+015-BH	100.67	7/1/2022	0.2	15.2	2.85	97.82	NA	NA	NA	NA	4.65

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3+015-BH	100.67	7/5/2022	0.1	23.6	2.84	97.83	NA	NA	NA	NA	4.70
A3+015-BH	100.67	7/11/2022	0.2	19.3	2.75	97.92	NA	NA	NA	NA	4.68
A3+015-BH	100.67	7/18/2022	0.2	12.9	2.84	97.83	NA	NA	NA	NA	4.68
A3+015-BH	100.67	7/25/2022	0.2	11.4	2.84	97.83	NA	NA	NA	NA	4.68
A3+015-BH	100.67	8/1/2022	0.1	16.9	2.83	97.84	NA	NA	NA	NA	5.68
A3+015-BH	100.67	8/8/2022	0.2	79.5	2.85	97.82	NA	NA	NA	NA	5.53
A3+015-BH	100.67	8/15/2022	0.6	16.1	3.01	97.66	NA	NA	NA	NA	5.41
A3+015-BH	100.67	8/22/2022	0.7	2.9	2.98	97.69	NA	NA	NA	NA	5.21
A3+015-TW	100.67	9/6/2022	0.9	94.5	2.85	97.82	NA	NA	NA	NA	5.96
A3+015-TW	100.67	9/12/2022	0.0	70.9	2.88	97.79	NA	NA	NA	NA	6.13
A3+015-TW	100.67	9/19/2022	0.7	97.1	2.85	97.82	NA	NA	NA	NA	NM
A3+015-TW	100.67	9/26/2022	0.9	121.9	2.86	97.81	NA	NA	NA	NA	NM
A3+015-TW	100.67	10/3/2022	0.8	70.5	2.85	97.82	NA	NA	NA	NA	NM
A3+015-TW	100.67	11/7/2022	0.6	48.5	3.16	97.51	NA	NA	NA	NA	6.13
A3+015-TW	100.67	11/14/2022	0.2	40.0	2.90	97.77	2.86	97.81	2.85	0.05	NM
A3+015-TW	100.67	11/21/2022	0.1	1.7	2.88	97.79	2.85	97.82	2.84	0.04	NM
A3+015-TW	100.67	11/28/2022	0.4	57.7	3.10	97.57	NA	NA	NA	NA	6.14
A3+015-TW	100.67	12/5/2022	1.1	59.4	2.87	97.80	2.85	97.82	2.84	0.03	NM
A3+015-TW	100.67	12/12/2022	1.2	58.5	2.83	97.84	2.83	97.84	2.83	sheen	NM
A3+015-TW	100.67	12/19/2022	2.7	27.6	2.80	97.87	2.80	97.87	2.80	sheen	NM
A3+015-TW	100.67	12/27/2022	0.7	39.0	2.88	97.79	2.83	97.84	2.82	0.06	NM
A3+015-TW	100.67	1/3/2023	1.8	23.2	2.91	97.76	2.84	97.83	2.83	0.08	NM
A3+015-TW	100.67	1/9/2023	0.6	161.7	2.91	97.76	2.85	97.82	2.84	0.07	6.14
A3+015-TW	100.67	1/16/2023	0.7	57.6	2.92	97.75	2.85	97.82	2.84	0.08	6.11
A3+015-TW	100.67	1/23/2023	0.1	16.9	2.88	97.79	2.84	97.83	2.83	0.05	6.11
A3+015-TW	100.67	1/30/2023	0.0	21.0	2.90	97.77	2.87	97.80	2.86	0.04	6.10
A3+050-BH	100.65	6/27/2022	NM	54.0	NM	NA	NA	NA	NA	NA	NM
A3+050-BH	100.65	6/29/2022	NM	5.6	4.35	96.30	NA	NA	NA	NA	5.09
A3+050-BH	100.65	7/1/2022	0.4	1.5	3.90	96.75	NA	NA	NA	NA	5.09
A3+050-BH	100.65	7/5/2022	0.2	1.1	3.70	96.95	NA	NA	NA	NA	5.08
A3+050-BH	100.65	7/11/2022	0.2	0.7	3.65	97.00	NA	NA	NA	NA	5.05
A3+050-BH	100.65	7/18/2022	0.1	0.9	3.78	96.87	NA	NA	NA	NA	5.07
A3+050-BH	100.65	7/25/2022	0.4	0.8	3.73	96.92	NA	NA	NA	NA	5.08
A3+050-BH	100.65	8/1/2022	0.2	1.0	3.73	96.92	NA	NA	NA	NA	3.81
A3+050-BH	100.65	8/8/2022	0	0.0	3.87	96.78	NA	NA	NA	NA	5.29
A3+050-BH	100.65	8/15/2022	0.4	0.4	3.84	96.81	NA	NA	NA	NA	5.87
A3+050-TW	100.65	8/22/2022	NM	NM	5.64	95.01	NA	NA	NA	NA	5.95
A3+050-TW	100.65	8/23/2022	NM	NM	3.76	96.89	NA	NA	NA	NA	NM
A3+050-TW	100.65	8/29/2022	0.4	0.5	3.70	96.95	NA	NA	NA	NA	5.88
A3+050-TW	100.65	9/6/2022	0.3	0.5	3.66	96.99	NA	NA	NA	NA	5.49
A3+050-TW	100.65	9/12/2022	0	0.0	3.65	97.00	NA	NA	NA	NA	5.97

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3+050-TW	100.65	9/19/2022	0.7	1.6	3.64	97.01	NA	NA	NA	NA	NM
A3+050-TW	100.65	9/26/2022	0.8	3.0	3.65	97.00	NA	NA	NA	NA	NM
A3+050-TW	100.65	10/3/2022	0.5	1.3	3.67	96.98	NA	NA	NA	NA	NM
A3+050-TW	100.65	11/7/2022	0.6	2.7	3.71	96.94	NA	NA	NA	NA	5.88
A3+050-TW	100.65	11/14/2022	0.4	1.0	3.62	97.03	NA	NA	NA	NA	NM
A3+050-TW	100.65	11/21/2022	0.1	0.1	3.62	97.03	NA	NA	NA	NA	NM
A3+050-TW	100.65	11/28/2022	0.4	1.5	3.72	96.93	NA	NA	NA	NA	5.71
A3+050-TW	100.65	12/5/2022	0.8	1.4	3.62	97.03	3.60	97.05	3.59	0.03	NM
A3+050-TW	100.65	12/12/2022	0.8	1.6	3.57	97.08	NA	NA	NA	NA	NM
A3+050-TW	100.65	12/19/2022	1.4	3.5	3.55	97.10	NA	NA	NA	NA	NM
A3+050-TW	100.65	12/27/2022	0.6	1.0	3.54	97.11	NA	NA	NA	NA	NM
A3+050-TW	100.65	1/3/2023	1.1	1.3	3.52	97.13	NA	NA	NA	NA	NM
A3+050-TW	100.65	1/9/2023	0.5	0.8	3.52	97.13	NA	NA	NA	NA	5.87
A3+050-TW	100.65	1/16/2023	0.4	0.7	3.52	97.13	NA	NA	NA	NA	NM
A3+050-TW	100.65	1/23/2023	0.0	0.1	3.50	97.15	NA	NA	NA	NA	NM
A3+050-TW	100.65	1/30/2023	0.1	0.2	3.49	97.16	NA	NA	NA	NA	NM
A3+087-BH	100.49	6/29/2022	0.3	57.3	Dry	NA	NA	NA	NA	NA	NM
A3+087-BH	100.49	7/1/2022	0.3	10.6	Dry	NA	NA	NA	NA	NA	4.50
A3+087-BH	100.49	7/5/2022	0.1	1.9	Dry	NA	NA	NA	NA	NA	NM
A3+087-BH	100.49	7/11/2022	0.1	1.5	Dry	NA	NA	NA	NA	NA	4.54
A3+087-BH	100.49	7/18/2022	0.1	0.8	Dry	NA	NA	NA	NA	NA	4.52
A3+087-BH	100.49	7/25/2022	0.3	1.0	Dry	NA	NA	NA	NA	NA	4.52
A3+087-BH	100.49	8/1/2022	0.2	1.0	Dry	NA	NA	NA	NA	NA	4.52
A3+087-BH	100.49	8/3/2022	NM	41.1	Dry	NA	NA	NA	NA	NA	NM
A3+087-BH	100.49	8/8/2022	0	0.0	Dry	NA	NA	NA	NA	NA	6.02
A3+087-BH	100.49	8/15/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.86
A3+087-BH	100.49	8/22/2022	0.4	0.4	Dry	NA	NA	NA	NA	NA	5.88
A3+087-BH	100.49	8/29/2022	0.3	0.4	Dry	NA	NA	NA	NA	NA	5.90
A3+087-BH	100.49	9/6/2022	0.9	1.3	Dry	NA	NA	NA	NA	NA	5.90
A3+087-BH	100.49	9/12/2022	0	0.0	Dry	NA	NA	NA	NA	NA	5.91
A3+087-BH	100.49	9/19/2022	1.4	1.5	Dry	NA	NA	NA	NA	NA	5.89
A3+087-BH	100.49	9/26/2022	0.7	0.9	Dry	NA	NA	NA	NA	NA	5.91
A3+087-BH	100.49	10/3/2022	0.4	0.7	Dry	NA	NA	NA	NA	NA	5.92
A3+087-BH	100.49	11/7/2022	1.3	1.7	Dry	NA	NA	NA	NA	NA	5.95
A3+087-BH	100.49	11/14/2022	0.2	0.8	Dry	NA	NA	NA	NA	NA	5.92
A3+087-BH	100.49	11/21/2022	1.3	1.2	Dry	NA	NA	NA	NA	NA	NM
A3+087-BH	100.49	11/28/2022	0.4	0.9	Dry	NA	NA	NA	NA	NA	5.97
A3+087-BH	100.49	12/5/2022	0.8	0.8	Dry	NA	NA	NA	NA	NA	5.91
A3+087-BH	100.49	12/12/2022	0.7	0.8	Dry	NA	NA	NA	NA	NA	5.92
A3+087-BH	100.49	12/19/2022	2.0	3.1	Dry	NA	NA	NA	NA	NA	5.92
A3+087-BH	100.49	12/27/2022	0.7	1.4	Dry	NA	NA	NA	NA	NA	5.91

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3+087-BH	100.49	1/3/2023	0.7	1.3	Dry	NA	NA	NA	NA	NA	5.91
A3+087-BH	100.49	1/9/2023	0.8	1.5	Dry	NA	NA	NA	NA	NA	5.91
A3+087-BH	100.49	1/16/2023	0.4	0.8	Dry	NA	NA	NA	NA	NA	5.91
A3+087-BH	100.49	1/23/2023	0.0	0.1	Dry	NA	NA	NA	NA	NA	5.91
A3+087-BH	100.49	1/30/2023	0.1	0.2	Dry	NA	NA	NA	NA	NA	5.91
A3+150-BH	100.31	6/27/2022	NM	145.7	NM	NA	NA	NA	NA	NA	NM
A3+150-BH	100.31	6/29/2022	NM	32.5	NM	NA	NA	NA	NA	NA	NM
A3+150-BH	100.31	7/1/2022	NM	28.8	2.39	97.92	NA	NA	NA	NA	5.51
A3+150-BH	100.31	7/5/2022	NM	45.0	2.79	97.52	NA	NA	NA	NA	5.45
A3+150-BH	100.31	7/11/2022	0.4	23.1	2.77	97.54	NA	NA	NA	NA	5.53
A3+150-BH	100.31	7/18/2022	0.2	10.3	2.82	97.49	NA	NA	NA	NA	5.52
A3+150-BH	100.31	7/25/2022	0.7	11.7	2.81	97.50	NA	NA	NA	NA	5.52
A3+150-BH	100.31	8/1/2022	0.3	18.0	2.79	97.52	NA	NA	NA	NA	4.88
A3+150-BH	100.31	8/4/2022	NM	0.8	NM	NA	NA	NA	NA	NA	NM
A3+150-BH	100.31	8/8/2022	0	9.3	2.81	97.50	NA	NA	NA	NA	5.50
A3+150-BH	100.31	8/15/2022	0.5	13.9	2.80	97.51	2.79	97.52	2.79	sheen	4.83
A3+150-BH	100.31	8/22/2022	0.9	7.0	2.81	97.50	NA	NA	NA	NA	4.85
A3+150-BH	100.31	8/29/2022	0.6	11.6	2.80	97.51	NA	NA	NA	NA	4.45
A3+150-BH	100.31	9/6/2022	0.3	16.9	2.81	97.50	NA	NA	NA	NA	4.04
A3+150-BH	100.31	9/12/2022	0	12.3	2.82	97.49	NA	NA	NA	NA	4.37
A3+150-BH	100.31	9/19/2022	1.3	18.0	2.81	97.50	NA	NA	NA	NA	4.18
A3+150-BH	100.31	9/26/2022	1	13.5	2.81	97.50	NA	NA	NA	NA	3.82
A3+150-BH	100.31	10/3/2022	0	18.4	2.80	97.51	NA	NA	NA	NA	4.03
A3+150-BH	100.31	11/7/2022	1.6	10.7	3.02	97.29	NA	NA	NA	NA	3.98
A3+150-BH	100.31	11/14/2022	0.3	5.6	3.74	96.57	NA	NA	NA	NA	3.74
A3+150-BH	100.31	11/21/2022	0.7	1.4	2.84	97.47	NA	NA	NA	NA	4.35
A3+150-BH	100.31	11/28/2022	0.4	5.4	3.09	97.22	NA	NA	NA	NA	4.04
A3+150-BH	100.31	12/5/2022	0.8	5.2	2.84	97.47	NA	NA	NA	NA	4.28
A3+150-BH	100.31	12/12/2022	0.6	4.0	2.83	97.48	NA	NA	NA	NA	3.90
A3+150-BH	100.31	12/19/2022	1.0	3.7	2.79	97.52	NA	NA	NA	NA	4.12
A3+150-BH	100.31	12/27/2022	0.6	3.2	2.84	97.47	NA	NA	NA	NA	4.01
A3+150-BH	100.31	1/3/2023	0.7	1.6	2.82	97.49	NA	NA	NA	NA	3.98
A3+150-BH	100.31	1/9/2023	0.8	3.0	2.83	97.48	NA	NA	NA	NA	4.05
A3+150-BH	100.31	1/16/2023	0.4	1.6	2.82	97.49	NA	NA	NA	NA	4.15
A3+150-BH	100.31	1/23/2023	0.0	0.4	2.82	97.49	NA	NA	NA	NA	NM
A3+150-BH	100.31	1/30/2023	0.1	0.4	2.80	97.51	NA	NA	NA	NA	NM
A3+200-BH	100.16	7/1/2022	NM	28.6	Dry	NA	NA	NA	NA	NA	1.33
A3+200-BH	100.16	7/5/2022	0.1	43.5	Dry	NA	NA	NA	NA	NA	NM
A3+200-BH	100.16	7/11/2022	0.2	29.0	Dry	NA	NA	NA	NA	NA	1.31
A3+200-BH	100.16	7/18/2022	0.1	31.8	Dry	NA	NA	NA	NA	NA	1.31
A3+200-BH	100.16	7/25/2022	0.2	37.8	Dry	NA	NA	NA	NA	NA	1.29

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3+200-BH	100.16	8/1/2022	0.2	25.5	Dry	NA	NA	NA	NA	NA	1.30
A3+200-BH	100.16	8/8/2022	0	15.0	Dry	NA	NA	NA	NA	NA	1.63
A3+200-BH	100.16	8/15/2022	0.6	24.5	Dry	NA	NA	NA	NA	NA	1.25
A3+200-BH	100.16	8/22/2022	0.1	8.9	Dry	NA	NA	NA	NA	NA	1.25
A3+200-BH	100.16	8/29/2022	0.7	13.2	Dry	NA	NA	NA	NA	NA	1.04
A3+200-BH	100.16	9/6/2022	0.3	15.3	Dry	NA	NA	NA	NA	NA	1.10
A3+200-BH	100.16	9/12/2022	0	12.8	Dry	NA	NA	NA	NA	NA	1.05
A3+200-BH	100.16	9/19/2022	0.8	8.8	Dry	NA	NA	NA	NA	NA	1.11
A3+200-BH	100.16	9/26/2022	1	25.2	Dry	NA	NA	NA	NA	NA	1.08
A3+200-BH	100.16	10/3/2022	0	19.5	Dry	NA	NA	NA	NA	NA	0.98
A3+200-BH	100.16	11/7/2022	1.2	7.3	Dry	NA	NA	NA	NA	NA	1.06
A3+200-BH	100.16	11/14/2022	0.4	1.5	Dry	NA	NA	NA	NA	NA	1.07
A3+200-BH	100.16	11/21/2022	0.3	0.5	Dry	NA	NA	NA	NA	NA	1.06
A3+200-BH	100.16	11/28/2022	0.4	1.6	Dry	NA	NA	NA	NA	NA	1.09
A3+200-BH	100.16	12/5/2022	0.8	2.9	Dry	NA	NA	NA	NA	NA	1.05
A3+200-BH	100.16	12/12/2022	0.8	2.7	Dry	NA	NA	NA	NA	NA	1.05
A3+200-BH	100.16	12/19/2022	1.1	1.4	Dry	NA	NA	NA	NA	NA	1.06
A3+200-BH	100.16	12/27/2022	0.7	1.9	Dry	NA	NA	NA	NA	NA	1.05
A3+200-BH	100.16	1/3/2023	0.6	1.0	Dry	NA	NA	NA	NA	NA	1.05
A3+210-BH	100.13	6/24/2022	NM	10.8	NM	NA	NA	NA	NA	NA	NM
A3+210-BH	100.13	6/29/2022	NM	9.2	NM	NA	NA	NA	NA	NA	5.40
A3+210-BH	100.13	7/1/2022	NM	1.5	2.95	97.18	NA	NA	NA	NA	5.38
A3+210-BH	100.13	7/5/2022	0.8	4.8	2.95	97.18	NA	NA	NA	NA	5.40
A3+210-BH	100.13	7/11/2022	0.1	3.3	2.91	97.22	NA	NA	NA	NA	5.40
A3+210-BH	100.13	7/18/2022	0.1	1.8	2.94	97.19	NA	NA	NA	NA	5.47
A3+210-BH	100.13	7/25/2022	0.2	1.9	2.93	97.20	NA	NA	NA	NA	5.42
A3+210-BH	100.13	8/1/2022	0.2	1.7	2.91	97.22	NA	NA	NA	NA	5.40
A3+210-BH	100.13	8/8/2022	0	0.0	3.09	97.04	3.08	97.05	3.08	sheen	5.63
A3+210-BH	100.13	8/15/2022	1	1.2	2.90	97.23	NA	NA	NA	NA	4.89
A3+210-BH	100.13	8/22/2022	0	0.3	2.91	97.22	NA	NA	NA	NA	4.76
A3+210-BH	100.13	8/25/2022	NM	NM	2.90	97.23	NA	NA	NA	NA	4.60
A3+210-BH	100.13	8/29/2022	0.8	0.9	2.96	97.17	NA	NA	NA	NA	6.12
A3+210-TW	100.13	9/6/2022	0.3	0.9	2.98	97.15	NA	NA	NA	NA	6.18
A3+210-TW	100.13	9/12/2022	0	0.0	3.01	97.12	NA	NA	NA	NA	6.18
A3+210-TW	100.13	9/19/2022	0.8	1.0	2.97	97.16	NA	NA	NA	NA	NM
A3+210-TW	100.13	9/26/2022	0.8	6.0	2.99	97.14	NA	NA	NA	NA	NM
A3+210-TW	100.13	10/3/2022	0.1	3.3	2.97	97.16	NA	NA	NA	NA	NM
A3+210-TW	100.13	11/7/2022	0.4	2.1	3.10	97.03	NA	NA	NA	NA	6.16
A3+210-TW	100.13	11/14/2022	0.5	1.8	3.04	97.09	NA	NA	NA	NA	NM
A3+210-TW	100.13	11/21/2022	0.3	0.5	3.02	97.11	NA	NA	NA	NA	NM
A3+210-TW	100.13	11/28/2022	0.4	2.4	3.22	96.91	NA	NA	NA	NA	5.94

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3+210-TW	100.13	12/5/2022	0.8	3.5	3.02	97.11	NA	NA	NA	NA	NM
A3+210-TW	100.13	12/12/2022	0.7	2.5	3.02	97.11	3.02	97.11	3.02	sheen	NM
A3+210-TW	100.13	12/19/2022	1.0	2.8	NM	NA	NA	NA	NA	NA	NM
A3+210-TW	100.13	12/27/2022	0.0	1.3	3.04	97.09	NA	NA	NA	NA	NM
A3+210-TW	100.13	1/3/2023	0.6	1.1	3.05	97.08	NA	NA	NA	NA	NM
A3+210-TW	100.13	1/9/2023	0.5	2.5	3.06	97.07	NA	NA	NA	NA	6.18
A3+210-TW	100.13	1/16/2023	0.3	1.3	3.05	97.08	NA	NA	NA	NA	NM
A3+210-TW	100.13	1/23/2023	0.0	0.2	3.01	97.12	NA	NA	NA	NA	NM
A3+210-TW	100.13	1/30/2023	0.4	0.4	2.98	97.15	NA	NA	NA	NA	NM
A3+215-TR	100.11	3/4/2022	NM	479.2	NM	NA	NA	NA	NA	NA	NM
A3+215-TR	100.11	3/11/2022	NM	NM	2.90	97.21	NA	NA	NA	NA	NM
A3+215-TR	100.11	6/15/2022	1.8	24.3	NM	NA	NA	NA	NA	NA	NM
A3+225-HL	100.08	3/30/2022	NM	103.6	NM	NA	NA	NA	NA	NA	NM
A3+325-BH	99.70	3/10/2022	NM	NM	1.37	98.33	NA	NA	NA	NA	NM
A3+325-BH	99.70	3/11/2022	NM	NM	1.30	98.40	NA	NA	NA	NA	NM
A3+325-BH	99.70	7/20/2022	0	3.1	2.13	97.57	NA	NA	NA	NA	4.45
A3+325-BH	99.70	7/26/2022	0	3.2	2.31	97.39	NA	NA	NA	NA	4.45
A3+325-BH	99.70	8/1/2022	0.2	1.6	2.12	97.58	NA	NA	NA	NA	4.46
A3+325-BH	99.70	8/4/2022	NM	2.1	Dry	NA	NA	NA	NA	NA	NM
A3+325-BH	99.70	8/8/2022	0	0.1	2.12	97.58	NA	NA	NA	NA	5.37
A3+325-BH	99.70	8/15/2022	0.6	0.7	2.11	97.59	NA	NA	NA	NA	4.22
A3+325-BH	99.70	8/22/2022	0	0.1	2.11	97.59	NA	NA	NA	NA	4.00
A3+325-BH	99.70	8/25/2022	NM	NM	2.13	97.57	NA	NA	NA	NA	3.70
A3+325-BH	99.70	8/29/2022	0.9	10.6	2.17	97.53	NA	NA	NA	NA	6.30
A3+325-TW	99.70	9/6/2022	0.2	11.0	2.12	97.58	NA	NA	NA	NA	6.32
A3+325-TW	99.70	9/12/2022	0	0.0	2.13	97.57	NA	NA	NA	NA	6.33
A3+325-TW	99.70	9/19/2022	0.9	18.7	2.12	97.58	NA	NA	NA	NA	NM
A3+325-TW	99.70	9/26/2022	0.6	5.2	2.15	97.55	NA	NA	NA	NA	NM
A3+325-TW	99.70	10/3/2022	0	11.0	2.12	97.58	NA	NA	NA	NA	NM
A3+325-TW	99.70	11/7/2022	0.3	5.5	2.29	97.41	NA	NA	NA	NA	6.33
A3+325-TW	99.70	11/14/2022	0.2	54.4	2.14	97.56	NA	NA	NA	NA	NM
A3+325-TW	99.70	11/21/2022	0.2	0.8	2.11	97.59	NA	NA	NA	NA	NM
A3+325-TW	99.70	11/28/2022	0.3	5.4	2.30	97.40	NA	NA	NA	NA	6.10
A3+325-TW	99.70	12/5/2022	0.8	10.4	2.12	97.58	NA	NA	NA	NA	NM
A3+325-TW	99.70	12/12/2022	1.5	8.9	2.11	97.59	NA	NA	NA	NA	NM
A3+325-TW	99.70	12/19/2022	0.7	3.5	2.08	97.62	NA	NA	NA	NA	NM
A3+325-TW	99.70	12/27/2022	0.0	7.8	2.09	97.61	NA	NA	NA	NA	NM
A3+325-TW	99.70	1/3/2023	0.4	3.4	2.09	97.61	NA	NA	NA	NA	NM
A3+325-TW	99.70	1/9/2023	0.7	6.9	2.11	97.59	NA	NA	NA	NA	6.34
A3+325-TW	99.70	1/16/2023	0.3	5.5	2.08	97.62	NA	NA	NA	NA	NM
A3+325-TW	99.70	1/23/2023	0.1	1.4	2.06	97.64	NA	NA	NA	NA	NM

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3+325-TW	99.70	1/30/2023	0.1	2.1	2.08	97.62	NA	NA	NA	NA	NM
A3+375-BH	100.22	8/29/2022	0.3	24.9	0.85	99.37	NA	NA	NA	NA	6.40
A3+375-TW	100.22	9/6/2022	0.1	10.0	1.93	98.29	NA	NA	NA	NA	6.37
A3+375-TW	100.22	9/12/2022	0	0.7	1.96	98.26	NA	NA	NA	NA	6.32
A3+375-TW	100.22	9/19/2022	0.9	9.5	1.96	98.26	NA	NA	NA	NA	NM
A3+375-TW	100.22	9/26/2022	0.5	2.9	1.99	98.23	NA	NA	NA	NA	NM
A3+375-TW	100.22	10/3/2022	0	0.9	1.99	98.23	NA	NA	NA	NA	NM
A3+375-TW	100.22	11/7/2022	0.2	0.0	2.10	98.12	NA	NA	NA	NA	6.35
A3+375-TW	100.22	11/14/2022	0.2	0.7	2.09	98.13	NA	NA	NA	NA	NM
A3+375-TW	100.22	11/21/2022	0.2	0.2	2.02	98.20	NA	NA	NA	NA	NM
A3+375-TW	100.22	11/28/2022	0	0.7	2.02	98.20	NA	NA	NA	NA	6.12
A3+375-TW	100.22	12/5/2022	0.6	1.1	1.94	98.28	1.94	98.28	1.94	sheen	NM
A3+375-TW	100.22	12/12/2022	0.5	0.9	1.90	98.32	NA	NA	NA	NA	NM
A3+375-TW	100.22	12/19/2022	1.7	0.6	1.81	98.41	NA	NA	NA	NA	NM
A3+375-TW	100.22	12/27/2022	0.0	0.1	1.79	98.43	NA	NA	NA	NA	NM
A3+375-TW	100.22	1/3/2023	0.5	0.5	1.72	98.50	NA	NA	NA	NA	NM
A3+375-TW	100.22	1/9/2023	0.7	1.0	1.73	98.49	NA	NA	NA	NA	6.37
A3+375-TW	100.22	1/16/2023	0.4	0.7	1.70	98.52	NA	NA	NA	NA	NM
A3+375-TW	100.22	1/23/2023	0.0	0.1	1.72	98.50	NA	NA	NA	NA	NM
A3+375-TW	100.22	1/30/2023	0.1	0.2	1.71	98.51	NA	NA	NA	NA	NM
A3-010-BH	100.78	3/28/2022	NM	11.3	NM	NA	NA	NA	NA	NA	NM
A3-010-BH	100.78	3/31/2022	NM	685.0	NM	NA	NA	NA	NA	NA	NM
A3-010-BH	100.78	5/11/2022	NM	146.7	4.85	95.93	NA	NA	NA	NA	NM
A3-010-BH	100.78	5/23/2022	NM	110.0	NM	NA	NA	NA	NA	NA	NM
A3-010-BH	100.78	5/24/2022	0.3	244.8	4.55	96.23	4.26	96.52	4.20	0.35	5.33
A3-010-BH	100.78	6/1/2022	1.1	220.2	3.84	96.94	3.60	97.18	3.54	0.30	NM
A3-010-BH	100.78	6/7/2022	0.2	98.2	4.00	96.78	3.78	97.00	3.73	0.27	NM
A3-010-BH	100.78	6/14/2022	0.5	337.1	4.12	96.66	3.88	96.90	3.83	0.29	NM
A3-010-BH	100.78	6/15/2022	0.1	117.6	NM	NA	NA	NA	NA	NA	NM
A3-010-BH	100.78	6/21/2022	0.1	20.0	4.35	96.43	4.11	96.67	4.06	0.29	NM
A3-010-BH	100.78	6/22/2022	0.1	117.6	NM	NA	NA	NA	NA	NA	NM
A3-010-BH	100.78	6/27/2022	0.5	413.0	4.52	96.26	4.33	96.45	4.29	0.23	NM
A3-010-BH	100.78	7/1/2022	NM	289.4	4.57	96.21	4.37	96.41	4.33	0.24	NM
A3-010-BH	100.78	7/5/2022	1.6	208.2	4.93	95.85	4.49	96.29	4.39	0.54	5.08
A3-010-BH	100.78	7/11/2022	1.4	128.3	4.83	95.95	4.41	96.37	4.32	0.51	5.45
A3-010-BH	100.78	8/22/2022	0.8	62.4	3.79	96.99	3.74	97.04	3.73	0.06	5.42
A3-010-BH	100.78	8/24/2022	NM	NM	5.50	95.28	5.12	95.66	5.03	0.47	5.69
A3-010-TR	100.78	4/13/2022	NM	227.0	NM	NA	NA	NA	NA	NA	NM
A3-010-TR	100.78	5/11/2022	NM	176.0	NM	NA	NA	NA	NA	NA	NM
A3-010-TR	100.78	6/15/2022	3.1	356.2	NM	NA	NA	NA	NA	NA	NM
A3-010-TR	100.78	6/15/2022	0.8	615.0	NM	NA	NA	NA	NA	NA	NM

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3-010-TW	100.78	8/29/2022	1	128.0	4.95	95.83	4.94	95.84	4.94	sheen	6.02
A3-010-TW	100.78	9/6/2022	1.6	86.6	4.95	95.83	4.95	95.83	4.95	sheen	5.93
A3-010-TW	100.78	9/7/2022	NM	NM	5.11	95.67	4.99	95.79	4.96	0.15	NM
A3-010-TW	100.78	9/12/2022	0	126.9	5.15	95.63	5.12	95.66	5.11	0.04	5.96
A3-010-TW	100.78	9/19/2022	1.4	105.1	5.11	95.67	5.10	95.68	5.10	0.01	NM
A3-010-TW	100.78	9/26/2022	0.7	184.8	5.09	95.69	5.02	95.76	5.00	0.09	NM
A3-010-TW	100.78	10/3/2022	0.8	174.1	5.04	95.74	4.96	95.82	4.94	0.10	NM
A3-010-TW	100.78	11/7/2022	0.5	129.1	5.07	95.71	5.01	95.77	5.00	0.07	6.02
A3-010-TW	100.78	11/14/2022	0.2	191.2	5.12	95.66	5.05	95.73	5.03	0.09	NM
A3-010-TW	100.78	11/21/2022	0.8	13.3	5.02	95.76	5.02	95.76	5.02	sheen	NM
A3-010-TW	100.78	11/28/2022	0.8	253.6	5.05	95.73	5.03	95.75	5.02	0.03	60.40
A3-010-TW	100.78	12/5/2022	1.1	226.1	5.12	95.66	5.04	95.74	5.02	0.10	NM
A3-010-TW	100.78	12/12/2022	0.8	204.8	5.17	95.61	5.07	95.71	5.05	0.12	NM
A3-010-TW	100.78	12/19/2022	1.2	148	5.00	95.78	NA	NA	NA	NA	NM
A3-010-TW	100.78	12/27/2022	0.8	161.7	4.75	96.03	4.69	96.09	4.68	0.07	NM
A3-010-TW	100.78	1/3/2023	2.0	87.6	4.66	96.12	4.66	96.12	4.66	sheen	NM
A3-010-TW	100.78	1/9/2023	1.0	158.3	4.98	95.80	4.79	95.99	4.75	0.23	6.00
A3-010-TW	100.78	1/16/2023	1.0	120.9	4.96	95.82	4.78	96.00	4.74	0.22	5.84
A3-010-TW	100.78	1/23/2023	0.1	24.0	5.02	95.76	4.75	96.03	4.69	0.33	5.84
A3-010-TW	100.78	1/30/2023	0.1	26.0	5.05	95.73	4.83	95.95	4.78	0.27	5.83
A3-040-BH	100.91	6/30/2022	NM	229.5	NM	NA	NA	NA	NA	NA	NM
A3-040-BH	100.91	7/1/2022	0.6	120.7	NM	NA	NA	NA	NA	NA	NM
A3-040-BH	100.91	7/5/2022	1.4	102.8	NM	NA	NA	NA	NA	NA	NM
A3-040-BH	100.91	7/11/2022	1	114.8	Dry	NA	NA	NA	NA	NA	1.35
A3-040-BH	100.91	7/25/2022	0.5	50.0	NM	NA	NA	NA	NA	NA	NM
A3-040-BH	100.91	8/1/2022	0.7	40.0	Dry	NA	NA	NA	NA	NA	1.34
A3-040-BH	100.91	8/3/2022	0.8	275.7	NM	NA	NA	NA	NA	NA	NM
A3-040-BH	100.91	8/8/2022	0	70.2	5.24	95.67	5.22	95.69	5.21	0.03	5.97
A3-040-BH	100.91	8/15/2022	0.8	107.2	5.41	95.50	5.40	95.51	5.40	sheen	5.96
A3-040-BH	100.91	8/22/2022	0.4	42.6	5.59	95.32	5.58	95.33	5.58	sheen	5.84
A3-040-TW	100.91	9/6/2022	1.3	44.7	NM	NA	5.52	NA	5.52	NA	6.08
A3-040-TW	100.91	9/7/2022	NM	NM	6.11	94.80	5.64	95.27	5.53	0.58	6.11
A3-040-TW	100.91	9/12/2022	0	39.7	NA	NA	5.70	NA	5.70	NA	6.11
A3-040-TW	100.91	9/19/2022	1.4	NM	NM	NA	NA	NA	NA	NA	NM
A3-040-TW	100.91	9/26/2022	1	85.0	NA	NA	5.84	NA	5.84	NA	NM
A3-040-TW	100.91	10/3/2022	0.7	36.0	NA	NA	5.97	NA	5.97	NA	6.10
A3-040-TW	100.91	11/7/2022	1.3	7.3	NA	NA	6.07	NA	6.07	NA	6.08
A3-040-TW	100.91	11/14/2022	0.4	19.9	NM	NA	NA	NA	NA	NA	NM
A3-040-TW	100.91	11/21/2022	1.3	1.3	NM	NA	NA	NA	NA	NA	NM
A3-040-TW	100.91	11/28/2022	1.6	22.0	NA	NA	6.07	NA	6.07	NA	6.08
A3-040-TW	100.91	12/5/2022	1.1	13.4	NM	NA	NA	NA	NA	NA	NM

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3-040-TW	100.91	12/12/2022	1.5	12.5	NM	NA	NA	NA	NA	NA	NM
A3-040-TW	100.91	12/19/2022	1.3	7.4	NM	NA	NA	NA	NA	NA	NM
A3-040-TW	100.91	12/27/2022	1.2	8.9	4.34	96.57	NA	NA	NA	NA	NM
A3-040-TW	100.91	1/3/2023	2.4	4.2	3.51	97.40	NA	NA	NA	NA	NM
A3-040-TW	100.91	1/9/2023	0.9	33.5	3.59	97.32	NA	NA	NA	NA	6.11
A3-040-TW	100.91	1/16/2023	1.0	6.7	3.79	97.12	NA	NA	NA	NA	NM
A3-040-TW	100.91	1/23/2023	0.4	1.2	4.08	96.83	4.06	96.85	4.05	0.03	6.09
A3-040-TW	100.91	1/30/2023	0.4	1.8	4.26	96.65	4.24	96.67	4.24	0.02	6.09
A3-050-BH	100.95	6/30/2022	NM	14.7	NM	NA	NA	NA	NA	NA	NM
A3-050-BH	100.95	7/1/2022	NM	15.5	NM	NA	NA	NA	NA	NA	NM
A3-050-BH	100.95	7/5/2022	0.9	NM	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	7/11/2022	0.9	7.9	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	7/18/2022	1.1	2.8	Dry	NA	NA	NA	NA	NA	0.88
A3-050-BH	100.95	7/25/2022	NM	NM	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	8/1/2022	0.8	3.4	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	8/3/2022	0.9	NM	NM	NA	NA	NA	NA	NA	NM
A3-050-BH	100.95	8/8/2022	0.3	0.5	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	8/15/2022	0.8	0.5	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	8/22/2022	0.5	1.0	Dry	NA	NA	NA	NA	NA	0.89
A3-050-BH	100.95	8/29/2022	0.6	0.5	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	9/6/2022	0.9	0.7	Dry	NA	NA	NA	NA	NA	0.91
A3-050-BH	100.95	9/12/2022	0	0.0	Dry	NA	NA	NA	NA	NA	0.91
A3-050-BH	100.95	9/19/2022	1.4	1.1	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	9/26/2022	1	2.9	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	10/3/2022	0.7	1.7	Dry	NA	NA	NA	NA	NA	0.91
A3-050-BH	100.95	11/7/2022	1.7	1.8	Dry	NA	NA	NA	NA	NA	0.91
A3-050-BH	100.95	11/14/2022	0.4	2.3	Dry	NA	NA	NA	NA	NA	0.91
A3-050-BH	100.95	11/21/2022	1.5	1.4	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	11/28/2022	1.7	2.9	Dry	NA	NA	NA	NA	NA	0.92
A3-050-BH	100.95	12/5/2022	1.1	1.1	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	12/12/2022	1.6	1.3	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	12/19/2022	1.3	1.6	Dry	NA	NA	NA	NA	NA	0.90
A3-050-BH	100.95	12/27/2022	1.2	3.7	Dry	NA	NA	NA	NA	NA	0.89
A3-050-BH	100.95	1/3/2023	0.4	0	Dry	NA	NA	NA	NA	NA	0.87
A3-050-BHO	100.95	7/1/2022	0.6	82.0	3.59	97.36	NA	NA	NA	NA	3.97
A3-050-BHO	100.95	7/5/2022	1.2	26.0	3.72	97.23	NA	NA	NA	NA	3.98
A3-050-BHO	100.95	7/11/2022	0.9	13.6	3.72	97.23	NA	NA	NA	NA	3.97
A3-050-BHO	100.95	7/18/2022	1.1	5.0	3.82	97.13	NA	NA	NA	NA	3.96
A3-050-BHO	100.95	7/25/2022	0.6	11.5	Dry	NA	NA	NA	NA	NA	3.96
A3-050-BHO	100.95	8/1/2022	0.8	11.0	Dry	NA	NA	NA	NA	NA	3.75
A3-050-BHO	100.95	8/3/2022	NM	184.6	NM	NA	NA	NA	NA	NA	NM

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3-050-BHO	100.95	8/8/2022	0	30.2	5.32	95.63	NA	NA	NA	NA	5.90
A3-050-BHO	100.95	8/15/2022	0.7	15.0	5.10	95.85	NA	NA	NA	NA	5.88
A3-050-BHO	100.95	8/22/2022	0.5	24.5	5.05	95.90	NA	NA	NA	NA	5.86
A3-050-BHO	100.95	8/29/2022	0.6	24.2	4.63	96.32	NA	NA	NA	NA	5.89
A3-050-BHO	100.95	9/6/2022	0.9	22.1	5.13	95.82	NA	NA	NA	NA	5.84
A3-050-BHO	100.95	9/12/2022	0	10.2	5.21	95.74	NA	NA	NA	NA	5.84
A3-050-BHO	100.95	9/19/2022	1.4	5.4	5.30	95.65	NA	NA	NA	NA	5.84
A3-050-BHO	100.95	9/26/2022	1	21.0	5.39	95.56	NA	NA	NA	NA	5.82
A3-050-BHO	100.95	10/3/2022	0.7	25.2	5.46	95.49	NA	NA	NA	NA	5.84
A3-050-BHO	100.95	11/7/2022	1.5	27.0	Dry	NA	NA	NA	NA	NA	5.80
A3-050-BHO	100.95	11/14/2022	1.8	10.9	Dry	NA	NA	NA	NA	NA	5.80
A3-050-BHO	100.95	11/21/2022	1.4	5.4	Dry	NA	NA	NA	NA	NA	5.78
A3-050-BHO	100.95	11/28/2022	1.9	48.5	Dry	NA	NA	NA	NA	NA	5.88
A3-050-BHO	100.95	12/5/2022	1.1	58.7	Dry	NA	NA	NA	NA	NA	5.78
A3-050-BHO	100.95	12/12/2022	2.1	44.1	Dry	NA	NA	NA	NA	NA	5.76
A3-050-BHO	100.95	12/19/2022	1.5	57.8	Dry	NA	NA	NA	NA	NA	5.78
A3-050-BHO	100.95	12/27/2022	1.4	38.3	2.73	98.22	NA	NA	NA	NA	5.80
A3-050-BHO	100.95	1/3/2023	0.4	7.2	2.84	98.11	2.84	98.11	2.84	sheen	5.80
A3-050-BHO	100.95	1/9/2023	0.7	14.4	2.92	98.03	2.92	98.03	2.92	sheen	5.80
A3-050-BHO	100.95	1/16/2023	1.4	1.9	3.08	97.87	NA	NA	NA	NA	5.78
A3-050-BHO	100.95	1/23/2023	0.4	2.7	3.39	97.56	NA	NA	NA	NA	NM
A3-050-BHO	100.95	1/30/2023	0.3	1.6	3.63	97.32	NA	NA	NA	NA	NM
A3-090-BH	101.03	9/1/2022	NM	NM	5.89	95.14	5.89	95.14	5.89	sheen	6.00
A3-090-BH	101.03	9/6/2022	0.8	7.5	5.75	95.28	5.75	95.28	5.75	sheen	6.02
A3-090-BH	101.03	9/12/2022	0	0.1	5.66	95.37	NA	NA	NA	NA	6.01
A3-090-BH	101.03	9/19/2022	1.4	10.7	5.61	95.42	NA	NA	NA	NA	6.02
A3-090-BH	101.03	9/26/2022	1	8.0	5.61	95.42	5.59	95.44	5.59	0.02	6.01
A3-090-BH	101.03	10/3/2022	0.7	15.0	5.67	95.36	5.67	95.36	5.67	sheen	6.00
A3-090-BH	101.03	10/3/2022	0.7	15.0	5.67	95.36	5.67	95.36	5.67	sheen	6.00
A3-090-BH	101.03	11/7/2022	1.5	9.0	5.69	95.34	NA	NA	NA	NA	6.02
A3-090-BH	101.03	11/21/2022	1.9	2.8	5.71	95.32	5.70	95.33	5.70	sheen	6.03
A3-090-BH	101.03	11/28/2022	2.1	17.3	5.72	95.31	NA	NA	NA	NA	6.01
A3-090-BH	101.03	12/5/2022	1.3	7.9	5.71	95.32	NA	NA	NA	NA	5.72
A3-090-BH	101.03	12/12/2022	2.1	8.9	5.72	95.31	NA	NA	NA	NA	6.00
A3-090-BH	101.03	12/19/2022	1.0	2.8	5.71	95.32	NA	NA	NA	NA	5.99
A3-090-BH	101.03	12/27/2022	1.1	17.3	5.70	95.33	NA	NA	NA	NA	5.99
A3-090-BH	101.03	1/3/2023	0.4	1.6	5.72	95.31	NA	NA	NA	NA	5.99
A3-090-BH	101.03	1/9/2023	0.8	24.0	5.74	95.29	5.71	95.32	5.70	0.04	5.99
A3-090-BH	101.03	1/16/2023	0.5	6.2	5.71	95.32	NA	NA	NA	NA	5.98
A3-090-BH	101.03	1/23/2023	0.3	4.6	5.71	95.32	5.71	95.32	5.71	sheen	NM
A3-090-BH	101.03	1/30/2023	0.3	2.9	5.76	95.27	5.73	95.30	5.72	0.04	5.98

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3-100-BH	101.05	7/29/2022	0.7	647.9	NM	NA	NA	NA	NA	NA	NM
A3-100-BH	101.05	8/1/2022	0.7	143.5	NM	NA	NA	NA	NA	NA	NM
A3-100-BH	101.05	8/8/2022	0.2	15.0	Dry	NA	NA	NA	NA	NA	5.42
A3-100-BH	101.05	8/15/2022	0.6	6.2	Dry	NA	NA	NA	NA	NA	5.49
A3-100-BH	101.05	8/22/2022	0.6	7.5	Dry	NA	NA	NA	NA	NA	5.43
A3-100-BH	101.05	8/29/2022	0.5	5.0	Dry	NA	NA	NA	NA	NA	5.34
A3-100-BH	101.05	9/6/2022	0.7	76.9	Dry	NA	NA	NA	NA	NA	5.27
A3-100-BH	101.05	9/12/2022	0	95.1	Dry	NA	NA	NA	NA	NA	5.29
A3-100-BH	101.05	9/19/2022	1.5	108.8	Dry	NA	NA	NA	NA	NA	5.32
A3-100-BH	101.05	9/26/2022	0.8	6.7	Dry	NA	NA	NA	NA	NA	5.29
A3-100-BH	101.05	10/3/2022	0.8	92.5	Dry	NA	NA	NA	NA	NA	5.32
A3-100-BH	101.05	11/7/2022	1.4	95.1	Dry	NA	NA	NA	NA	NA	5.30
A3-100-BH	101.05	11/14/2022	0.8	53.8	Dry	NA	NA	NA	NA	NA	5.30
A3-100-BH	101.05	11/21/2022	2	7.8	Dry	NA	NA	NA	NA	NA	5.32
A3-100-BH	101.05	11/28/2022	2.2	134.3	Dry	NA	NA	NA	NA	NA	5.37
A3-100-BH	101.05	12/5/2022	0.8	111.3	Dry	NA	NA	NA	NA	NA	5.33
A3-100-BH	101.05	12/12/2022	1.8	68.6	Dry	NA	NA	NA	NA	NA	5.34
A3-100-BH	101.05	12/19/2022	1.0	6.3	Dry	NA	NA	NA	NA	NA	5.36
A3-100-BH	101.05	12/27/2022	0.9	7.8	Dry	NA	NA	NA	NA	NA	5.35
A3-100-BH	101.05	1/3/2023	0.3	2.6	Dry	NA	NA	NA	NA	NA	5.35
A3-100-BH	101.05	1/9/2023	0.9	3.9	Dry	NA	NA	NA	NA	NA	5.34
A3-100-BH	101.05	1/16/2023	0.6	114.0	Dry	NA	NA	NA	NA	NA	5.35
A3-100-BH	101.05	1/23/2023	0.3	26.8	Dry	NA	NA	NA	NA	NA	5.33
A3-100-BH	101.05	1/30/2023	0.4	12.7	Dry	NA	NA	NA	NA	NA	5.35
A3-110-BH	101.08	9/1/2022	NM	NM	NM	NA	NA	NA	NA	NA	5.96
A3-110-BH	101.08	9/6/2022	0.5	0.6	5.94	95.14	5.91	95.17	5.90	0.04	5.94
A3-110-BH	101.08	9/12/2022	0	0.0	5.88	95.20	NA	NA	NA	NA	5.92
A3-110-BH	101.08	9/19/2022	1	33.6	Dry	NA	5.82	NA	5.82	NA	5.89
A3-110-BH	101.08	9/26/2022	0.5	50.9	Dry	NA	5.88	NA	5.88	NA	5.92
A3-110-BH	101.08	10/3/2022	0.7	76.5	Dry	NA	5.91	NA	5.91	NA	5.92
A3-110-BH	101.08	11/7/2022	1.7	57.7	Dry	NA	NA	NA	NA	NA	5.90
A3-110-BH	101.08	11/14/2022	1.6	48.8	Dry	NA	NA	NA	NA	NA	5.88
A3-110-BH	101.08	11/21/2022	2.2	6.1	Dry	NA	NA	NA	NA	NA	5.88
A3-110-BH	101.08	11/28/2022	2.2	23.8	Dry	NA	NA	NA	NA	NA	5.91
A3-110-BH	101.08	12/5/2022	0.8	54.9	Dry	NA	NA	NA	NA	NA	5.85
A3-110-BH	101.08	12/12/2022	1.2	56.0	5.80	95.28	NA	NA	NA	NA	5.88
A3-110-BH	101.08	12/19/2022	0.5	37.5	5.64	95.44	NA	NA	NA	NA	5.89
A3-110-BH	101.08	12/27/2022	1.3	84.7	3.46	97.62	3.37	97.71	3.35	0.11	3.89
A3-110-BH	101.08	1/3/2023	0.3	36	3.35	97.73	3.33	97.75	3.32	0.03	5.85
A3-110-BH	101.08	1/9/2023	0.7	83.7	3.56	97.52	3.47	97.61	3.45	0.11	5.91
A3-110-BH	101.08	1/16/2023	0.6	82.6	3.69	97.39	3.60	97.48	3.58	0.11	5.88

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3-110-BH	101.08	1/23/2023	0.2	17.2	4.00	97.08	4.00	97.08	4.00	sheen	5.88
A3-110-BH	101.08	1/30/2023	0.3	17.8	4.52	96.56	4.52	96.56	4.52	sheen	NM
A3-150-BH	101.19	7/29/2022	1.2	38.3	NM	NA	NA	NA	NA	NA	NM
A3-150-BH	101.19	8/1/2022	0.8	0.6	NM	NA	NA	NA	NA	NA	NM
A3-150-BH	101.19	8/8/2022	0.4	0.5	Dry	NA	NA	NA	NA	NA	5.04
A3-150-BH	101.19	8/15/2022	0.6	0.6	Dry	NA	NA	NA	NA	NA	4.97
A3-150-BH	101.19	8/22/2022	0	0.0	Dry	NA	NA	NA	NA	NA	4.98
A3-150-BH	101.19	8/29/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	4.97
A3-150-BH	101.19	9/6/2022	0.6	0.8	Dry	NA	NA	NA	NA	NA	4.98
A3-150-BH	101.19	9/12/2022	0	0.0	Dry	NA	NA	NA	NA	NA	4.97
A3-150-BH	101.19	9/19/2022	1	3.2	Dry	NA	NA	NA	NA	NA	4.95
A3-150-BH	101.19	9/26/2022	0.5	1.7	Dry	NA	NA	NA	NA	NA	4.96
A3-150-BH	101.19	10/3/2022	0.6	2.3	Dry	NA	NA	NA	NA	NA	4.96
A3-150-BH	101.19	11/7/2022	1.6	2.2	Dry	NA	NA	NA	NA	NA	4.89
A3-150-BH	101.19	11/14/2022	1.5	4.4	Dry	NA	NA	NA	NA	NA	4.89
A3-150-BH	101.19	11/21/2022	2.4	2.3	Dry	NA	NA	NA	NA	NA	5.40
A3-150-BH	101.19	11/28/2022	2	2.4	Dry	NA	NA	NA	NA	NA	4.96
A3-150-BH	101.19	12/5/2022	0.8	0.8	Dry	NA	NA	NA	NA	NA	4.90
A3-150-BH	101.19	12/12/2022	1.1	1.3	Dry	NA	NA	NA	NA	NA	4.93
A3-150-BH	101.19	12/19/2022	0.5	1.0	Dry	NA	NA	NA	NA	NA	4.06
A3-150-BH	101.19	12/27/2022	0.8	1.4	Dry	NA	NA	NA	NA	NA	4.94
A3-150-BH	101.19	1/3/2023	0.3	0.2	Dry	NA	NA	NA	NA	NA	4.93
A3-150-BH	101.19	1/9/2023	0.8	0.8	Dry	NA	NA	NA	NA	NA	4.91
A3-150-BH	101.19	1/16/2023	0.5	1.0	Dry	NA	NA	NA	NA	NA	4.93
A3-150-BH	101.19	1/23/2023	0.2	0.3	Dry	NA	NA	NA	NA	NA	4.93
A3-150-BH	101.19	1/30/2023	6.3	0.4	Dry	NA	NA	NA	NA	NA	4.93
A3-150-TR	101.19	3/3/2022	NM	7.0	NM	NA	NA	NA	NA	NA	NM
A3-150-TR	101.19	3/4/2022	NM	397.2	NM	NA	NA	NA	NA	NA	NM
A3-200-BH	101.39	8/1/2022	0.8	27.8	NM	NA	NA	NA	NA	NA	NM
A3-200-BH	101.39	8/8/2022	0.2	0.2	5.06	96.33	NA	NA	NA	NA	6.00
A3-200-BH	101.39	8/15/2022	0.5	0.6	5.40	95.99	NA	NA	NA	NA	5.98
A3-200-BH	101.39	8/22/2022	0.6	0.7	5.73	95.66	5.73	95.66	5.73	sheen	5.96
A3-200-BH	101.39	8/29/2022	0.5	0.5	5.74	95.65	NA	NA	NA	NA	5.81
A3-200-BH	101.39	9/6/2022	0.5	0.6	Dry	NA	NA	NA	NA	NA	5.73
A3-200-BH	101.39	9/12/2022	0	0.0	Dry	NA	NA	NA	NA	NA	5.73
A3-200-BH	101.39	9/19/2022	0.9	1.0	Dry	NA	NA	NA	NA	NA	5.72
A3-200-BH	101.39	9/26/2022	0.5	1.3	Dry	NA	NA	NA	NA	NA	5.71
A3-200-BH	101.39	10/3/2022	0.6	1.2	Dry	NA	NA	NA	NA	NA	5.72
A3-200-BH	101.39	11/7/2022	1.6	1.9	4.79	96.60	NA	NA	NA	NA	5.72
A3-200-BH	101.39	11/14/2022	1.3	1.6	4.48	96.91	NA	NA	NA	NA	5.71
A3-200-BH	101.39	11/21/2022	NM	2.1	4.34	97.05	NA	NA	NA	NA	5.76

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3-200-BH	101.39	11/28/2022	2	2.3	4.13	97.26	NA	NA	NA	NA	5.76
A3-200-BH	101.39	12/5/2022	0.8	1.1	4.03	97.36	NA	NA	NA	NA	5.71
A3-200-BH	101.39	12/12/2022	1.2	1.5	4.00	97.39	NA	NA	NA	NA	5.71
A3-200-BH	101.39	12/19/2022	0.5	0.7	3.85	97.54	NA	NA	NA	NA	5.72
A3-200-BH	101.39	12/27/2022	0.7	1.6	3.13	98.26	NA	NA	NA	NA	5.05
A3-200-BH	101.39	1/3/2023	0	0.4	3.54	97.85	NA	NA	NA	NA	5.71
A3-200-BH	101.39	1/9/2023	0.7	0.9	3.86	97.53	NA	NA	NA	NA	5.73
A3-200-BH	101.39	1/16/2023	0.4	0.9	4.00	97.39	NA	NA	NA	NA	5.70
A3-200-BH	101.39	1/23/2023	0.1	0.2	4.14	97.25	NA	NA	NA	NA	5.69
A3-200-BH	101.39	1/30/2023	0.4	0.4	4.14	97.25	NA	NA	NA	NA	NM
A3-240-BH	101.44	8/5/2022	0	294.8	NM	NA	NA	NA	NA	NA	NM
A3-240-BH	101.44	8/8/2022	0.2	0.3	Dry	NA	NA	NA	NA	NA	5.82
A3-240-BH	101.44	8/15/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.73
A3-240-BH	101.44	8/22/2022	0.7	0.7	Dry	NA	NA	NA	NA	NA	5.74
A3-240-BH	101.44	8/29/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.73
A3-240-BH	101.44	9/6/2022	0.5	1.0	Dry	NA	NA	NA	NA	NA	5.68
A3-240-BH	101.44	9/12/2022	0	0.0	Dry	NA	NA	NA	NA	NA	5.65
A3-240-BH	101.44	9/19/2022	0.6	3.2	Dry	NA	NA	NA	NA	NA	5.64
A3-240-BH	101.44	9/26/2022	0.4	2.4	Dry	NA	NA	NA	NA	NA	5.64
A3-240-BH	101.44	10/3/2022	0.6	1.6	Dry	NA	NA	NA	NA	NA	5.65
A3-240-BH	101.44	11/7/2022	1.5	4.1	Dry	NA	NA	NA	NA	NA	5.79
A3-240-BH	101.44	11/14/2022	0.9	5.3	Dry	NA	NA	NA	NA	NA	5.64
A3-240-BH	101.44	11/21/2022	3	2.9	Dry	NA	NA	NA	NA	NA	5.63
A3-240-BH	101.44	11/28/2022	2.1	8.1	Dry	NA	NA	NA	NA	NA	5.65
A3-240-BH	101.44	12/5/2022	0.8	4.6	Dry	NA	NA	NA	NA	NA	5.63
A3-240-BH	101.44	12/12/2022	0.7	3.8	Dry	NA	NA	NA	NA	NA	5.64
A3-240-BH	101.44	12/19/2022	0.6	1.3	Dry	NA	NA	NA	NA	NA	5.62
A3-240-BH	101.44	12/27/2022	0.8	3.7	3.67	97.77	NA	NA	NA	NA	4.42
A3-240-BH	101.44	1/3/2023	0	1.9	3.63	97.81	NA	NA	NA	NA	5.63
A3-240-BH	101.44	1/9/2023	0.5	3.5	3.76	97.68	NA	NA	NA	NA	5.64
A3-240-BH	101.44	1/16/2023	0.4	2.9	3.89	97.55	NA	NA	NA	NA	5.60
A3-240-BH	101.44	1/23/2023	0.2	1.0	4.02	97.42	NA	NA	NA	NA	5.61
A3-240-BH	101.44	1/30/2023	0.3	1.1	4.12	97.32	NA	NA	NA	NA	NM
A3-250-BH	101.47	8/1/2022	0.8	NM	NM	NA	NA	NA	NA	NA	NM
A3-250-BH	101.47	8/8/2022	0.1	0.1	Dry	NA	NA	NA	NA	NA	5.96
A3-250-BH	101.47	8/15/2022	0.5	0.6	Dry	NA	NA	NA	NA	NA	5.93
A3-250-BH	101.47	8/22/2022	0.7	0.7	Dry	NA	NA	NA	NA	NA	5.88
A3-250-BH	101.47	8/29/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.88
A3-250-BH	101.47	9/6/2022	0.5	1.3	Dry	NA	NA	NA	NA	NA	5.79
A3-250-BH	101.47	9/12/2022	0	0.0	Dry	NA	NA	NA	NA	NA	5.80
A3-250-BH	101.47	9/19/2022	0.6	5.7	Dry	NA	NA	NA	NA	NA	5.80

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3-250-BH	101.47	9/26/2022	0.4	1.2	Dry	NA	NA	NA	NA	NA	5.80
A3-250-BH	101.47	10/3/2022	0.5	1.6	Dry	NA	NA	NA	NA	NA	5.78
A3-250-BH	101.47	11/7/2022	1.6	10.0	Dry	NA	NA	NA	NA	NA	5.24
A3-250-BH	101.47	11/14/2022	1.2	2.8	Dry	NA	NA	NA	NA	NA	5.80
A3-250-BH	101.47	11/21/2022	2.8	3.4	Dry	NA	NA	NA	NA	NA	5.78
A3-250-BH	101.47	11/28/2022	2.1	6.8	Dry	NA	NA	NA	NA	NA	5.80
A3-250-BH	101.47	12/5/2022	0.7	4.5	Dry	NA	NA	NA	NA	NA	5.70
A3-250-BH	101.47	12/12/2022	0.7	1.9	Dry	NA	NA	NA	NA	NA	5.71
A3-250-BH	101.47	12/19/2022	0.6	1.0	Dry	NA	NA	NA	NA	NA	5.72
A3-250-BH	101.47	12/27/2022	1.2	1.9	Dry	NA	NA	NA	NA	NA	5.71
A3-250-BH	101.47	1/3/2023	0	1.4	Dry	NA	NA	NA	NA	NA	5.71
A3-250-BH	101.47	1/9/2023	0.4	0.7	Dry	NA	NA	NA	NA	NA	5.72
A3-250-BH	101.47	1/16/2023	0.4	1.6	Dry	NA	NA	NA	NA	NA	5.72
A3-250-BH	101.47	1/23/2023	0.3	0.3	Dry	NA	NA	NA	NA	NA	5.72
A3-250-BH	101.47	1/30/2023	0.2	0.3	Dry	NA	NA	NA	NA	NA	5.71
A3-300-BH	101.49	8/4/2022	0.1	201.6	NM	NA	NA	NA	NA	NA	NM
A3-300-BH	101.49	8/8/2022	0.1	0.2	Dry	NA	NA	NA	NA	NA	5.41
A3-300-BH	101.49	8/15/2022	0.5	0.6	Dry	NA	NA	NA	NA	NA	5.35
A3-300-BH	101.49	8/22/2022	0.7	0.8	Dry	NA	NA	NA	NA	NA	4.76
A3-300-BH	101.49	8/29/2022	0.5	0.6	Dry	NA	NA	NA	NA	NA	5.31
A3-300-BH	101.49	9/6/2022	0.5	5.2	Dry	NA	NA	NA	NA	NA	5.11
A3-300-BH	101.49	9/12/2022	0	3.4	Dry	NA	NA	NA	NA	NA	5.24
A3-300-BH	101.49	9/19/2022	0.6	26.1	Dry	NA	NA	NA	NA	NA	5.25
A3-300-BH	101.49	9/26/2022	0.4	7.2	Dry	NA	NA	NA	NA	NA	5.24
A3-300-BH	101.49	10/3/2022	0.4	13.8	Dry	NA	NA	NA	NA	NA	5.23
A3-300-BH	101.49	11/7/2022	1.5	10.2	Dry	NA	NA	NA	NA	NA	5.25
A3-300-BH	101.49	11/14/2022	0.9	18.8	Dry	NA	NA	NA	NA	NA	5.22
A3-300-BH	101.49	11/21/2022	2.2	1.9	Dry	NA	NA	NA	NA	NA	5.23
A3-300-BH	101.49	11/28/2022	2.2	3.1	Dry	NA	NA	NA	NA	NA	5.22
A3-300-BH	101.49	12/5/2022	0.6	7.6	Dry	NA	NA	NA	NA	NA	5.21
A3-300-BH	101.49	12/12/2022	0.7	5.8	Dry	NA	NA	NA	NA	NA	5.21
A3-300-BH	101.49	12/19/2022	0.4	5.2	Dry	NA	NA	NA	NA	NA	5.22
A3-300-BH	101.49	12/27/2022	1.2	6.6	Dry	NA	NA	NA	NA	NA	5.24
A3-300-BH	101.49	1/3/2023	0	2.0	Dry	NA	NA	NA	NA	NA	5.21
A3-300-BH	101.49	1/9/2023	0.4	3.4	Dry	NA	NA	NA	NA	NA	5.21
A3-300-BH	101.49	1/16/2023	0.3	0.5	Dry	NA	NA	NA	NA	NA	5.21
A3-300-BH	101.49	1/23/2023	0.1	0.4	Dry	NA	NA	NA	NA	NA	5.20
A3-300-BH	101.49	1/30/2023	0.3	0.7	Dry	NA	NA	NA	NA	NA	5.20
A3-350-BH	101.53	8/5/2022	NM	17.5	NM	NA	NA	NA	NA	NA	NM
A3-350-BH	101.53	8/8/2022	0.1	0.1	Dry	NA	NA	NA	NA	NA	5.80
A3-350-BH	101.53	8/15/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.69

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
A3-350-BH	101.53	8/22/2022	0.6	0.7	Dry	NA	NA	NA	NA	NA	5.68
A3-350-BH	101.53	8/29/2022	0.5	0.5	Dry	NA	NA	NA	NA	NA	5.65
A3-350-BH	101.53	9/6/2022	0.5	2.5	Dry	NA	NA	NA	NA	NA	5.53
A3-350-BH	101.53	9/12/2022	0	80.0	Dry	NA	NA	NA	NA	NA	5.39
A3-350-BH	101.53	9/19/2022	0.6	50.3	Dry	NA	NA	NA	NA	NA	5.37
A3-350-BH	101.53	9/26/2022	0.3	1.0	Dry	NA	NA	NA	NA	NA	5.26
A3-350-BH	101.53	10/3/2022	0.4	1.3	Dry	NA	NA	NA	NA	NA	5.27
A3-350-BH	101.53	11/7/2022	1.7	3.3	Dry	NA	NA	NA	NA	NA	5.27
A3-350-BH	101.53	11/14/2022	1.6	10.5	Dry	NA	NA	NA	NA	NA	5.23
A3-350-BH	101.53	11/21/2022	1.2	1.2	Dry	NA	NA	NA	NA	NA	5.22
A3-350-BH	101.53	11/28/2022	2.1	12.3	Dry	NA	NA	NA	NA	NA	5.25
A3-350-BH	101.53	12/5/2022	0.6	1.8	Dry	NA	NA	NA	NA	NA	5.17
A3-350-BH	101.53	12/12/2022	0.7	2.0	Dry	NA	NA	NA	NA	NA	5.18
A3-350-BH	101.53	12/19/2022	0.3	1.2	Dry	NA	NA	NA	NA	NA	5.16
A3-350-BH	101.53	12/27/2022	0.4	177.9	Dry	NA	NA	NA	NA	NA	5.15
A3-350-BH	101.53	1/3/2023	0	0.7	Dry	NA	NA	NA	NA	NA	5.15
A3-350-BH	101.53	1/9/2023	0.4	4.2	Dry	NA	NA	NA	NA	NA	5.13
A3-350-BH	101.53	1/16/2023	0.3	1.1	Dry	NA	NA	NA	NA	NA	5.13
A3-350-BH	101.53	1/23/2023	0.0	0.6	Dry	NA	NA	NA	NA	NA	5.11
A3-350-BH	101.53	1/30/2023	0.3	1.3	Dry	NA	NA	NA	NA	NA	5.09
A3-375-TR	101.51	3/3/2022	NM	658.0	NM	NA	NA	NA	NA	NA	NM
A3-375-TR	101.51	3/4/2022	NM	387.4	NM	NA	NA	NA	NA	NA	NM
PS+095-BH	NM	6/30/2022	NM	1.8	NM	NA	NA	NA	NA	NA	NM
PS+095-BH	NM	7/1/2022	NM	0.2	Dry	NA	NA	NA	NA	NA	1.90
PS+095-BH	NM	7/5/2022	0.2	0.0	NM	NA	NA	NA	NA	NA	NM
PS+095-BH	NM	7/11/2022	0.4	0.1	Dry	NA	NA	NA	NA	NA	2.88
PS+095-BH	NM	7/18/2022	0.3	0.4	Dry	NA	NA	NA	NA	NA	2.52
PS+095-BH	NM	7/25/2022	0.4	0.3	Dry	NA	NA	NA	NA	NA	2.52
PS+095-BH	NM	8/1/2022	0.4	0.3	Dry	NA	NA	NA	NA	NA	2.50
PS+095-BH	NM	8/8/2022	0.0	0.0	Dry	NA	NA	NA	NA	NA	2.57
PS+095-BH	NM	8/15/2022	0.5	0.2	Dry	NA	NA	NA	NA	NA	2.50
PS+095-BH	NM	8/22/2022	0.3	0.3	Dry	NA	NA	NA	NA	NA	2.48
PS+095-BH	NM	8/29/2022	0.9	0.4	Dry	NA	NA	NA	NA	NA	2.43
PS+095-BH	NM	9/6/2022	0.3	0.1	Dry	NA	NA	NA	NA	NA	2.40
PS+095-BH	NM	9/12/2022	0.0	0.0	Dry	NA	NA	NA	NA	NA	2.39
PS+095-BHO	NM	6/30/2022	0.3	2.1	NM	NA	NA	NA	NA	NA	NM
PS+095-BHO	NM	7/1/2022	0.4	0.5	Dry	NA	NA	NA	NA	NA	3.92
PS+095-BHO	NM	7/5/2022	NM	0.2	NM	NA	NA	NA	NA	NA	NM
PS+095-BHO	NM	7/11/2022	0.4	0.3	Dry	NA	NA	NA	NA	NA	3.96
PS+095-BHO	NM	7/18/2022	0.3	0.4	Dry	NA	NA	NA	NA	NA	3.96
PS+095-BHO	NM	7/25/2022	0.4	0.5	Dry	NA	NA	NA	NA	NA	3.97

Table 6-3. Periodic Water Level, Organic Vapor Headspace, and LNAPL Monitoring In Adit 3 Sampling Locations

Location	Tunnel Floor (ft, amsl)	Date	Organic Vapor Measurement		Top of Perched Water[1]				Product Measured		Total Depth Measured (ft, btf)
			Ambient (ppmv)	Downhole (ppmv)	Measured (ft, btf)	Measured (ft, amsl)	Corrected (ft, btf)	Corrected (ft, amsl)	Top (ft, btf)	Thickness (ft)	
PS+095-BHO	NM	8/1/2022	0.4	0.3	Dry	NA	NA	NA	NA	NA	3.96
PS+095-BHO	NM	8/8/2022	0	0.0	Dry	NA	NA	NA	NA	NA	3.99
PS+095-BHO	NM	8/15/2022	0.5	0.2	Dry	NA	NA	NA	NA	NA	3.94
PS+095-BHO	NM	8/22/2022	0.2	0.4	Dry	NA	NA	NA	NA	NA	3.95
PS+095-BHO	NM	8/29/2022	0.8	0.4	Dry	NA	NA	NA	NA	NA	3.75
PS+095-BHO	NM	9/6/2022	0.3	0.2	Dry	NA	NA	NA	NA	NA	3.96
PS+095-BHO	NM	9/12/2022	0	0.0	Dry	NA	NA	NA	NA	NA	3.97

Notes:

ft - feet

ft, amsl - feet, above mean sea level

ft, btf - feet, below tunnel floor

NA - Not applicable

NM - Not measured

Table 6-3. Periodic Organic Headspace Measurements in Boreholes and Temporary **w**ells

Date	A3+375-TW	A3+325-TW	A3+210-TW	A3+200-BH	A3+150-BH	A3+087-BH	A3+050-TW	A3+015-BH	A3-010-TW	A3-040-TW	A3-050-BH	A3-050-BHO	A3-090-BH	A3-100-BH	A3-110-BH	A3-150-BH	A3-200-BH	A3-240-BH	A3-250-BH	A3-300-BH	A3-350-BH
8/22/2022	NM	0.1	0.3	8.9	7.0	0.4	NM	2.9	62.4	42.6	1.0	24.5	NI	7.5	Ni	0.0	0.7	0.7	0.7	0.8	0.7
8/29/2022	NM	10.6	0.9	13.2	11.6	0.4	0.5	NM	128.0	NM	0.5	24.2	NM	5.0	NM	0.5	0.5	0.5	0.5	0.6	0.5
9/6/2022	10.0	11.0	0.9	15.3	16.9	1.3	0.5	94.5	86.6	44.7	0.7	22.1	7.5	76.9	0.6	0.8	0.6	1.0	1.3	5.2	2.5
9/12/2022	0.7	0.0	0.0	12.8	12.3	0.0	0.0	70.9	126.9	39.7	0.0	10.2	0.1	95.1	0.0	0.0	0.0	0.0	0.0	3.4	80.0
9/19/2022	9.5	18.7	1.0	8.8	18.0	1.5	1.6	97.1	105.1	85.0	1.1	5.4	10.7	108.8	33.6	3.2	1	3.2	5.7	26.1	50.3
9/26/2022	2.9	5.2	6.0	25.2	13.5	0.9	3.0	121.9	184.8	NM	2.9	21.0	8.0	6.7	50.9	1.7	1.3	2.4	1.2	7.2	1.0
10/3/2022	0.9	11.0	3.3	19.5	18.4	0.7	1.3	70.5	174.1	36.0	1.7	25.2	15.0	92.5	76.5	2.3	1.2	1.6	1.6	13.8	1.3
11/7/2022	0.0	5.5	2.1	7.3	10.7	1.7	2.7	48.5	129.1	7.3	1.8	27.0	9.6	95.0	57.7	2.2	1.9	4.1	10.0	16.2	3.3
11/14/2022	0.7	54.4	1.8	1.5	5.6	0.8	1.0	40.0	191.2	19.9	2.3	10.9	6.0	53.8	48.8	4.4	1.6	5.3	2.8	18.8	10.5
11/21/2022*	0.2	0.8	0.5	0.5	1.4	1.2	0.1	1.7	13.3	1.3	1.4	5.4	2.8	7.8	6.1	2.3	2.1	2.9	3.4	1.9	1.2
11/28/2022	0.7	5.4	2.4	1.6	5.4	0.9	1.5	57.7	253.6	22.0	2.9	48.5	17.3	134.3	23.8	2.4	2.3	8.1	6.8	12.3	3.1
12/5/2022	1.1	10.4	3.5	2.9	5.2	0.8	1.4	59.4	276.1	13.4	1.1	58.7	7.9	111.3	54.9	0.8	1.1	4.6	4.5	7.6	1.8
12/12/2022	0.9	8.9	2.5	2.7	4.0	0.8	1.6	58.5	204.8	12.5	1.3	44.1	8.9	68.0	56.0	1.3	1.5	3.8	1.9	5.8	2.0
12/19/2022	0.6	3.5	2.8	1.4	3.7	3.1	3.5	27.6	148.0	7.4	1.6	57.8	2.8	6.3	37.5	1.0	0.7	1.3	1.0	5.2	1.2
12/27/2022	0.1	7.8	1.3	1.9	3.2	1.4	1.0	39.0	161.7	8.9	3.7	38.3	17.3	7.8	84.7	1.4	1.6	3.7	1.9	6.6	177.9
1/3/2023	0.5	3.4	1.1	1.0	1.6	1.3	1.3	23.2	87.6	4.2	0.0	7.2	1.6	2.6	36.0	0.2	0.4	1.9	1.4	2.0	0.7
1/9/2023	1.0	6.9	2.5	A	3.0	1.5	0.8	161.7	158.3	33.5	A	14.4	24.0	3.9	83.7	0.8	0.9	3.5	0.7	3.4	4.2
1/16/2023	0.7	5.5	1.3	A	1.6	0.8	0.7	57.6	120.9	6.7	A	1.9	6.2	114.0	82.6	1.0	0.9	2.9	1.6	0.5	1.1
1/23/2023	0.1	1.4	0.2	A	0.4	0.1	0.1	16.9	24.0	1.2	A	2.7	4.6	26.8	17.2	0.3	0.2	1.0	0.3	0.4	0.6
1/30/2023	0.2	2.1	0.4	A	0.4	0.2	0.2	21.0	26.0	1.8	A	1.6	2.9	12.7	17.8	0.4	0.4	1.1	0.3	0.7	1.3

Notes:

NM - Not measured

NI -Not installed

A -Abandoned

* -Readings collected with MultiRAE, artificially low

ppmv - parts per million by volume

ppmv Scale

276.1
200.0
100.0
50.0
0.0

Table 8-1. Analytical Laboratory Sample Summary

Location	Field Sample ID	Date	Time	Matrix	Type	TPH-g	BTEX	TPH-d/o	NAPHs	TO-15	TO-3	Gases	SHC	PIANO	Laboratory	Sample Delivery Group	Laboratory Sample ID
2S+075-TR	2SMIS75-SON01-000.0	3/4/2022	15:50	SO	N	1	1	1	1						Eurofins Seattle	580-111187	580-111187-07
A3-375-TR	A3MIS-375-SON01-000.0	3/5/2022	14:10	SO	N	1	1	1	1						Eurofins Seattle	580-111187	580-111187-01
A3-150-TR	A3MIS-150-SOFT01-000.0	3/5/2022	14:50	SO	FT	1	1	1	1						Eurofins Seattle	580-111187	580-111187-02
A3-150-TR	A3MIS-150-SOFT02-000.0	3/5/2022	15:00	SO	FT	1	1	1	1						Eurofins Seattle	580-111187	580-111187-03
A3-150-TR	A3MIS-150-SOFT03-000.0	3/5/2022	15:10	SO	FT	1	1	1	1						Eurofins Seattle	580-111187	580-111187-04
A3+000-TR	A3MIS000-SON01-000.0	3/5/2022	15:35	SO	N	1	1	1	1						Eurofins Seattle	580-111187	580-111187-05
A3+215-TR	A3MIS215-SON01-000.0	3/5/2022	16:05	SO	N	1	1	1	1						Eurofins Seattle	580-111187	580-111187-06
A3-010-TR	A3000MISH-SOFT01-000.0	3/29/2022	16:20	SO	FT	1	1	1	1						Eurofins Seattle	580-112035	580-112035-01
A3-010-TR	A3000MISH-SOFT02-000.0	3/29/2022	16:20	SO	FT	1	1	1	1						Eurofins Seattle	580-112035	580-112035-02
A3-010-TR	A3000MISH-SOFT03-000.0	3/29/2022	16:20	SO	FT	1	1	1	1						Eurofins Seattle	580-112035	580-112035-03
A3-010-TR	A3000MISH-SOFT02-003.0	4/6/2022	15:30	SO	FT	1	1	1	1						Eurofins Seattle	580-112521	580-112521-02
A3-010-TR	A3000MISH-SOFT03-003.0	4/6/2022	15:30	SO	FT	1	1	1	1						Eurofins Seattle	580-112521	580-112521-03
A3-010-TR	A3000MISH-SOFT01-003.2	4/12/2022	13:30	SO	FT	1	1	1	1						Eurofins Seattle	580-112657	580-112657-01
A3-010-TR	A3000MISH-SOFT02-003.2	4/12/2022	13:30	SO	FT	1	1	1	1						Eurofins Seattle	580-112657	580-112657-02
A3-010-TR	A3000MISH-SOFT03-003.2	4/12/2022	13:30	SO	FT	1	1	1	1						Eurofins Seattle	580-112657	580-112657-03
1S+025-BH	1S025BH-SON01-005.0-006.0	8/2/2022	14:48	SO	N			1	1						Eurofins Seattle	580-116630	580-116630-01
2S+025-BH	2S025BH-SON01-003.0-004.0	8/2/2022	9:07	SO	N			1	1						Eurofins Seattle	580-116630	580-116630-02
A3+000-BH	A3000-SON01-002.0	3/11/2022	13:05	SO	N			1	1						Eurofins Seattle	580-111395	580-111395-04
A3+015-BH	A3015-SON01-002.0	4/1/2022	16:45	SO	N	1	1	1	1						Eurofins Seattle	580-112198-1	580-112198-05

Table 8-1. Analytical Laboratory Sample Summary

Location	Field Sample ID	Date	Time	Matrix	Type	TPH-g	BTEX	TPH-d/o	NAPHs	TO-15	TO-3	Gases	SHC	PIANO	Laboratory	Sample Delivery Group	Laboratory Sample ID
A3+050-BH	A3050BH-SON01-004.0-005.0	6/27/2022	15:29	SO	N			1	1						Eurofins Seattle	580-115366	580-115366-02
A3+087-BH	A3087BH-SON01-004.0-005.0	6/29/2022	10:01	SO	N			1	1						Eurofins Seattle	580-115496	580-115496-01
A3+150-BH	A3150BH-SON01-000.0-001.0	6/27/2022	10:05	SO	N			1	1						Eurofins Seattle	580-115366	580-115366-01
A3+210-BH	A3210BH-SON01-002.0-003.0	6/24/2022	15:10	SO	N			1	1						Eurofins Seattle	580-115329	580-115329-01
A3+215-BH	A3215-SON01-002.0	3/11/2022	11:55	SO	N			1	1						Eurofins Seattle	580-111395	580-111395-01
A3+225-BH	A3325H-SON01-001.0	3/30/2022	11:45	SO	N	1	1	1	1						Eurofins Seattle	580-112035	580-112035-05
A3+325-BH	A3325-SON01-002.0	3/11/2022	12:05	SO	N			1	1						Eurofins Seattle	580-111395	580-111395-02
A3+375-BH	A3375BH-SON01-000.0-001.0	8/26/2022	10:20	SO	N			1	1						Eurofins Seattle	580-117418	580-117418-01
A3-010-BH	A3-010-SON01-002.0	3/30/2022	10:10	SO	N	1	1	1	1						Eurofins Seattle	580-112035	580-112035-04
A3-040-BH	A3-040BH-SON01-005.0-006.0	8/3/2022	10:23	SO	N			1	1						Eurofins Seattle	580-116666	580-116666-01
A3-050-BH	A3-050BH-SON01-004.0-004.0	6/30/2022	14:28	SO	N			1	1						Eurofins Seattle	580-115521	580-115521-02
A3-090-BH	A3-090BH-SON01-003.0-004.0	8/29/2022	11:41	SO	N			1	1						Eurofins Seattle	580-117418	580-117418-03
A3-100-BH	A3-100BH-SON01-003.0--004.0	7/29/2022	10:14	SO	N			1	1						Eurofins Seattle	580-116547	580-116547-01
A3-110-BH	A3-110BH-SON01-004.0-005.0	8/29/2022	9:58	SO	N			1	1						Eurofins Seattle	580-117418	580-117418-02
A3-150-BH	A3-150BH-SON01-001.0-002.0	7/29/2022	14:08	SO	N			1	1						Eurofins Seattle	580-116547	580-116547-02
A3-150-BH	A3-150-SON01-002.0	3/11/2022	12:45	SO	N			1	1						Eurofins Seattle	580-111395	580-111395-03
A3-200-BH	A3-200BH-SON01-004.0-005.0	8/1/2022	9:47	SO	N			1	1						Eurofins Seattle	580-116547	580-116547-03
A3-240-BH	A3-240BH-SON01-004.0-005.0	8/5/2022	10:36	SO	N			1	1						Eurofins Seattle	580-116756	580-116756-01
A3-300-BH	A3-300BH-SON01-004.0-005.0	8/4/2022	3:00	SO	N			1	1						Eurofins Seattle	580-116684	580-116684-01

Table 8-1. Analytical Laboratory Sample Summary

Location	Field Sample ID	Date	Time	Matrix	Type	TPH-g	BTEX	TPH-d/o	NAPHs	TO-15	TO-3	Gases	SHC	PIANO	Laboratory	Sample Delivery Group	Laboratory Sample ID
A3-350-BH	A3-350BH-SON01-002.0-003.0	8/5/2022	14:04	SO	N			1	1						Eurofins Seattle	580-116756	580-116756-02
PS+095-BH	PS095BH-SON01-003.0-004.0	6/30/2022	9:53	SO	N			1	1						Eurofins Seattle	580-115521	580-115521-01
A3+015-BH	A3015-WGN01-002.0	4/1/2022	16:00	WG	N	1	1	1	1						Eurofins Seattle	580-112198-1	580-112198-06
A3+015-BH	A3015-WGN01-052322	5/23/2022	10:00	WG	N	1	1	1	1						Eurofins Seattle	580-114114	580-114114-01
A3+215-BH	A3215-WGN01-002.0	3/11/2022	11:35	WG	N			1	1						Eurofins Seattle	580-111395	580-111395-06
A3+325-BH	A3325-WGN01-002.0	3/11/2022	11:15	WG	N			1	1						Eurofins Seattle	580-111395	580-111395-05
A3-010-DSVMP	A3-010SVMP-WGN01B-2208WK4	8/23/2022	10:30	WG	N	1	1	1	1						Eurofins Seattle	580-117282	580-117282-01
A3+050-TW	A3050TW-WGN01LF-2209WK3	9/12/2022	11:50	WG	N	1	1	1	1						Eurofins Seattle	580-117885	580-117885-04
A3+210-TW	A3210TW-WGN01LF-2209WK3	9/12/2022	11:10	WG	N	1	1	1	1						Eurofins Seattle	580-117885	580-117885-03
A3+325-TW	A3325TW-WGN01LF-2209WK3	9/12/2022	10:30	WG	N	1	1	1	1						Eurofins Seattle	580-117885	580-117885-02
A3+375-TW	A3375TW-WGN01LF-2209WK3	9/12/2022	10:00	WG	N	1	1	1	1						Eurofins Seattle	580-117885	580-117885-01
A3-010-DSVMP	A3-010DSVMP-PRN01-WK2	9/12/2022	12:55	PR	N								1	1	Alpha	L2250292	L2250292-02
A3-010-TW	A3-010TW-PRN01-WK2	9/12/2022	13:35	PR	N								1	1	Alpha	L2250426	L2250426-01
A3+015-TW	A3015TW-PRN01-WK2	9/12/2022	13:15	PR	N								1	1	Alpha	L2250292	L2250292-01
A3-040-TW	A3-040TW-PRN01-WK2	9/12/2022	14:10	PR	N								1	1	Alpha	L2250426	L2250426-02
PSCOOLING	PSCOOLING-WSFD01-000.0	3/31/2022	12:15	WS	FD	1	1	1	1						Eurofins Seattle	580-112198-1	580-112198-02
PSCOOLING	PSCOOLING-WSN01-000.0	3/31/2022	12:15	WS	N	1	1	1	1						Eurofins Seattle	580-112198-1	580-112198-01
SUMP ADIT3	SUMP-WSN01-000.0	3/31/2022	09:45	WS	N	1	1	1	1						Eurofins Seattle	580-112198-1	580-112198-04
SUMPDRN	SUMPDRN-WSN01-000.0	3/31/2022	11:30	WS	N	1	1	1	1						Eurofins Seattle	580-112198-1	580-112198-03

Table 8-1. Analytical Laboratory Sample Summary

Location	Field Sample ID	Date	Time	Matrix	Type	TPH-g	BTEX	TPH-d/o	NAPHs	TO-15	TO-3	Gases	SHC	PIANO	Laboratory	Sample Delivery Group	Laboratory Sample ID
2S+075-SVMP	2S075-GSFD01-000.0-021822	2/18/2022	13:07	GS	FD					1					Air Toxics	2202482A	2202482A-04
2S+075-SVMP	2S075-GSFD01-000.0-021822	2/18/2022	13:07	GS	FD						1				Air Toxics	2202482B	2202482B-04
2S+075-SVMP	2S075-GSFD01-000.0-021822	2/18/2022	13:07	GS	FD							1			Air Toxics	2202482C	2202482C-04
2S+075-SVMP	2S075-GSN01-000.0-021822	2/18/2022	13:07	GS	N					1					Air Toxics	2202482A	2202482A-03
2S+075-SVMP	2S075-GSN01-000.0-021822	2/18/2022	13:07	GS	N						1				Air Toxics	2202482B	2202482B-03
2S+075-SVMP	2S075-GSN01-000.0-021822	2/18/2022	13:07	GS	N							1			Air Toxics	2202482C	2202482C-03
A3+250-SVMP	A3250-GSN01-000.0-021822	2/18/2022	12:16	GS	N					1					Air Toxics	2202482A	2202482A-02
A3+250-SVMP	A3250-GSN01-000.0-021822	2/18/2022	12:16	GS	N						1				Air Toxics	2202482B	2202482B-02
A3+250-SVMP	A3250-GSN01-000.0-021822	2/18/2022	12:16	GS	N							1			Air Toxics	2202482C	2202482C-02
A3B-150-SVMP	A3B-150-GSN01-000.0-021822	2/18/2022	12:40	GS	N					1					Air Toxics	2202482A	2202482A-01
A3B-150-SVMP	A3B-150-GSN01-000.0-021822	2/18/2022	12:40	GS	N						1				Air Toxics	2202482B	2202482B-01
A3B-150-SVMP	A3B-150-GSN01-000.0-021822	2/18/2022	12:40	GS	N							1			Air Toxics	2202482C	2202482C-01
1S+075-DSVMP-	1S075-GSN01-12.6-2212	12/15/2022	2L21016-0	GS	N					1	1	1			AMAC	2L21016	2L21016-05
1S+075-DSVMP	1S075-GSN01-29.0-2212	12/15/2022	2L21016-0	GS	N					1	1	1			AMAC	2L21016	2L21016-06
1S+075-DSVMP	2S075-GSN01-5.0-2212	12/15/2022	2L21016-1	GS	N					1	1	1			AMAC	2L21016	2L21016-16
2S+100-SVMP	2S100-GSN01-0.5-2212	12/15/2022	2L21016-1	GS	N					1	1	1			AMAC	2L21016	2L21016-15
A3-010-DSVMP	A3-010-GSN01-62.0-2212	12/15/2022	2L21016-0	GS	N					1	1	1			AMAC	2L21016	2L21016-01
A3-275-SVMP	A3-275-GSN01-0.5-2212	12/15/2022	2L21016-1	GS	N					1	1	1			AMAC	2L21016	2L21016-17
A3-375-SVMP	A3-375-GSN01-0.5-2212	12/16/2022	2L21016-1	GS	N					1	1	1			AMAC	2L21016	2L21016-12

Table 8-1. Analytical Laboratory Sample Summary

Location	Field Sample ID	Date	Time	Matrix	Type	TPH-g	BTEX	TPH-d/o	NAPHs	TO-15	TO-3	Gases	SHC	PIANO	Laboratory	Sample Delivery Group	Laboratory Sample ID
A3-375-DSVMP	A3-375-GSN01-12.5-2212	12/16/2022	2L21016-	GS	N					1	1	1			AMAC	2L21016	2L21016-02
A3-375-DSVMP	A3-375-GSN01-34.5-2212	12/16/2022	2L21016-	GS	N					1	1	1			AMAC	2L21016	2L21016-03
A3-375-DSVMP	A3-375-GSN01-47.5-2212	12/16/2022	2L21016-	GS	N					1	1	1			AMAC	2L21016	2L21016-04
A3-375-SVMP	A3-375-GSN01-5.0-2212	12/16/2022	2L21016-	GS	N					1	1	1			AMAC	2L21016	2L21016-14
A3+150-SVMP	A3150-GSN01-0.5-2212	12/15/2022	2L21016-	GS	N					1	1	1			AMAC	2L21016	2L21016-13
A3a-100-SVMP	A3a-100-GSFD01-0.5-2212	12/15/2022	2L21016-	GS	FD					1	1	1			AMAC	2L21016	2L21016-10
A3a-100-SVMP	A3a-100-GSN01-0.5-2212	12/15/2022	2L21016-	GS	N					1	1	1			AMAC	2L21016	2L21016-09
A3b-350-SVMP	A3b-350-GSN01-0.5-2212	12/16/2022	2L21016-	GS	N					1	1	1			AMAC	2L21016	2L21016-11
A3b+000-SVMP	A3b000-GSFD01-0.5-2212	12/15/2022	2L21016-	GS	FD					1	1	1			AMAC	2L21016	2L21016-08
A3b+000-SVMP	A3b000-GSN01-0.5-2212	12/15/2022	2L21016-	GS	N					1	1	1			AMAC	2L21016	2L21016-07
A3-010-SVMP	A3-010-GSN02-62.0-2212	12/19/2022	2L21017-	GS	N					1	1	1			AMAC	2L21017	2L21017-01
A3-375-SVMP	A3-375-GSN01-63.5-2212	12/19/2022	2L21017-	GS	N					1	1	1			AMAC	2L21017	2L21017-02

Table 8-1. Analytical Laboratory Sample Summary

Location	Field Sample ID	Date	Time	Matrix	Type	TPH-g	BTEX	TPH-d/o	NAPHs	TO-15	TO-3	Gases	SHC	PIANO	Laboratory	Sample Delivery Group	Laboratory Sample ID

Notes

ID - Identifier
SDG -Sample Delivery Group

Sample Type Code:

FD - Field Duplicate sample
N - Normal environmental sample
FT - Field Triplicate or replicate

Matrix Code:

GS - Air sample
PR - Product sample
WG -Groundwater Sample
WS -Surface water Sample
SO -Soil Sample

Analytic Methods:

TPH-g - Gasoline range TPH by SW8260
BTEX -Benzene, toluene, ethylbenzene, and xylenes by SW8240
TPH-d/o -Diesel and residual oil range TPH by SW8015 modified
NAPHs -Naphthalene, 1-methylnaphthalene, 2-methylnaphthalene by SW8270
TO-15 -Volatile organic compounds in air by TO-15
TO-3 -Total petroleum hydrocarbons in air by TO-3
Gases Helium, CO2, methane, and oxygen by ASTM 1946 or C3
SHC - Saturated hydrocarbon analysis for fuel forensics
PIANO - Paraffins, isoparaffins, aromatics, naphthenes and olefins, for fuel forensics

Table 8-2. Subsurface Soil Sample Results from Adit 3 Trenches

			Sample ID			2SMIS75-SON01-000.0					A3MIS-375-SON01-000.0					A3MIS-150-SOFT01-000.0					A3MIS-150-SOFT02-000.0					A3MIS-150-SOFT03-000.0					A3MIS000-SON01-000.0				
			Boring ID			2S+075-TR					A3-375-TR					A3-150-TR					A3-150-TR					A3-150-TR					A3+000-TR				
			Date			3/4/2022					3/5/2022					3/5/2022					3/5/2022					3/5/2022					3/5/2022				
			Sample interval (ft bgs)			0.0 - 0.5					0.0 - 0.5					0.0 - 0.5					0.0 - 0.5					0.0 - 0.5					0.0 - 0.5				
Chemical	CAS No.	Units	Leaching to Groundwater EAL	Direct Exposure EAL	Odor Threshold EAL	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance
Benzene	71-43-2	mg/kg	0.3	1	500	0.20	U				0.19	U				0.2	U				0.2	U				0.220	U				0.320	U	A		
Toluene	108-88-3	mg/kg	0.8	818	500	0.39	U				0.37	U				0.4	U				0.4	U				0.440	U				0.630	U			
Ethylbenzene	100-41-4	mg/kg	0.9	62	479	0.39	U				0.37	U				0.4	U				0.4	U				0.440	U				0.630	U			
Xylenes, Total	1330-20-7	mg/kg	1.4	129	260	0.20	U				0.20	J				0.2	U				0.2	U				0.220	U				0.320	U			
Naphthalene	91-20-3	mg/kg	3.1	28	500	0.22					5		A			0.037					0.046					0.036					0.130				
1-Methylnaphthalene	90-12-0	mg/kg	0.9	169	500	1.60		A			15		A			0.055					0.093					0.094					2		A		
2-Methylnaphthalene	91-57-6	mg/kg	1.9	39	500	1.90					16		A			0.033					0.045					0.051					1.200				
C6-C10 Gasoline Range Organics	Gas	mg/kg	696	451	100	39	U				130				C	200				C	220				C	190				C	54	U			
C10-C24 Petroleum Hydrocarbons	Diesel	mg/kg	940	219	500	400			B		6200		A	B	C	1300		A	B	C	1400		A	B	C	1000		A	B	C	4200		A	B	C
C24-C40 Petroleum Hydrocarbons	Oil	mg/kg	1000	9386	500	250					310	J				160					190					150					280				

Table 8-2. Subsurface Soil Sample Results from Adit 3 Trenches

					Sample ID	A3MIS215-SON01-000.0					A3000MISH-SOFT01-000.0					A3000MISH-SOFT02-000.0					A3000MISH-SOFT03-000.0					A3000MISH-SOFT02-003.0					A3000MISH-SOFT03-003.0				
					Boring ID	A3+215-TR					A3-010-TR					A3-010-TR					A3-010-TR					A3-010-TR					A3-010-TR				
					Date	3/5/2022					3/29/2022					3/29/2022					3/29/2022					4/6/2022					4/6/2022				
					Sample interval (ft bgs)	0.0 - 0.5					0.0 - 0.5					0.0 - 0.5					0.0 - 0.5					3.0 - 3.2					3.0 - 3.2				
Chemical	CAS No.	Units	Leaching to Groundwater EAL	Direct Exposure EAL	Odor Threshold EAL	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance
Benzene	71-43-2	mg/kg	0.3	1	500	2.2	U	A	B		0.023	U				0.025	U				0.024	U				0.023	U				0.030	U			
Toluene	108-88-3	mg/kg	0.8	818	500	4.3	U	A			0.046	U				0.050	U				0.048	U				0.046	U				0.059	U			
Ethylbenzene	100-41-4	mg/kg	0.9	62	479	4.3	U	A			0.046	U				0.050	U				0.048	U				0.046	U				0.059	U			
Xylenes, Total	1330-20-7	mg/kg	1.4	129	260	2.2	U	A			0.015	J				0.025	UJ				0.024	UJ				0.023	U				0.030	U			
Naphthalene	91-20-3	mg/kg	3.1	28	500	0.004	J				0.008	J				0.012	J				0.024	J				0.011	J				0.017	J			
1-Methylnaphthalene	90-12-0	mg/kg	0.9	169	500	0.020					0.002	J				0.003	J				0.006	J				0.006	J				0.006	J			
2-Methylnaphthalene	91-57-6	mg/kg	1.9	39	500	0.011					0.003	J				0.004	J				0.009					0.006	J				0.004	UJ			
C6-C10 Gasoline Range Organics	Gas	mg/kg	696	451	100	36	J				4.6	U				5	U				4.8	U				35	J				69	J			
C10-C24 Petroleum Hydrocarbons	Diesel	mg/kg	940	219	500	260			B		16	J				20	J				33	J				180					170				
C24-C40 Petroleum Hydrocarbons	Oil	mg/kg	1000	9386	500	100					67					70					85					100					120				

Table 8-2. Subsurface Soil Sample Results from Adit 3 Trenches

					Sample ID	A3000MISH-SOFT01-003.2					A3000MISH-SOFT02-003.2					A3000MISH-SOFT03-003.2				
					Boring ID	A3-010-TR					A3-010-TR					A3-010-TR				
					Date	4/12/2022					4/12/2022					4/12/2022				
					Sample interval (ft bgs)	3.2 - 3.7					3.2 - 3.7					3.2 - 3.7				
Chemical	CAS No.	Units	Leaching to Groundwater EAL	Direct Exposure EAL	Odor Threshold EAL	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance
Benzene	71-43-2	mg/kg	0.3	1	500	0.022	U				0.004	UJ				0.024	U			
Toluene	108-88-3	mg/kg	0.8	818	500	0.045	U				0.009	UJ				0.048	U			
Ethylbenzene	100-41-4	mg/kg	0.9	62	479	0.045	U				0.009	UJ				0.048	U			
Xylenes, Total	1330-20-7	mg/kg	1.4	129	260	0.022	U				0.004	UJ				0.024	U			
Naphthalene	91-20-3	mg/kg	3.1	28	500	0.005	U				0.005	U				0.004	U			
1-Methylnaphthalene	90-12-0	mg/kg	0.9	169	500	0.002	U				0.002	U				0.002	U			
2-Methylnaphthalene	91-57-6	mg/kg	1.9	39	500	0.004	U				0.004	U				0.003	U			
C6-C10 Gasoline Range Organics	Gas	mg/kg	696	451	100	31	J				19	J				140	J			C
C10-C24 Petroleum Hydrocarbons	Diesel	mg/kg	940	219	500	810	J		B	C	730			B	C	650			B	C
C24-C40 Petroleum Hydrocarbons	Oil	mg/kg	1000	9386	500	110					110					150				

Notes:

CAS No. - Chemical Abstract Services Number
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
ft bgs - feet below ground surface
mg/kg - milligrams per kilogram
NT - Analysis not conducted

Quality Assurance Flags
J - The compound was positively identified, the reported value is estimated
U - Undetected at the limit of detection

Table A-2. Soil Action Levels
EAL Exceedance Flags
A - Result exceeds Leaching to Groundwater EAL
B - Result exceeds Human Health Direct Exposure EAL
C - Result exceeds Odor EAL
650 - Result Exceeds one or more EALs

Table 8-3. Subsurface Soil Sample Statistics from Adit 3 Trenches

Analyte	No. Analyzed	No. Detected	% Detected	Maximum Concentration or Limit of Detection (mg/kg)	Leaching to GW EAL Exceedance	Direct Exposure EAL Exceedance	Odor/Nuisance Threshold EAL Exceedance
Benzene	15			2.2	2	1	
Toluene	15			4.3	1		
Ethylbenzene	15			4	1		
Xylenes, Total	15	2	13%	2	1		
Naphthalene	15	12	80%	5	1		
1-Methylnaphthalene	15	12	80%	15	3		
2-Methylnaphthalene	15	11	73%	16	1		
C6-C10 Gasoline Range Organics	15	10	67%	220			5
C10-C24 Petroleum Hydrocarbons	15	15	100%	6200	5	10	8
C24-C40 Petroleum Hydrocarbons	15	15	100%	310			

Notes:
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
mg/kg - milligrams per kilogram
[1] - Table A-2. Soil Action Levels

Table 8-4. Sample Locations Exceeding DOH EALs by COPC in Trenches

Matrix	DOH EAL	COPC	Number of Sample Locations Exceeding[b]	Sample Locations Exceeding EALs by COPC		
Soil: Trenches	Leaching to Groundwater[a]	Benzene	2	A3+000-TR	A3+215-TR	
		Toluene	1	A3+215-TR		
		Ethylbenzene	1	A3+215-TR		
		Xylenes, Total	1	A3+215-TR		
		Naphthalene	1	A3-375-TR		
		1-Methylnaphthalene	3	2S+075-TR	A3-375-TR	A3+000-TR
		2-Methylnaphthalene	1	A3-375-TR		
		C10-C24 Petroleum Hydrocarbons	3	A3-375-TR	A3-150-TR	A3+000-TR
	Direct Exposure[a]	Benzene	1	A3+215-TR		
		C10-C24 Petroleum Hydrocarbons	6	2S+075-TR A3+000-TR	A3-375-TR A3+215-TR	A3-150-TR A3-010-TR
	Odor Nuisance[a]	C6-C10 Gasoline Range Organics	3	A3-375-TR	A3-150-TR	A3-010-TR
		C10-C24 Petroleum Hydrocarbons	4	A3-375-TR A3-010-TR	A3-150-TR	A3+000-TR

Notes:
COPC - Chemical of Potential Concern
DOH EAL - Hawaii Department of Health Environmental Action Level (2017)
[a] TABLE A-2. SOIL ACTION LEVELS,
(Potentially impacted groundwater IS a current or potential drinking water resource; Surface water body IS located within 150m of release site)
[b] Exceedances may include analytical result or Limit of Detection (LOD) when LOD exceeds EAL.

Table 8-5. Subsurface Soil Sample Results from Adit 3 Boreholes

					Sample ID	1S025BH-SON01-005.0-006.0					2S025BH-SON01-003.0-004.0					A3000-SON01-002.0					A3015-SON01-002.0					A3050BH-SON01-004.0-005.0					A3087BH-SON01-004.0-005.0				
					Boring ID	1S+025-BH					2S+025-BH					A3+000-BH					A3+015-BH					A3+050-BH					A3+087-BH				
					Date	8/2/2022					8/2/2022					3/11/2022					4/1/2022					6/27/2022					6/29/2022				
					Sample interval (ft bgs)	005.0-006.0					003.0-004.0					2.0 - 2.5					2.0 - 2.5					004.0-005.0					004.0-005.0				
Chemical	CAS No.	Units	Leaching to Groundwater EAL	Direct Exposure EAL	Odor Threshold EAL	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance
Benzene	71-43-2	mg/kg	0.3	1	500	NT	NT				NT	NT				NT	NT				0.340	U	A			NT	NT				NT	NT			
Toluene	108-88-3	mg/kg	0.8	817.7	500	NT	NT				NT	NT				NT	NT				0.68	U				NT	NT				NT	NT			
Ethylbenzene	100-41-4	mg/kg	0.9	62	479	NT	NT				NT	NT				NT	NT				0.77	J				NT	NT				NT	NT			
Xylenes, Total	1330-20-7	mg/kg	1.4	129	260	NT	NT				NT	NT				NT	NT				4.1		A			NT	NT				NT	NT			
Naphthalene	91-20-3	mg/kg	3.1	28	500	0.002	J				0.17					4.8		A			9.5		A			0.005	U				0.003	J			
1-Methylnaphthalene	90-12-0	mg/kg	0.9	169	500	0.002	U				1.7		A			8.6		A			17		A			0.140					0.027				
2-Methylnaphthalene	91-57-6	mg/kg	1.9	39	500	0.004	J				1.7					11		A			22		A			0.100					0.032				
C6-C10 Gasoline Range Organics	Gas	mg/kg	696	451	100	NT	NT				NT	NT				NT	NT				130				C	NT	NT				NT	NT			
C10-C24 Petroleum Hydrocarbons	Diesel	mg/kg	940	219	500	36	U				720			B	C	3800		A	B	C	3900		A	B	C	1200		A	B	C	46	J			
C24-C40 Petroleum Hydrocarbons	Oil	mg/kg	1000	9386	500	36	U				31	U				49	U				37	U				38	U				92				

Table 8-5. Subsurface Soil Sample Results from Adit 3 Boreholes

					Sample ID	A3150BH-SON01-000.0-001.0					A3210BH-SON01-002.0-003.0					A3215-SON01-002.0					A3325H-SON01-001.0					A3325-SON01-002.0					A3375BH-SON01-000.0-001.0				
					Boring ID	A3+150-BH					A3+210-BH					A3+215-BH					A3+225-BH					A3+325-BH					A3+375-BH				
					Date	6/27/2022					6/24/2022					3/11/2022					3/30/2022					3/11/2022					8/26/2022				
					Sample interval (ft bgs)	000.0-001.0					002.0-003.0					2.0 - 2.5					1.0 - 1.5					2.0 - 2.5					000.0-001.0				
Chemical	CAS No.	Units	Leaching to Groundwater EAL	Direct Exposure EAL	Odor Threshold EAL	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance
Benzene	71-43-2	mg/kg	0.3	1	500	NT	NT				NT	NT				NT	NT				0.023	UJ				NT	NT				NT	NT			
Toluene	108-88-3	mg/kg	0.8	817.7	500	NT	NT				NT	NT				NT	NT				0.045	UJ				NT	NT				NT	NT			
Ethylbenzene	100-41-4	mg/kg	0.9	62	479	NT	NT				NT	NT				NT	NT				0.045	UJ				NT	NT				NT	NT			
Xylenes, Total	1330-20-7	mg/kg	1.4	129	260	NT	NT				NT	NT				NT	NT				0.065	J				NT	NT				NT	NT			
Naphthalene	91-20-3	mg/kg	3.1	28	500	0.004	J				0.005	U				0.003	J				0.120					0.030					0.005	U			
1-Methylnaphthalene	90-12-0	mg/kg	0.9	169	500	0.012					0.006	J				0.001	J				0.790					0.002	J				0.002	U			
2-Methylnaphthalene	91-57-6	mg/kg	1.9	39	500	0.013					0.007	J				0.005	U				0.930					0.004	J				0.004	U			
C6-C10 Gasoline Range Organics	Gas	mg/kg	696	451	100	NT	NT				NT	NT				NT	NT				4.4	UJ				NT	NT				NT	NT			
C10-C24 Petroleum Hydrocarbons	Diesel	mg/kg	940	219	500	27	J				45	U				47	U				2000		A	B	C	18	J				40	U			
C24-C40 Petroleum Hydrocarbons	Oil	mg/kg	1000	9386	500	130					45	U				47	U				35	J				83					40	U			

Table 8-5. Subsurface Soil Sample Results from Adit 3 Boreholes

					Sample ID	A3-010-SON01-002.0					A3-040BH-SON01-005.0-006.0					A3-050BH-SON01-004.0-004.0					A3-090BH-SON01-003.0-004.0					A3-100BH-SON01-003.0--004.0					A3-110BH-SON01-004.0-005.0				
					Boring ID	A3-010-BH					A3-040-BH					A3-050-BH					A3-090-BH					A3-100-BH					A3-110-BH				
					Date	3/30/2022					8/3/2022					6/30/2022					8/29/2022					7/29/2022					8/29/2022				
					Sample interval (ft bgs)	2.0 - 2.5					005.0-006.0					004.0-004.0					003.0-004.0					03.0--004.0					004.0-005.0				
Chemical	CAS No.	Units	Leaching to Groundwater EAL	Direct Exposure EAL	Odor Threshold EAL	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance
Benzene	71-43-2	mg/kg	0.3	1	500	0.310	UJ	A			NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
Toluene	108-88-3	mg/kg	0.8	817.7	500	0.310	J				NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
Ethylbenzene	100-41-4	mg/kg	0.9	62	479	1.7	J	A			NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
Xylenes, Total	1330-20-7	mg/kg	1.4	129	260	9.6	J	A			NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
Naphthalene	91-20-3	mg/kg	3.1	28	500	32	J	A	B		3.4		A			0.280					1.500					11		A			3.3		A		
1-Methylnaphthalene	90-12-0	mg/kg	0.9	169	500	53	J	A			6.5		A			0.820					3.2		A			19		A			6.5		A		
2-Methylnaphthalene	91-57-6	mg/kg	1.9	39	500	74	J	A	B		9.1		A			1.000					4.5		A			27		A			8.9		A		
C6-C10 Gasoline Range Organics	Gas	mg/kg	696	451	100	250	J			C	NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
C10-C24 Petroleum Hydrocarbons	Diesel	mg/kg	940	219	500	50000		A	B	C	1800	J	A	B	C	270			B		1900		A	B	C	6400	J	A	B	C	3100		A	B	C
C24-C40 Petroleum Hydrocarbons	Oil	mg/kg	1000	9386	500	70	J				34	J				33	U				42	U				26	J				45	U			

Table 8-5. Subsurface Soil Sample Results from Adit 3 Boreholes

					Sample ID	A3-150BH-SON01-001.0-002.0					A3-150-SON01-002.0					A3-200BH-SON01-004.0-005.0					A3-240BH-SON01-004.0-005.0					A3-300BH-SON01-004.0-005.0					A3-350BH-SON01-002.0-003.0				
					Boring ID	A3-150-BH					A3-150-BH					A3-200-BH					A3-240-BH					A3-300-BH					A3-350-BH				
					Date	7/29/2022					3/11/2022					8/1/2022					8/5/2022					8/4/2022					8/5/2022				
					Sample interval (ft bgs)	001.0-002.0					2.0 - 2.5					004.0-005.0					004.0-005.0					004.0-005.0					002.0-003.0				
Chemical	CAS No.	Units	Leaching to Groundwater EAL	Direct Exposure EAL	Odor Threshold EAL	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance
Benzene	71-43-2	mg/kg	0.3	1	500	NT	NT				NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
Toluene	108-88-3	mg/kg	0.8	817.7	500	NT	NT				NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
Ethylbenzene	100-41-4	mg/kg	0.9	62	479	NT	NT				NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
Xylenes, Total	1330-20-7	mg/kg	1.4	129	260	NT	NT				NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
Naphthalene	91-20-3	mg/kg	3.1	28	500	0.004	U				0.005	U				0.004	U				0.44					0.73					0.031				
1-Methylnaphthalene	90-12-0	mg/kg	0.9	169	500	0.062					0.002	U				0.002	J				1.20		A			1.8		A			0.610				
2-Methylnaphthalene	91-57-6	mg/kg	1.9	39	500	0.049					0.004	U				0.003	J				1.600					2.4		A			0.740				
C6-C10 Gasoline Range Organics	Gas	mg/kg	696	451	100	NT	NT				NT	NT				NT	NT				NT	NT				NT	NT				NT	NT			
C10-C24 Petroleum Hydrocarbons	Diesel	mg/kg	940	219	500	84					20	J				10	J				230			B		300			B		180				
C24-C40 Petroleum Hydrocarbons	Oil	mg/kg	1000	9386	500	36	U				93					29	U				22	J				70					34	J			

Table 8-5. Subsurface Soil Sample Results from Adit 3 Boreholes

			Sample ID			PS095BH-SON01-003.0-004.0				
			Boring ID			PS+095-BH				
			Date			6/30/2022				
			Sample interval (ft bgs)			003.0-004.0				
Chemical	CAS No.	Units	Leaching to Groundwater EAL	Direct Exposure EAL	Odor Threshold EAL	Result	Flag	Leaching Exceedance	Direct Exposure Exceedance	Odor Exceedance
Benzene	71-43-2	mg/kg	0.3	1	500	NT	NT			
Toluene	108-88-3	mg/kg	0.8	817.7	500	NT	NT			
Ethylbenzene	100-41-4	mg/kg	0.9	62	479	NT	NT			
Xylenes, Total	1330-20-7	mg/kg	1.4	129	260	NT	NT			
Naphthalene	91-20-3	mg/kg	3.1	28	500	0.005	U			
1-Methylnaphthalene	90-12-0	mg/kg	0.9	169	500	0.002	U			
2-Methylnaphthalene	91-57-6	mg/kg	1.9	39	500	0.003	U			
C6-C10 Gasoline Range Organics	Gas	mg/kg	696	451	100	NT	NT			
C10-C24 Petroleum Hydrocarbons	Diesel	mg/kg	940	219	500	32	U			
C24-C40 Petroleum Hydrocarbons	Oil	mg/kg	1000	9386	500	32	U			

Notes:

CAS No. - Chemical Abstract Services Number
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
ft bgs - feet below ground surface
mg/kg - milligrams per kilogram
NT - Analysis not conducted

Quality Assurance Flags
J - The compound was positively identified, the reported value is estimated
U - Undetected at the limit of detection

Table A-2. Soil Action Levels
EAL Exceedance Flags
A - Result exceeds Leaching to Groundwater EAL
B - Result exceeds Human Health Direct Exposure EAL
C - Result exceeds Odor EAL

230 - Result Exceeds one or more EALs

Table 8-6. Subsurface Soil Sample Statistics from Adit 3 Boreholes

Analyte	Number Analyzed	Number Detected	Percent Detected	Maximum Concentration or Limit of Detection (mg/kg)	Leaching to GW EAL Exceedance[1]	Direct Exposure EAL Exceedance[1]	Odor/Nuisance Threshold EAL Exceedance[1]
Benzene	3			0.3	2		
Toluene	3	1	33%	0.7			
Ethylbenzene	3	2	67%	1.7	1		
Xylenes, Total	3	3	100%	9.6	2		
Naphthalene	25	18	72%	32	6	1	
1-Methylnaphthalene	25	21	84%	53	10		
2-Methylnaphthalene	25	21	84%	74	8	1	
C6-C10 Gasoline Range Organics	3	2	67%	250			2
C10-C24 Petroleum Hydrocarbons	25	20	80%	50000	9	13	10
C24-C40 Petroleum Hydrocarbons	25	11	44%	130			

Notes:

EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
mg/kg - milligrams per kilogram
[1] - Table A-2. Soil Action Levels

Table 8-7. Sample Locations Exceeding DOH EALs for Soil by COPC in Boreholes

Matrix	DOH EAL	COPC	Number of Sample Locations Exceeding[b]	Sample Locations Exceeding EALs by COPC		
Soil: Boreholes	Leaching to Groundwater[a]	Benzene	2	A3+015-BH	A3-010-BH	
		Ethylbenzene	1	A3-010-BH		
		Xylenes, Total	2	A3-010-BH	A3+015-BH	
		Naphthalene	6	A3+000-BH A3-040-BH	A3+015-BH A3-100-BH	A3-010-BH A3-110-BH
		1-Methylnaphthalene	10	2S+025-BH A3-010-BH A3-100-BH A3-300-BH	A3+000-BH A3-040-BH A3-110-BH	A3+015-BH A3-090-BH A3-240-BH
		2-Methylnaphthalene	8	A3+000-BH A3-040-BH A3-110-BH	A3+015-BH A3-090-BH A3-300-BH	A3-010-BH A3-100-BH
		C10-C24 Petroleum Hydrocarbons	9	A3+000-BH A3+225-BH A3-090-BH	A3+015-BH A3-010-BH A3-100-BH	A3+050-BH A3-040-BH A3-110-BH
	Direct Exposure[a]	Naphthalene	1	A3-010-BH		
		2-Methylnaphthalene	1	A3-010-BH		
		C10-C24 Petroleum Hydrocarbons	13	2S+025-BH A3+050-BH A3-040-BH A3-100-BH A3-300-BH	A3+000-BH A3+225-BH A3-050-BH A3-110-BH	A3+015-BH A3-010-BH A3-090-BH A3-240-BH
	Odor Nuisance[a]	C6-C10 Gasoline Range Organics	2	A3+015-BH	A3-010-BH	
		C10-C24 Petroleum Hydrocarbons	10	2S+025-BH A3+050-BH A3-040-BH A3-110-BH	A3+000-BH A3+225-BH A3-090-BH	A3+015-BH A3-010-BH A3-100-BH

Notes:
COPC - Chemical of Potential Concern
DOH EAL - Hawaii Department of Health Environmentla Action Level (2017)
[a] TABLE A-2. SOIL ACTION LEVELS,
(Potentially impacted groundwater IS a current or potential drinking water resource; Surface water body IS located within 150m of release site)
(Groundwater IS a current or potential drinking water resource)(Surface water body IS located within 150m of release site)
[b] Exceedances may include analytical result or Limit of Detection (LOD) when LOD exceeds EAL.

Table 8-8. Groundwater Sample Results from Adit 3 Bore Holes

			Sample ID			A3015-WGN01-002.0					A3015-WGN01-052322					A3215-WGN01-002.0					A3325-WGN01-002.0					A3-010SVMP-WGN01B-2208WK4				
			Boring ID			A3+015-BH					A3+015-BH					A3+215-BH					A3+325-BH					A3-010-DSVMP				
			Date			4/1/2022					5/23/2022					3/11/2022					3/11/2022					8/23/2022				
Chemical	CAS No.	Units	Drinking Water Toxicity EAL	Chronic Aquatic Habitat EAL	Taste/Odor Threshold EAL	Result	Flag	Drinking Water Toxicity EAL Exceedance	Aquatic Habitat EAL Exceedance	Taste/Odor Threshold EAL Exceedance	Result	Flag	Drinking Water Toxicity EAL Exceedance	Aquatic Habitat EAL Exceedance	Taste/Odor Threshold EAL Exceedance	Result	Flag	Drinking Water Toxicity EAL Exceedance	Aquatic Habitat EAL Exceedance	Taste/Odor Threshold EAL Exceedance	Result	Flag	Drinking Water Toxicity EAL Exceedance	Aquatic Habitat EAL Exceedance	Taste/Odor Threshold EAL Exceedance	Result	Flag	Drinking Water Toxicity EAL Exceedance	Aquatic Habitat EAL Exceedance	Taste/Odor Threshold EAL Exceedance
Benzene	71-43-2	µg/L	5	160	170	1.3					0.5	U				NT	NT				NT	NT				0.5	U			
Toluene	108-88-3	µg/L	1000	62	40	3.9	J				0.8	U				NT	NT				NT	NT				0.8	U			
Ethylbenzene	100-41-4	µg/L	700	61	30	40				C	1.3					NT	NT				NT	NT				0.8	U			
Xylenes, Total	1330-20-7	µg/L	10000	27	20	190			B	C	26.0				C	NT	NT				NT	NT				0.8	U			
Naphthalene	91-20-3	µg/L	17	21	21	400		A	B	C	81		A	B	C	0.089	U				0.076	U				0.42	UJ			
1-Methylnaphthalene	90-12-0	µg/L	27	2	10	660		A	B	C	140		A	B	C	0.036	U				0.049	J				0.084	UJ			
2-Methylnaphthalene	91-57-6	µg/L	24	5	10	930		A	B	C	170		A	B	C	0.089	U				0.076	U				0.084	UJ			
C6-C10 Gasoline Range Organics	Gas	µg/L	297	500	500	1600		A	B	C	360		A			NT	NT				NT	NT				92	J			
C10-C24 Petroleum Hydrocarbons	Diesel	µg/L	401	640	500	390000	J	A	B	C	130000		A	B	C	230	J				570		A		C	1500	J	A	B	C
C24-C40 Petroleum Hydrocarbons	Oil	µg/L	2407	640	500	430	J				1100			B	C	380	J				630				C	500	J			

Notes:
CAS No. - Chemical Abstract Services Number
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
ft bgs - feet below ground surface
µg/L -micrograms per liter
NT - Analysis not conducted
Quality Assurance Flags
J - The compound was positively identified, the reported value is estimated
U - Undetected at the limit of detection
Table D1-a Groundwater Action Levels (HDOH 2017)
EAL Exceedance Flags
A - Result exceeds Drinking Water Toxicity EAL
B - Result exceeds Aquatic Habitat EAL
C - Result exceeds Taste and Odor EAL
570 - Result Exceeds one or more EALs

Table 8-9. Perched Groundwater Sample Statistics from Adit 3 Boreholes

Analyte	No. Analyzed	No. Detected	% Detected	Maximum Concentration or Limit of Detection (µg/L)	Drinking Water Toxicity EAL Exceedance[1]	Aquatic Habitat EAL Exceedance[2]	Taste/Odor Threshold EAL Exceedance[3]
Benzene	3	1	33%	1.3			
Toluene	3	1	33%	3.9			
Ethylbenzene	3	2	67%	40			1
Xylenes, Total	3	2	67%	190		1	2
Naphthalene	5	2	40%	400	2	2	2
1-Methylnaphthalene	5	3	60%	660	2	2	2
2-Methylnaphthalene	5	2	40%	930	2	2	2
C6-C10 Gasoline Range Organics	3	3	100%	1600	2	1	1
C10-C24 Petroleum Hydrocarbons	5	5	100%	390000	4	3	4
C24-C40 Petroleum Hydrocarbons	5	5	100%	1100		1	2

Notes:
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
µg/L - micrograms per liter
[1] - Drinking Water Toxicity (Surfer Table D-3a)
[2] - Chronic Freshwater Aquatic Habitat (Surfer Table D-4a)
[3] - Gross contamination (e.g., taste/ odor) (Surfer Table G-3)

Table 8-10. Sample Locations Exceeding DOH EALs for Groundwater by COPC in Boreholes

Matrix	DOH EAL	COPC	Number of Sample Locations Exceeding[b]	Sample Locations Exceeding EALs by COPC		
Groundwater: Boreholes	Drinking Water Toxicity[a]	Naphthalene	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		1-Methylnaphthalene	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		2-Methylnaphthalene	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		C6-C10 Gasoline Range Organics	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		C10-C24 Petroleum Hydrocarbons	4	A3+015-BH (4/1/2022) A3-010-BH	A3+015-BH (5/23/2023)	A3+325-BH
	Aquatic Toxicity[a]	Xylenes, Total	1	A3+015-BH (4/1/2022)		
		Naphthalene	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		1-Methylnaphthalene	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		2-Methylnaphthalene	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		C6-C10 Gasoline Range Organics	1	A3+015-BH (4/1/2022)		
		C10-C24 Petroleum Hydrocarbons	3	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	A3-010-BH
		C24-C40 Petroleum Hydrocarbons	1		A3+015-BH (5/23/2023)	
	Taste/Odor Threshold[a]	Ethylbenzene	1	A3+015-BH (4/1/2022)		
		Xylenes, Total	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		Naphthalene	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		1-Methylnaphthalene	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		2-Methylnaphthalene	2	A3+015-BH (4/1/2022)	A3+015-BH (5/23/2023)	
		C6-C10 Gasoline Range Organics	1	A3+015-BH (4/1/2022)		
		C10-C24 Petroleum Hydrocarbons	4	A3+015-BH (4/1/2022) A3-010-BH	A3+015-BH (5/23/2023)	A3+325-BH
		C24-C40 Petroleum Hydrocarbons	2		A3+015-BH (5/23/2023)	

Notes:
COPC - Chemical of Potential Concern
DOH EAL - Hawaii Department of Health Environmentla Action Level (2017)
[a] TABLE D-1b. GROUNDWATER ACTION LEVELS
(Groundwater IS a current or potential drinking water resource)(Surface water body IS located within 150m of release site)
[b] Exceedances may include analytical result or Limit of Detection (LOD) when LOD exceeds EAL.

Table 8-11. Groundwater Sample Results from Adit 3 Temporary Wells

			Sample ID			A3050TW-WGN01LF-2209WK3					A3210TW-WGN01LF-2209WK3					A3325TW-WGN01LF-2209WK3					A3375TW-WGN01LF-2209WK3				
			Boring ID			A3+050-TW					A3+210-TW					A3+325-TW					A3+375-TW				
			Date			9/12/2022					9/12/2022					9/12/2022					9/12/2022				
Chemical	CAS No.	Units	Drinking Water Toxicity EAL	Chronic Aquatic Habitat EAL	Taste/Odor Threshold EAL	Result	Flag	Drinking Water Toxicity EAL Exceedance	Aquatic Habitat EAL Exceedance	Taste/Odor Threshold EAL Exceedance	Result	Flag	Drinking Water Toxicity EAL Exceedance	Aquatic Habitat EAL Exceedance	Taste/Odor Threshold EAL Exceedance	Result	Flag	Drinking Water Toxicity EAL Exceedance	Aquatic Habitat EAL Exceedance	Taste/Odor Threshold EAL Exceedance	Result	Flag	Drinking Water Toxicity EAL Exceedance	Aquatic Habitat EAL Exceedance	Taste/Odor Threshold EAL Exceedance
Benzene	71-43-2	µg/L	5	160	170	0.5	U				0.5	U				0.500	U				0.500	U			
Toluene	108-88-3	µg/L	1000	62	40	0.8	U				0.8	U				0.800	U				0.800	U			
Ethylbenzene	100-41-4	µg/L	700	61	30	1	U				0.8	U				0.800	U				0.800	U			
Xylenes, Total	1330-20-7	µg/L	10000	27	20	1	U				0.8	U				0.800	U				0.800	U			
Naphthalene	91-20-3	µg/L	17	21	21	0	U				0	U				0.420	U				0.430	U			
1-Methylnaphthalene	90-12-0	µg/L	27	2	10	0	U				0	U				0.083	U				0.087	U			
2-Methylnaphthalene	91-57-6	µg/L	24	5	10	0	U				0	U				0.083	U				0.087	U			
C6-C10 Gasoline Range Organics	Gas	µg/L	297	500	500	80	UJ				80	UJ				80	UJ				80	UJ			
C10-C24 Petroleum Hydrocarbons	Diesel	µg/L	401	640	500	1200		A	B	C	110	U				330					74	J			
C24-C40 Petroleum Hydrocarbons	Oil	µg/L	2407	640	500	210	J				320	U				220	J				320	U			

Notes:
CAS No. - Chemical Abstract Services Number
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
ft bgs - feet below ground surface
µg/L -micrograms per liter
NT - Analysis not conducted
Quality Assurance Flags
J - The compound was positively identified, the reported value is estimated
U - Undetected at the limit of detection
Table D1-a Groundwater Action Levels (HDOH 2017)
EAL Exceedance Flags
A - Result exceeds Drinking Water Toxicity EAL
B - Result exceeds Aquatic Habitat EAL
C - Result exceeds Taste and Odor EAL
570 - Result Exceeds one or more EALs

Table 8-12. Perched Groundwater Sample Statistics from Adit 3 Temporary Wells

Analyte	No. Analyzed	No. Detected	% Detected	Maximum Concentration or Limit of Detection (µg/L)	Drinking Water Toxicity EAL Exceedance[1]	Aquatic Habitat EAL Exceedance[2]	Taste/Odor Threshold EAL Exceedance[3]
Benzene	4			0.5			
Toluene	4			0.8			
Ethylbenzene	4			0.8			
Xylenes, Total	4			0.8			
Naphthalene	4			0.44			
1-Methylnaphthalene	4			0.09			
2-Methylnaphthalene	4			0.09			
C6-C10 Gasoline Range Organics	4			80			
C10-C24 Petroleum Hydrocarbons	4	3	75%	1200	1	1	1
C24-C40 Petroleum Hydrocarbons	4	2	50%	320			

Notes:
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
µg/L - micrograms per liter
[1] - Drinking Water Toxicity (Surfer Table D-3a)
[2] - Chronic Freshwater Aquatic Habitat (Surfer Table D-4a)
[3] - Gross contamination (e.g., taste/ odor) (Surfer Table G-3)

Table 8-13. Sample Locations Exceeding DOH EALs by COPC or with LNAPL in Temporary Wells

Matrix	DOH EAL	COPC	Number of Sample Locations Exceeding[b]	Sample Locations Exceeding EALs by COPC		
Perched Groundwater	Drinking Water Toxicity[a]	C10-C24 Petroleum Hydrocarbons	1	A3+050-TW		
	Aquatic Toxicity[a]	C10-C24 Petroleum Hydrocarbons	1	A3+050-TW		
	Taste/Odor Thresholds[a]	C10-C24 Petroleum Hydrocarbons	1	A3+050-TW		
	LNAPL	JP-5 Observed as LNAPL or exceeding Solubility Limit	3	A3+015-TW	A3-010-TW	A3-040-TW

Notes:
COPC - Chemical of Potential Concern
DOH EAL - Hawaii Department of Health Environmental Action Level (2017)
[b] TABLE D-1b. GROUNDWATER ACTION LEVELS
(Groundwater IS a current or potential drinking water resource)(Surface water body IS located within 150m of release site)
[b] Exceedances may include analytical result or Limit of Detection (LOD) when LOD exceeds EAL.

Table 8-14. Soil Vapor Sample Results from Adit 3 Soil Vapor Monitoring Points (February 2022)

				Sample ID	2S075-GSFD01-000.0-021822				2S075-GSN01-000.0-021822				A3250-GSN01-000.0-021822				A3B-150-GSN01-000.0-021822			
				Boring ID	2S+075-SVMP				2S+075-SVMP				A3+250-SVMP				A3B-150-SVMP			
				Date	2/18/2022				2/18/2022				2/18/2022				2/18/2022			
Chemical	CAS No.	Units	Commercial Indoor Air EAL	Shallow Soil Vapor EAL	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance
Benzene	71-43-2	µg/m^3	1.6	6289	200	U	A		200	U	A		200.0	U	A		190	U	A	
Toluene	108-88-3	µg/m^3	4380.0	17520000	110	J			84	J			230	U			56	J		
Ethylbenzene	100-41-4	µg/m^3	49.1	196224	260	J	A		220	J	A		270	U	A		260	U	A	
Xylenes, Total	1330-20-7	µg/m^3	87.6	350400	2310		A		2190		A		540	U	A		960		A	
Naphthalene	91-20-3	µg/m^3	2.6	10512	1600		A		2500		A		170	U	A		170	U	A	
Petroleum Hydrocarbons (as Gasoline)	8006-61-9	µg/m^3	1230.8	4923120	690000		A		700000		A		820000		A		460000		A	
C5-C12 Gasoline Range Organics	AirGAS	µg/m^3	551.9	2207520	1100000		A		1100000		A		1200000		A		820000		A	
2-Butanone (MEK)	78-93-3	µg/m^3	4380	17520000	1300				1400				830	U			1600			
4-Methyl-2-pentanone (MIBK)	108-10-1	µg/m^3	2628	10512000	250	U			250	U			250	U			250	U		
Acetone	67-64-1	µg/m^3	27156	108624000	420	J			960	J			670	U			1200	J		
Bromoform	75-25-2	µg/m^3	11.1	44596	640	U	A		640	U	A		630	U	A		630	U	A	
Bromomethane	74-83-9	µg/m^3	4.4	17520	1100	U	A		1100	U	A		1100	U	A		1100	U	A	
Methyl tert-butyl ether (MTBE)	1634-04-4	µg/m^3	47.2	188677	450	U	A		450	U	A		450	U	A		440	U	A	
Styrene	100-42-5	µg/m^3	876	3504000	260	U			260	U			260	U			260	U		
Carbon Dioxide	124-38-9	%	None	None	0.07000	J			0.06800	J			2.40000	J			0.71000	J		
Helium	7440-59-7	µg/m^3	None	None	0.00820	U			0.00820	U			0.00810	U			0.00800	U		
Methane	74-82-8	µg/m^3	None	None	0.00018	J			0.00022				0.00027				0.00024			
Oxygen	7782-44-7	µg/m^3	None	None	20.0	J			20.0	J			17.0	J			20.0	J		

Notes:
CAS No. - Chemical Abstract Services Number
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
ft bgs - feet below ground surface
µg/m^3 -micrograms per meter cubed
NT - Analysis not conducted
None - No EAL Established
Quality Assurance Flags
J - The compound was positively identified, the reported value is estimated
U - Undetected at the Method Detection Limit, value is the Limit of Detection (LOD)
Table C. Indoor Air and Soil Vapor EALs
EAL Exceedance Flags
A - Result exceeds Commercial Indoor Air EAL
B - Result exceeds Shallow Soil Vapor EAL
230 - Result Exceeds one or more EALs

Table 8-15. Soil Gas Sample Statistics from Adit 3 Soil Vapor Monitoring Points (February 2022)

Analyte	Number Analyzed	Number Detected	% Detected	Maximum Concentration or Limit of Detection (µg/m^3)	Commercial Indoor Air EAL Exceedance	Shallow Soil Vapor EAL Exceedance
Benzene[2]	4		0%	200	4	
Toluene	4	3	75%	230		
Ethylbenzene	4	2	50%	270	4	
m,p-Xylene	4	3	75%	1400		
o-Xylene	4	3	75%	910		
Xylenes, Total	4	3	75%	2310	4	
Naphthalene	4	2	50%	2500	4	
C5-C12 Gasoline Range Organics	4	4	100%	1200000	4	

Notes:
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
µg/m^3 - micrograms per cubic meters
[1] - Table C. Indoor Air and Soil Vapor Action Levels
[2] - Not detected, MDL exceeds EAL due to dilution

Table 8-16. Sample Locations Exceeding DOH EALs by COPC in Soil Vapor Monitoring Points in February 2022

Matrix	DOH EAL	COPC	Number of Sample Locations Exceeding	Sample Locations Exceeding EALs by COPC		
Soil Vapor	Commerical Indoor Air[a]	Benzene	4	2S+075-SVMP	A3b-150-SVMP	A3+250-SVMP
		Ethylbenzene	4	2S+075-SVMP	A3b-150-SVMP	A3+250-SVMP
		Xylenes, Total	4	2S+075-SVMP	A3b-150-SVMP	A3+250-SVMP
		Naphthalene	4	2S+075-SVMP	A3b-150-SVMP	A3+250-SVMP
		C5-C12 Gasoline Range Organics	4	2S+075-SVMP	A3b-150-SVMP	A3+250-SVMP
	Shallow Soil Vapor[a]	None				

Notes:
COPC - Chemical of Potential Concern
DOH EAL - Hawaii Department of Health Environmental Action Level (2017)
[a] TABLE C. INDOOR AIR AND SOIL VAPOR ACTION LEVELS
[b] Exceedances may include analytical result or Limit of Detection (LOD) when LOD exceeds EAL.

Table 8-17. Soil Vapor Sample Results from Adit 3 Soil Vapor Monitoring Points

				Sample ID	2S100-GSN01-0.5-2212				A3-275-GSN01-0.5-2212				A3-375-GSN01-0.5-2212				A3-375-GSN01-5.0-2212				A3150-GSN01-0.5-2212				A3a-100-GSFD01-0.5-2212			
				Boring ID	2S+100-SVMP				A3-275-SVMP				A3-375-SVMP				A3-375-SVMP				A3+150-SVMP				A3a-100-SVMP			
				Date	12/15/2022				12/15/2022				12/16/2022				12/16/2022				12/15/2022				12/15/2022			
Chemical	CAS No.	Units	Commercial Indoor Air EAL	Shallow Soil Vapor EAL	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance
Benzene	71-43-2	µg/m^3	1.6	6289	26	UJ	A		480	U	A		0.9	J			3	U	A		96	UJ	A		160	UJ	A	
Toluene	108-88-3	µg/m^3	4380.0	17520000	10	J			580	J			6	J			3	J			110	UJ			190	UJ		
Ethylbenzene	100-41-4	µg/m^3	49.1	196224	34	UJ			640	U	A		4	J			3	J			130	UJ	A		220	UJ	A	
m,p-Xylene	179601-23-1	µg/m^3	None	None	31	J			1300	U			10	J			12	J			260	UJ			440	UJ		
o-Xylene	95-47-6	µg/m^3	None	None	15	J			640	U			11	J			6	J			130	UJ			220	UJ		
Xylenes, Total	1330-20-7	µg/m^3	87.6	350400	46				1940		A		21	U			18				390		A		660		A	
Naphthalene	91-20-3	µg/m^3	2.6	10512	83	J	A		780	UJ	A		5	UJ	A		5	UJ	A		160	UJ	A		260	UJ	A	
C4-C12 Gasoline	AirGAS	µg/m^3	551.9	2207520	24000	J	A		220000		A		36000	J	A		37000	J	A		19000	J	A		27000	J	A	
Carbon Dioxide	124-38-9	µg/m^3	None	None	0	U			0	U			0	U			1				0	U			0	U		
Helium	7440-59-7	µg/m^3	None	None	0	U			0	U			0	U			0	U			0	U			0	U		
Methane	74-82-8	µg/m^3	None	None	0	U			0	U			0	U			0	U			0	U			0	U		
Oxygen	7782-44-7	µg/m^3	None	None	23				23				23				22				21				23			

Table 8-17. Soil Vapor Sample Results from Adit 3 Soil Vapor Monitoring Points

				Sample ID	A3a-100-GSN01-0.5-2212				A3b-350-GSN01-0.5-2212				A3b000-GSFD01-0.5-2212				A3b000-GSN01-0.5-2212				A3-010-GSN02-62.0-2212			
				Boring ID	A3a-100-SVMP				A3b-350-SVMP				A3b+000-SVMP				A3b+000-SVMP				A3-010-SVMP			
				Date	12/15/2022				12/16/2022				12/15/2022				12/15/2022				12/19/2022			
Chemical	CAS No.	Units	Commercial Indoor Air EAL	Shallow Soil Vapor EAL	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance
Benzene	71-43-2	µg/m^3	1.6	6289	26	UJ	A		26	UJ	A		3	U	A		3	U	A		3	J	A	
Toluene	108-88-3	µg/m^3	4380.0	17520000	30	UJ			30	UJ			3	J			5	J			7	J		
Ethylbenzene	100-41-4	µg/m^3	49.1	196224	34	UJ			34	UJ			2	J			3	J			49			
m,p-Xylene	179601-23-1	µg/m^3	None	None	15	J			70	UJ			8	J			8	J			170			
o-Xylene	95-47-6	µg/m^3	None	None	34	UJ			34	UJ			3	J			3	J			61			
Xylenes, Total	1330-20-7	µg/m^3	87.6	350400	49				104		A		11				11				231		A	
Naphthalene	91-20-3	µg/m^3	2.6	10512	42	UJ	A		42	UJ	A		2	J			2	J			3	J	A	
C4-C12 Gasoline	AirGAS	µg/m^3	551.9	2207520	24000		A		110	J			410				530				4000		A	
Carbon Dioxide	124-38-9	µg/m^3	None	None	0	U			0	U			0	U			0	U			2			
Helium	7440-59-7	µg/m^3	None	None	0	U			0	U			0	U			0	U			0	U		
Methane	74-82-8	µg/m^3	None	None	0	U			0	U			0	U			0	U			0	U		
Oxygen	7782-44-7	µg/m^3	None	None	23				23				22				23				22			

Notes:
CAS No. - Chemical Abstract Services Number
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
ft bgs - feet below ground surface
µg/m^3 -micrograms per meter cubed
NT - Analysis not conducted
None - No EAL Established
Quality Assurance Flags
J - The compound was positively identified, the reported value is estimated
U - Undetected at the Method Detection Limit, value is the Limit of Detection (LOD)
Table C. Indoor Air and Soil Vapor EALs
EAL Exceedance Flags
A - Result exceeds Commercial Indoor Air EAL
B - Result exceeds Shallow Soil Vapor EAL
230 - Result Exceeds one or more EALs

Table 8-18. Soil Gas Sample Statistics from Adit 3 Soil Vapor Monitoring Points (December 2022)

Analyte	Number Analyzed	Number Detected	% Detected	Maximum Concentration or Limit of Detection (µg/m^3)	Commercial Indoor Air EAL Exceedance	Shallow Soil Vapor EAL Exceedance
Benzene	11	2	18%	480	10	
Toluene	11	7	64%	580		
Ethylbenzene	11	5	45%	640	3	
m,p-Xylene	11	7	64%	1300		
o-Xylene	11	6	55%	640		
Xylenes, Total	11	10	91%	1940	5	
Naphthalene	11	4	36%	780	9	
C4-C12 Gasoline	11	11	100%	220000	8	

Notes:

EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)

µg/m^3 - micrograms per cubic meters

[1] - Table C. Indoor Air and Soil Vapor Action Levels

[2] - Not detected, MDL exceeds EAL due to dilution

Table 8-19. Sample Locations Exceeding DOH EALs by COPC in Soil Vapor Monitoring Points in December 2022

Matrix	DOH EAL	COPC	Number of Sample Locations Exceeding[b]	Locations Exceeding EALs by COPC		
Soil Vapor	Commerical Indoor Air[a]	Benzene	9	2S+100-SVMP A3-375-SVMP (5.0') A3b-350-SVMP	A3-100-SVMP A3+150-SVMP A3b+000-SVMP	A3-275-SVMP A3a-100-SVMP A3-010-SVMP
		Ethylbenzene	3	A3-275-SVMP	A3+150-SVMP	A3a-100-SVMP
		Xylenes, Total	6	A3-010-SVMP A3a-100-SVMP	A3-275-SVMP A3b-350-SVMP	A3+150-SVMP A3-010-SVMP
		Naphthalene	9	2S+100-SVMP A3-375-SVMP (0.5') A3a-100-SVMP	A3-100-SVMP A3-375-SVMP (5.0') A3-010-SVMP	A3-275-SVMP A3+150-SVMP A3b-350-SVMP
		C4-C12 Gasoline Range Organics	8	2S+100-SVMP A3-375-SVMP (0.5') A3a-100-SVMP	A3-100-SVMP A3-375-SVMP (5.0') A3-010-SVMP	A3-275-SVMP A3+150-SVMP
	Shallow Soil Vapor[a]	None	None			

Notes:
COPC - Chemical of Potential Concern
DOH EAL - Hawaii Department of Health Environmental Action Level (2017)
[a] TABLE C. INDOOR AIR AND SOIL VAPOR ACTION LEVELS
[b] Exceedances may include analytical result or Limit of Detection (LOD) when LOD exceeds EAL.

Table 8-20. Soil Vapor Sample Results from Adit 3 Soil Vapor Monitoring Points (January 2023)

				Sample ID	2S075-GSN01-5.0-2301				2S100-GSN01-0.5-2301				A3-275-GSN01-0.5-2301				A3-375-GSN01-0.5-2301				A3-375-GSN01-5.0-2301				A3150-GSN01-0.5-2301			
				Boring ID	2S+075-SVMP-5.0				2S+100-SVMP				A3-275-SVMP				A3-375-SVMP				A3-375-SVMP-5.0				A3+150-SVMP			
				Date	1/16/2023				1/16/2023				1/17/2023				1/16/2023				1/16/2023				1/17/2023			
Chemical	CAS No.	Units	Commercial Indoor Air EAL	Shallow Soil Vapor EAL	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance
Benzene	71-43-2	µg/m^3	1.6	6289	3	UJ	A		24	J	A		960.0	UJ	A		3	UJ	A		3	UJ	A		130	UJ	A	
Toluene	108-88-3	µg/m^3	4380.0	17520000	4	UJ			4	UJ			1100	UJ			4	UJ			4	UJ			150	UJ		
Ethylbenzene	100-41-4	µg/m^3	49.1	196224	4	UJ			4	UJ			1300	UJ	A		4	UJ			4	UJ			170	UJ	A	
m,p-Xylene	179601-23-1	µg/m^3	None	None	9	UJ			3	J			2600	UJ			9	UJ			9	UJ			350	UJ		
o-Xylene	95-47-6	µg/m^3	None	None	4	UJ			4	UJ			1300	UJ			4	UJ			4	UJ			170	UJ		
Xylenes, Total	1330-20-7	µg/m^3	87.6	350400	13				8				3900	U	A		13				13				520		A	
Naphthalene	91-20-3	µg/m^3	2.6	10512	5	UJ	A		14	J	A		1600	UJ	A		5	UJ	A		5	UJ	A		210	UJ	A	
C4-C12 Gasoline	AirGAS	µg/m^3	551.9	2207520	25000		A		21000		A		240000		A		47000		A		18000		A		30000		A	
Carbon Dioxide	124-38-9	µg/m^3	None	None	0.15	U			0.15	U			0.15	U			0.15	U			0.81				0.84			
Helium	7440-59-7	µg/m^3	None	None	0.10	U			5.40				0.19	J			0.10	U			0.10	U			0.10	U		
Methane	74-82-8	µg/m^3	None	None	0.10	U			0.10	U			0.10	U			0.10	U			0.10	U			0.10	U		
Oxygen	7782-44-7	µg/m^3	None	None	21				19				20				20				19				19			

Table 8-20. Soil Vapor Sample Results from Adit 3 Soil Vapor Monitoring Points (January 2023)

				Sample ID	A3A-100-GSFD01-0.5-2301				A3A-100-GSN01-0.5-2301				A3B-350-GSN01-0.5-2301				A3B000-GSN01-0.5-2301			
				Boring ID	A3a-100-SVMP				A3a-100-SVMP				A3b-350-SVMP				A3b+000-SVMP			
				Date	1/16/2023				1/16/2023				1/16/2023				1/16/2023			
Chemical	CAS No.	Units	Commercial Indoor Air EAL	Shallow Soil Vapor EAL	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance	Result	Flag	Commercial Indoor EAL Exceedance	Shallow Soil Vapor EAL Exceedance
Benzene	71-43-2	µg/m^3	1.6	6289	260	UJ	A		260	UJ	A		26	UJ	A		3	UJ	A	
Toluene	108-88-3	µg/m^3	4380.0	17520000	300	UJ			300	UJ			30	UJ			4	UJ		
Ethylbenzene	100-41-4	µg/m^3	49.1	196224	340	UJ	A		340	UJ	A		34	UJ			4	UJ		
m,p-Xylene	179601-23-1	µg/m^3	None	None	700	UJ			700	UJ			22	J			3	J		
o-Xylene	95-47-6	µg/m^3	None	None	340	UJ			340	UJ			34	UJ			4	UJ		
Xylenes, Total	1330-20-7	µg/m^3	87.6	350400	1040		A		1040		A		56				7			
Naphthalene	91-20-3	µg/m^3	2.6	10512	420	UJ	A		420	UJ	A		87	J	A		5	UJ	A	
C4-C12 Gasoline	AirGAS	µg/m^3	551.9	2207520	39000		A		50000		A		31000		A		720		A	
Carbon Dioxide	124-38-9	µg/m^3	None	None	0.15	U			0.15	U			0.15	U			0.15	U		
Helium	7440-59-7	µg/m^3	None	None	0.10	U			0.10	U			0.25				0.10	U		
Methane	74-82-8	µg/m^3	None	None	0.10	U			0.10	U			0.10	U			0.10	U		
Oxygen	7782-44-7	µg/m^3	None	None	20				19				20				19			

Notes:
CAS No. - Chemical Abstract Services Number
EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)
ft bgs - feet below ground surface
µg/m^3 -micrograms per meter cubed
NT - Analysis not conducted
None - No EAL Established
Quality Assurance Flags
J - The compound was positively identified, the reported value is estimated
U - Undetected at the Method Detection Limit, value is the Limit of Detection (LOD)
Table C. Indoor Air and Soil Vapor EALs
EAL Exceedance Flags
A - Result exceeds Commercial Indoor Air EAL
B - Result exceeds Shallow Soil Vapor EAL
230 - Result Exceeds one or more EALs

Table 8-21. Soil **Vapor** Sample Statistics from Adit 3 Soil Vapor Monitoring Points (January 2023)

Analyte	Number Analyzed	Number Detected	% Detected	Maximum Concentration or Limit of Detection (µg/m^3)	Commercial Indoor Air EAL Exceedance	Shallow Soil Vapor EAL Exceedance
Benzene	10	1	10%	960	10	
Toluene	10	6	60%	1100		
Ethylbenzene	10	4	40%	1300	4	
m,p-Xylene	10	6	60%	2600		
o-Xylene	10	5	50%	1300		
Xylenes, Total	10	9	90%	3900	4	
Naphthalene	10	3	30%	1600	10	
C4-C12 Gasoline	10	10	100%	240000	10	

Notes:

EAL - Hawaii Department of Health Environmental Action Level (HDOH 2017)

µg/m^3 - micrograms per cubic meters

[1] - Table C. Indoor Air and Soil Vapor Action Levels

[2] - Not detected, MDL exceeds EAL due to dilution

Table 8-22. Sample Locations Exceeding DOH EALs by COPC in Soil Vapor Monitoring Points in January 2023

Matrix	DOH EAL	COPC	Number of Sample Locations Exceeding[b]	Locations Exceeding EALs by COPC		
Soil Vapor	Commerical Indoor Air[a]	Benzene	10	2S+075-SVMP-5.0 A3-375-SVMP A3a-100-SVMP A3b+000-SVMP	2S+100-SVMP A3-375-SVMP-5.0 A3a-100-SVMP	A3-275-SVMP A3+150-SVMP A3b-350-SVMP
		Ethylbenzene	4	A3-275-SVMP A3+150-SVMP	A3a-100-SVMP	A3a-100-SVMP
		Xylenes, Total	4	A3-275-SVMP A3+150-SVMP	A3a-100-SVMP	A3a-100-SVMP
		Naphthalene	10	2S+075-SVMP-5.0 A3-375-SVMP A3a-100-SVMP A3b+000-SVMP	2S+100-SVMP A3-375-SVMP-5.0 A3a-100-SVMP	A3-275-SVMP A3+150-SVMP A3b-350-SVMP
		C4-C12 Gasoline Range Organics	10	2S+075-SVMP-5.0 A3-375-SVMP A3a-100-SVMP A3b+000-SVMP	2S+100-SVMP A3-375-SVMP-5.0 A3a-100-SVMP	A3-275-SVMP A3+150-SVMP A3b-350-SVMP
	Shallow Soil Vapor[a]	None	None			

Notes:
COPC - Chemical of Potential Concern
DOH EAL - Hawaii Department of Health Environmental Action Level (2017)
[a] TABLE C. INDOOR AIR AND SOIL VAPOR ACTION LEVELS
[b] Exceedances may include analytical result or Limit of Detection (LOD) when LOD exceeds EAL.

Table 9-1: Target Analytes for Middle-Distillate Contaminated Media

Petroleum Product	Media	Recommended Target Analytes
Middle Distillates: diesel, kerosene, Stoddard solvents, heating fuels, jet fuels	Soil	TPH-g/d/o, BTEX, N, 1MN, and 2MN
	Soil Vapor	TPH-g/d/o, BTEX, N, and methane
	Groundwater	TPH-g/d/o, BTEX, N, 1MN, and 2MN

Notes:

TPH-g/d/o - Total petroleum hydrocarbons in the gasoline, diesel , and oil range

BTEX – Benzene, toluene, ethylbenzene, and xylenes

N, 1MN, 2MN – Naphthalene, 1-methylnaphthalene, 2-methylnaphthalene

Source: (DOH 2017 Vol. 2, Table 6-1)

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Source: (DOH 2017 Vol. 2, Table 6-1)

Appendix A – Geophysical Investigation Reports

Appendix A – Geophysical Investigation Reports

RPT-2022-004, Rev. 1

RED HILL BULK FUEL STORAGE FACILITY LOWER ACCESS TUNNEL PILOT GEOPHYSICAL INVESTIGATION - HAWAII

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Prepared for AECOM

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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

In January and February of 2022, hydroGEOPHYSICS, Inc. (HGI), under contract to AECOM, performed a pilot geophysical investigation of the Lower Access Tunnel at the United States (U.S.) Navy Red Hill Bulk Fuel Storage Facility, Oahu, Hawaii. On or about November 20, 2021, a leak into the tunnel created a significant risk to the underlying groundwater. The source of the leak was from a pipeline nearly (b) (3) (A) from the entrance of the tunnel; the leak entered the host rock from the tunnel floor from the leak point to a sump near the entrance.

1.2 SITE LOCATION

The Red Hill Bulk Fuel Storage Facility is located approximately (b) (3) (A) of Pearl Harbor. The Facility lies along the (b) (3) (A) edge of the Koolau Range and is situated on a topographic ridge that divides the Halawa Valley and the Moanalua Valley. Figure 1 and Figure 2 display the general location of the pilot geophysical investigation.

1.3 OBJECTIVE OF INVESTIGATION

The objective of the pilot geophysical investigation was to:

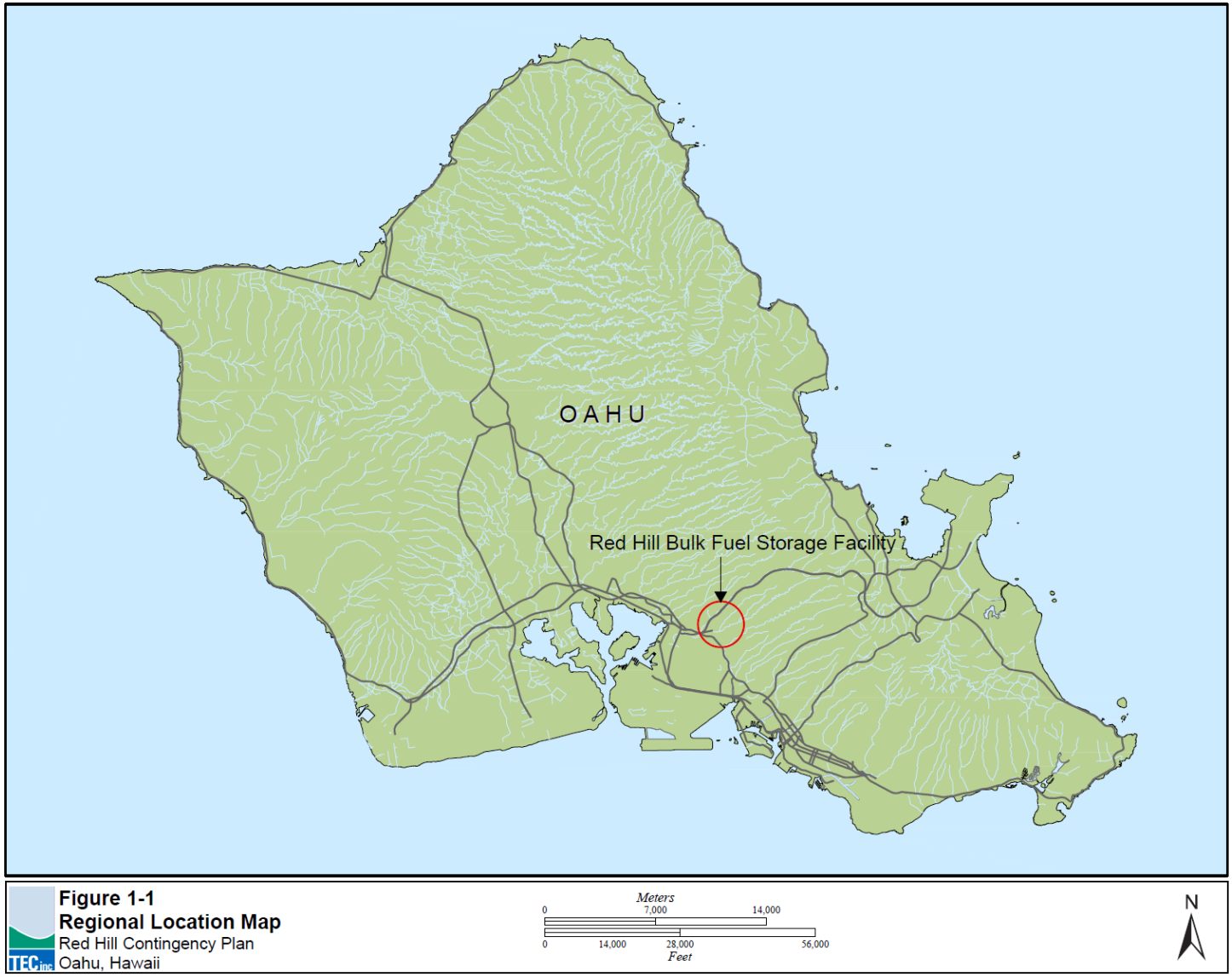
- Test a number of geophysical methods to determine their effectiveness for imaging and delineating potential hydrocarbon sources in the underlying fractured basalt.
- Determine if the geophysical methods could image any void space, preferential pathways for water or fluid movement, and fracture zone or faults within the basalt bedrock.
- In addition, the ground penetrating radar method was applied to the storage tank area to determine if a sub-tunnel drain could be imaged.

1.4 SCOPE OF INVESTIGATION

Three geophysical methods were employed and co-analyzed to investigate sections of the lower access tunnel and Pearl Harbor tunnel in proximity to the leak location. The chosen methods were electrical resistivity, induced polarization (IP), and ground penetrating radar (GPR). Figure 3 and Figure 4 display a detailed coverage map of the geophysical investigation.

In addition, the GPR method was employed to investigate the area of the lower access tunnel in proximity to storage tanks 17 through 20. Figure 5 displays a detailed coverage map of the geophysical investigation.

Figure 1. General Location Map.



Taken from: Red Hill Bulk Fuel Storage Facility Final Groundwater Protection Plan, 2008 by TEC Inc.

Figure 2. General overview of the Red Hill Bulk Fuel Storage Facility on Oahu, Hawaii.

(b) (3) (A)

[redacted]

Figure 3. Survey Coverage for the Electrical Resistivity and IP Investigation near the Leak Location.

(b) (3) (A)

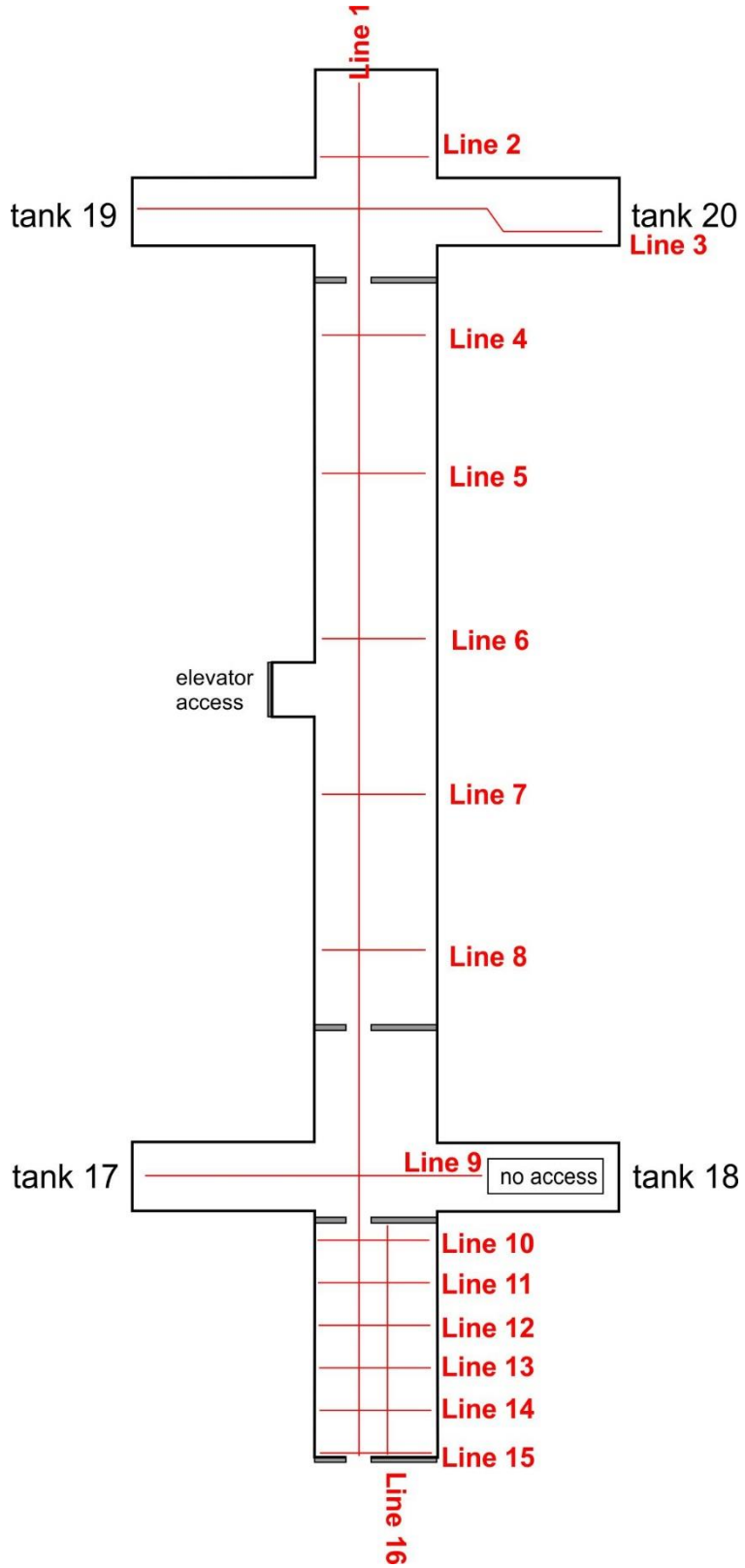
[redacted]

Figure 4. Survey Coverage for the GPR Investigation near the Leak Location.

(b) (3) (A)

[redacted]

Figure 5. Survey Coverage for the GPR Investigation in Fuel Tank Area, Detailed Coverage Map.



2.0 GEOPHYSICAL THEORY

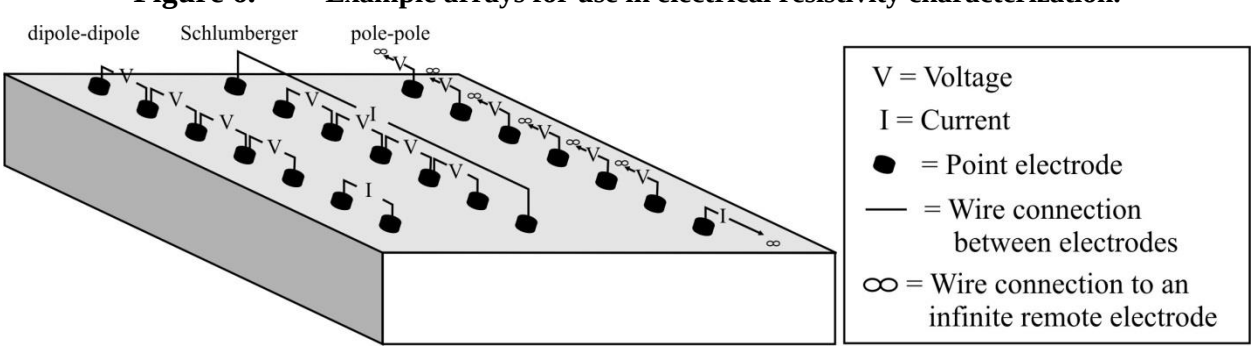
2.1 ELECTRICAL RESISTIVITY

2.1.1 Method Description

Electrical resistivity is a volumetric property that describes the resistance of electrical current flow within a medium (Rucker *et al.*, 2011; Telford *et al.*, 1990). Direct electrical current is propagated in rocks and minerals by electronic or electrolytic means. Electronic conduction occurs in minerals where free electrons are available, such as the electrical current flow through metal. Electrolytic conduction, on the other hand, relies on the dissociation of ionic species within a pore space. With electrolytic conduction, the movement of electrons varies with the mobility, concentration, and the degree of dissociation of the ions.

Mechanistically, the resistivity method uses electric current (I) that is transmitted into the earth through one pair of electrodes (transmitting dipole) that are in contact with the soil. The resultant voltage potential (V) is then measured across another pair of electrodes (receiving dipole). Numerous electrodes can be deployed along a transect (which may be anywhere from feet to miles in length), or within a grid. Figure 6 shows examples of electrode layouts for surveying. The figure shows transects with a variety of array types (dipole-dipole, Schlumberger, pole-pole). A complete set of measurements occurs when each electrode (or adjacent electrode pair) passes current, while all other adjacent electrode pairs are utilized for voltage measurements. Modern equipment automatically switches the transmitting and receiving electrode pairs through a single multi-core cable connection. Rucker *et al.* (2009) describe in more detail the methodology for efficiently conducting an electrical resistivity survey.

Figure 6. Example arrays for use in electrical resistivity characterization.



The modern application of the resistivity method uses numerical modeling and inversion theory to estimate the electrical resistivity distribution of the subsurface given the known quantities of electrical current, measured voltage, and electrode positions. A common resistivity inverse method incorporated in commercially available codes is the regularized least squares optimization

method (Sasaki, 1989; Loke, *et al.*, 2003). The objective function within the optimization aims to minimize the difference between measured and modeled potentials (subject to certain constraints, such as the type and degree of spatial smoothing or regularization) and the optimization is conducted iteratively due to the nonlinear nature of the model that describes the potential distribution. The relationship between the subsurface resistivity (ρ) and the measured voltage is given by the following equation (from Dey and Morrison, 1979):

$$-\nabla\cdot\left[\frac{1}{\rho(x,y,z)}\nabla V(x,y,z)\right]=\left(\frac{I}{U}\right)\delta(x-x_s)\delta(y-y_s)\delta(z-z_s) \quad (1)$$

where I is the current applied over an elemental volume U specified at a point (x_s, y_s, z_s) by the Dirac delta function.

Equation (1) is solved many times over the volume of the earth by iteratively updating the resistivity model values using either the L_2-norm smoothness-constrained least squares method, which aims to minimize the square of the misfit between the measured and modeled data (de Groot-Hedlin & Constable, 1990; Ellis & Oldenburg, 1994):

$$\left(J_i^T J_i+\lambda_i W^T W\right)\Delta r_i = J_i^T g_i-\lambda_i W^T W r_{i-1} \quad (2)$$

or the L_1-norm that minimizes the sum of the absolute value of the misfit:

$$\left(J_i^T R_d J_i+\lambda_i W^T R_m W\right)\Delta r_i = J_i^T R_d g_i-\lambda_i W^T R_m W r_{i-1} \quad (3)$$

where g is the data misfit vector containing the difference between the measured and modeled data, J is the Jacobian matrix of partial derivatives, W is a roughness filter, R_d and R_m are the weighting matrices to equate model misfit and model roughness, Δr_i is the change in model parameters for the ith iteration, r_i is the model parameters for the previous iteration, and λ_i = the damping factor.

2.1.2 Electrical Resistivity Collected Inside a Tunnel

The acquisition of electrical resistivity inside a buried tunnel has slightly different geometry and boundary condition constraints compared to the typical acquisition on the surface of the earth. While both have an insulating boundary condition directly at the electrode positions, the insulating boundary is infinite for the land surface and finite for the tunnel. An insulating boundary condition means that electrical current cannot flow across the interface, similar to a no-flow boundary in groundwater modeling. The finite boundary condition of the tunnel may potentially present some challenges for modeling and interpretation when assuming the data have been collected on the surface. Our inverse modeling tools, however, are limited to that assumption.

In order to fully understand the limitations of the tunnel's complex geometry and the ability to map electrically conductive targets beneath the tunnel, we conducted a set of trials using COMSOL Multiphysics software to emulate the tunnel at the Red Hill Bulk Fuel Storage Facility. COMSOL has the ability to reproduce electrical resistivity data acquired in complex three-dimensional scenarios and we have used it for understanding the effects of steel cased wells (Saribudak et al., 2020), steel reinforced concrete (Haas et al., 2022), and the in situ recovery of copper (Rucker et al., 2022). With COMSOL, we placed a tunnel 200 feet below ground surface with a diameter of 10 feet. The tunnel walls were given an insulating boundary and electrodes were placed along the tunnel floor every 10 feet. We then created scenarios of a conductive body above, to the side, and below the tunnel. Hypothetically, a conductive body below the tunnel floor could be seepage of water through cracks in the concrete with pooling of water in discrete zones. A conductive body above the concrete tunnel could be from pooling of infiltrating water from the surface.

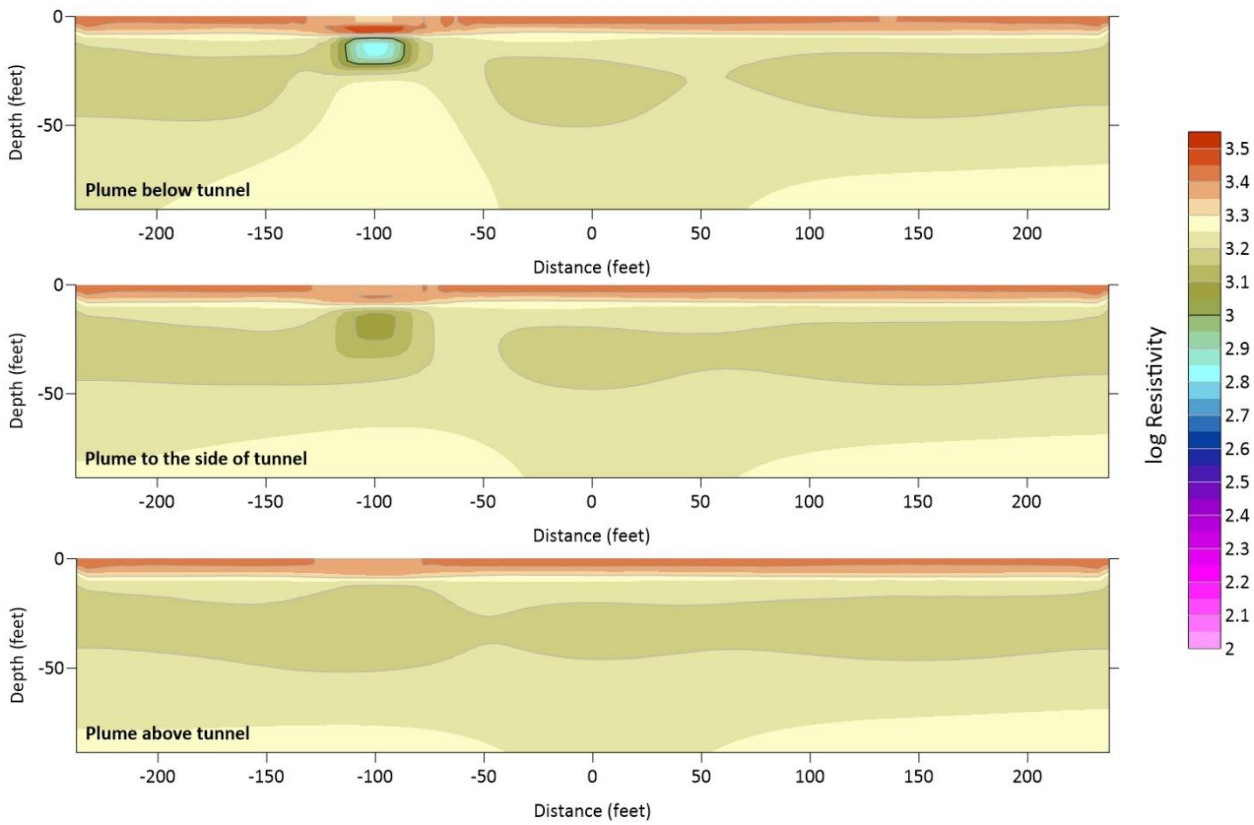
Figure 7. Domain and geometry for modeling a target below a tunnel in COMSOL.

(b) (3) (A)

[redacted]

Figure 7 shows the geometry of the system with the 10-foot diameter tunnel and conductive target below the tunnel floor. We assigned the background a value of 1,000 ohm-m and the target a value of 10 ohm-m. The target is an ellipsoid of radii 20, 10, and 10 feet. Forty-nine electrodes were spaced 10 feet apart along the tunnel floor and we simulated the resistivity acquisition using the Alt3_Wenner array. Figure 8 shows the inversion results using RES2DINV. The top image, with the target modeled below the tunnel, easily resolves the target in its correct position. The middle plot with the conductive plume to the side of the tunnel shows a significantly diminished target that is faintly recognizable. The bottom image, with the target above the tunnel, barely shows any change from the assigned background resistivity and we would assume no target in the section if we collected these data in the field. Therefore, in general, resistivity model results with conductive targets would be assumed to manifest below the tunnel.

Figure 8. Inversion results of a conductive target above, to the side, and below the tunnel.



2.1.3 Resolving Power of Electrical Resistivity Geophysics

The electrical resistivity method, when applied from the surface the earth (or from a surface within a tunnel) has limited resolving power to define structures at some depth below the survey line. Typically, we refer to this as a depth of investigation, which can be directly influenced by the values of electrical resistivity targets relative to a background value, heterogeneity of electrical

properties across the entire surveyed field, the size of the target, the array that is used, the noise in the measurements, and the noise offered by subsurface metallic infrastructure. A general rule of thumb is to consider the method resolving a target at a height that varied between 10-20% of its depth. Table 1 lists some examples of the rule using consistent units across columns. The range, again, depends on the contrast of the target relative to the host and conductive targets are more easily imaged than resistive targets because conductive targets will focus some of the current flow through the high conductivity region, thus having a greater effect on the measured voltage.

Table 1. Resolution of electrical resistivity targets.

Depth of Target (meters or feet)	Minimum Height of Target (meters or feet)
10	1 - 2
50	5 – 10
100	10 – 20
500	50 - 100

An example of a conductive target may be the pooling of water below the tunnel floor. If the pooled solution is 2 meters tall, then it will be resolved at depths less than 10 meters, marginal between 10 and 20 meters, and not at all below 20 meters. For a resistive target consisting of a five meter diameter open tunnel in a highly resistive basalt bedrock, the chance of resolving the tunnel is low because the contrast in electrical properties is rather small. In the Red Hill tunnel complex, the conductive metallic infrastructure (pipes, conduit, pumps, etc.) may also mask resistive features, making it impossible to image even when it is relatively close to the survey line.

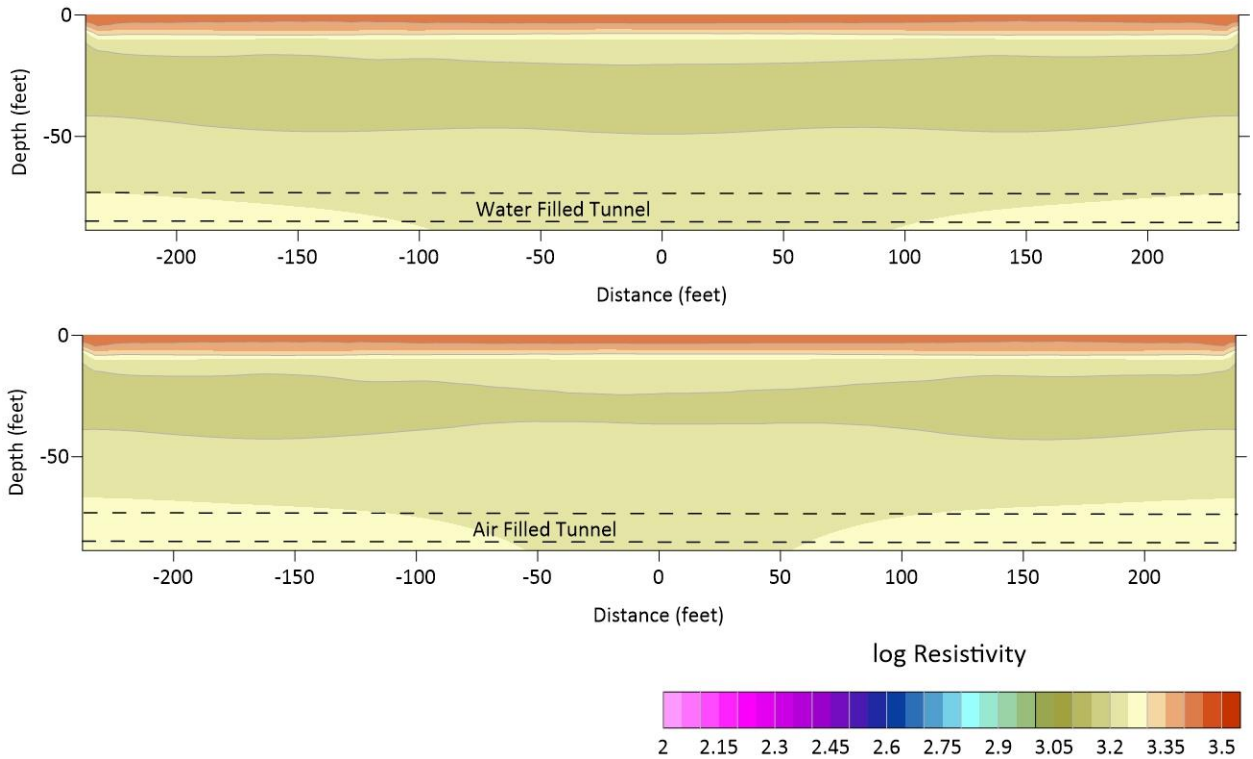
We show another COMSOL model with two tunnels to illustrate the difficulty of locating the second water development tunnel (b) (3) (A) the Lower Access Tunnel. We simplified the model and made the top tunnel 10 feet diameter and the bottom tunnel 15 feet diameter located 80 feet below the top tunnel running along an oblique angle of 10 degrees. We filled the lower tunnel with groundwater equal to 200 ohm-m and with air at 200k ohm-m. Figure 9 shows the geometry and Figure 10 shows the model results. Neither of the tunnels were recognizable in the inversion model. This reasoning can be applied to imaging preferential pathways between the two tunnels as well, since the target dimensions and anticipated resistivity contrast may be too small to be adequately resolved in this environment.

Figure 9. Domain and geometry of the two-tunnel COMSOL model, with the lower water development tunnel filled with groundwater

(b) (3) (A)

[redacted]

Figure 10. Inversion results of the two-tunnel model.



2.2 INDUCED POLARIZATION (CHARGEABILITY)

During resistivity measurements, the resistivity meter measures the voltage across a pair of electrodes, which is then normalized to obtain a transfer resistance (R):

$$R = \frac{V_p}{I} \ , \tag{4}$$

where V_p is the primary voltage during current transmission (I). From the transfer resistance and geometric factor, an apparent resistivity (ρ_a) can be calculated (Rucker, 2009). For IP measurements, the resistivity meter measures the secondary voltage (V_s) decay curve after the current transmission is terminated to produce an apparent chargeability (m_a).

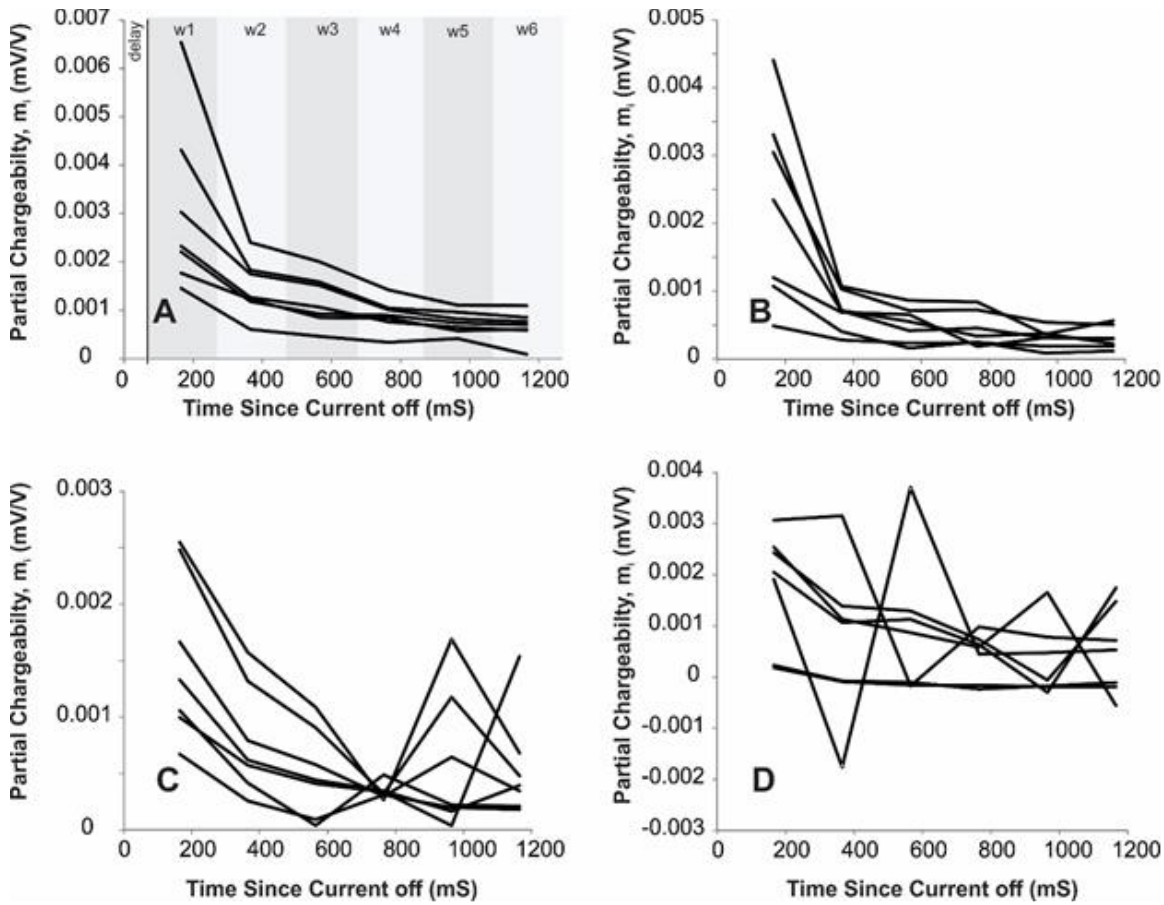
The secondary voltage is very small compared to the primary voltage, thus an integral measure of the decay curve is calculated (Ntarlagiannis et al., 2016):

$$m_a = \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{V_s(t)}{V_p} dt \, , \tag{5}$$

where t_1 is the initial delay (65 ms within our resistivity meter) and t_2 is the end of the integration of the curve. To be more accurate in the integration, the decay curve is parsed into six windows (or gates) that are linearly distributed across the measure time. For each of the six windows, w1

through w6, the equipment provides a partial chargeability value (Florsch et al., 2011), m_i, and the final summed apparent chargeability in the raw data file. Figure 7 shows examples of the partial values for several decay curves, where each window length is 200 ms, starting immediately after the initial 65 ms delay. For convenience of plotting, the integrated, partial chargeability value within each window is centered within the window on the time axis.

Figure 11. Example IP curves showing the partial chargeability value acquired within windows w1 through w6.



The full suite of subplots in Figure 7 shows a series of progressively noisier decay curves. The data highlighted in plots A and B are most likely useable for inverse modeling, judging by their smooth and monotonically decreasing values with time. The data shown in plots C and D are poor and unusable because the curves have partial chargeability values that are higher with time or are negative. Additionally, the best curves typically have values that are high overall. Chargeability is most strongly influenced by the earth materials and signal levels, which are controlled by transmitter power and the electrical coupling quality or contact resistance of the transmitter electrodes.

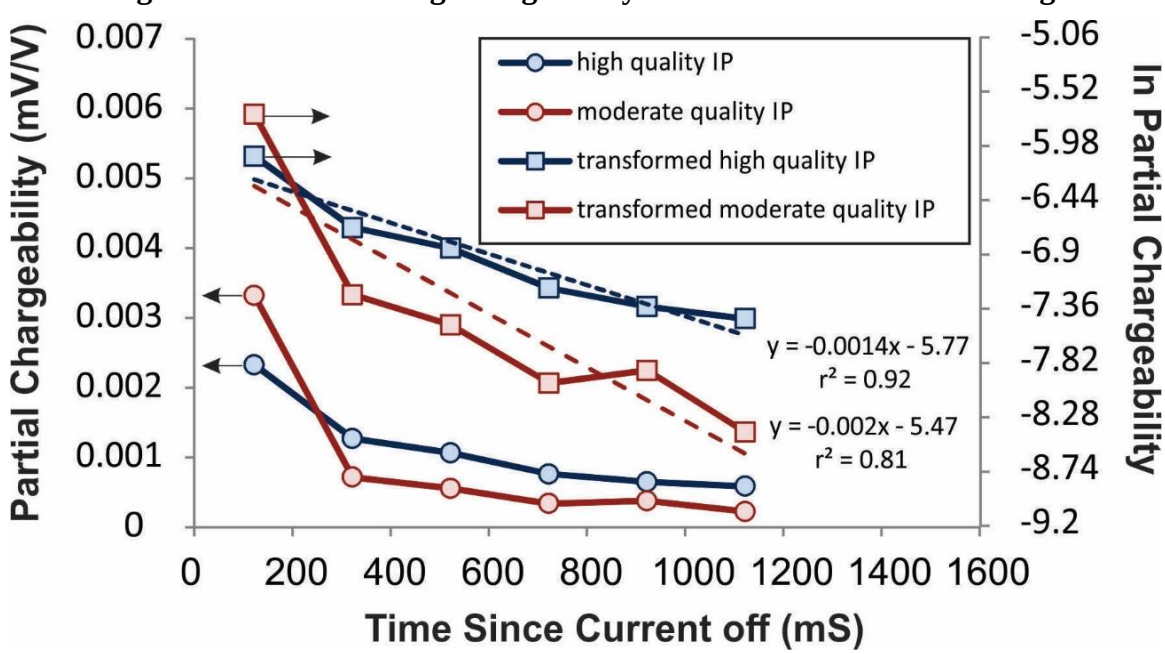
Processing of the chargeability data can be cumbersome given the large amount of information than can accompany an IP survey. Automated processing routines for data rejection can

significantly reduce the time between acquisition and interpretation. For IP, automation can be in the form of curve matching to an expected shape of the decay curve, which is exponential in the form of (Florsch *et al.*, 2011):

$$V(t) = V_p m e^{-t/\tau} \tag{6}$$

where τ is the characteristic time constant. In the automation of data rejection, we are less concerned with the parameterization of the decay than we are with how well the decay matches expectations. Figure 8 shows an example, where decay curves are transformed with the natural logarithm and modeled with a best fit line in semi-log space. The coefficient of determination, r^2, is subsequently used to judge the fit with a better fit to an exponential decay given to higher values. Any curve with a negative partial chargeability must automatically be rejected from the dataset as this would cause problems in the transformation.

Figure 12. Processing voltage decay curves for automated filtering.



For the inversion of chargeability, we follow the approach outlined in Kemna (2000) and Kemna *et al.* (2000) as implemented in RES2DINVx64. Iteratively, the resistivity is solved first, followed by a solution for chargeability using the same smooth model, constrained optimization presented in Eq. (3).

Various factors will cause a material to be chargeable and there are several tables in geophysical textbooks listing those values. It is generally difficult to compare one table to another because instruments will each have their own [t_1 t_2] (Equation (5)). A rough order of magnitude of chargeability for various materials is presented in Table 2. In southern Arizona, we have particular

experience with imaging tuff, a consolidated volcanic ash, which tends to have a high chargeability.

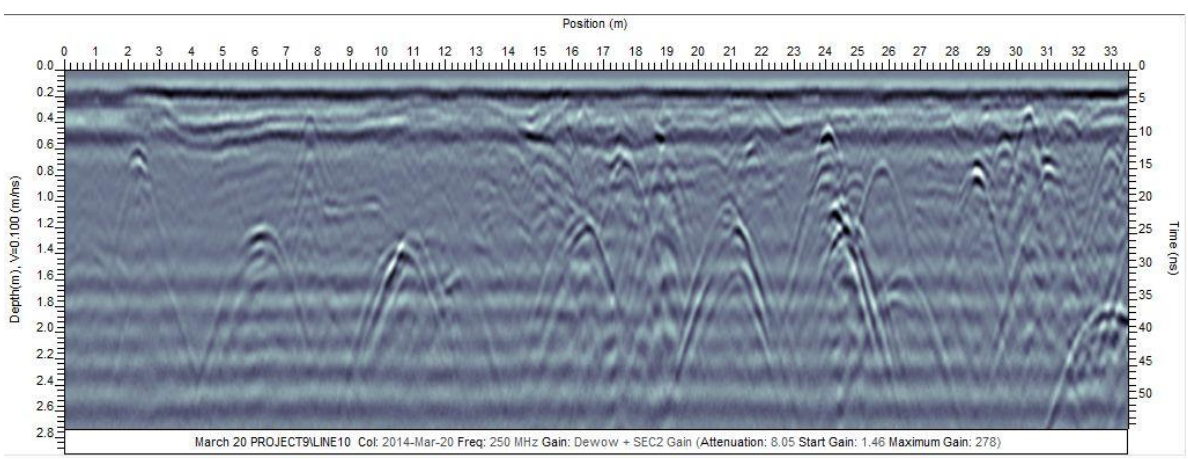
Table 2. Chargeability for some common materials.

Material type	Chargeability (msec)		Soil type	Chargeability (msec)
Groundwater	0		Silt	5-30
Alluvium	1-4		Sand (dry)	5-6
Gravel	3-9		Sand (wet)	10-15
Precambrian Volcanics	8-20		Sandy Soil (dry)	5-6
Precambrian Gneisses	6-30		Sandy Soil (wet)	15-20
Schist	5-20		Loamy Soil (dry)	5-6
Sandstone	3-12		Loamy Soil (wet)	10-20
Argilite	3-10		Clayey Soil (dry)	5-6
Quartzite	5-12		Clayey Soil (wet)	15-20
			Clay (dry)	3-6
			Clay (wet)	15-40

2.3 GROUND PENETRATING RADAR (GPR)

GPR uses high-frequency radio waves, typically in the range 10 MHz to 1.2 GHz to image subsurface structures and features. A transmitter antennae emits electromagnetic energy into the subsurface. When this energy encounters a buried object or an interface between materials having different permittivity's, part of the energy is reflected back to the surface. A receiving antennae records the variations in the return signal as a trace. The signals are plotted in real-time as distance versus travel time allowing an assessment of the results as the survey progresses (Figure 9). Target depth is proportional to the time taken for the signal to travel down and back to a given layer.

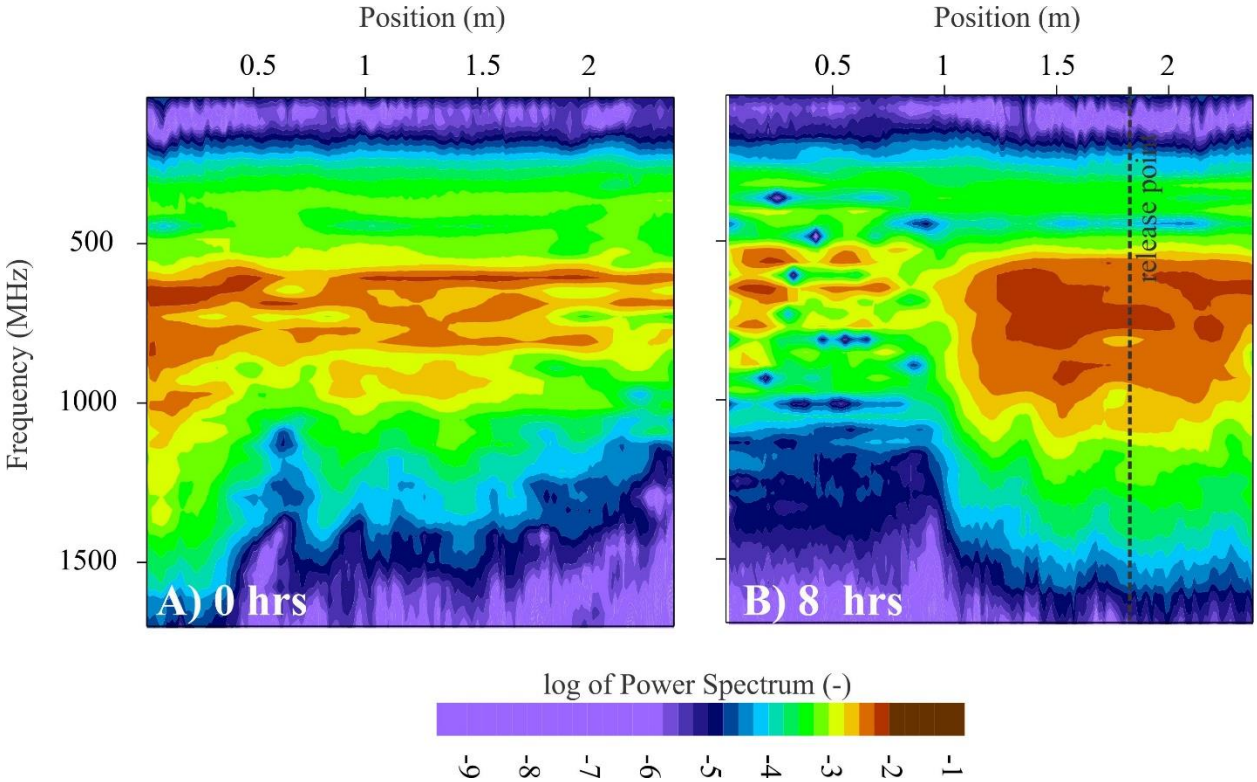
Figure 13. Example processed GPR profile illustrating diffraction hyperbola responses produced by subsurface features, such as void spaces and boulders.



GPR responds to changes in electrical properties (dielectric permittivity and electrical conductivity) which are a function of soil and rock material and moisture content. Electrically conductive materials, for example clay rich sediments, will limit radar signal penetration and hence imaging depths. The dielectric permittivity is a dimensionless measure of a materials capacity to store a charge when an electric field is applied (Table 3). This constant is primarily controlled by water content. Differences in dielectric constants at interfaces cause reflections in the GPR data, the strength of reflections is controlled by the contrast in the dielectric constants. Dielectric contrasts as small as one can produce reflections in GPR data.

Another method of examining GPR data is to investigate the frequency content of the received trace to determine shifts within the power spectra. The power spectra is calculated by conducting a Fourier transform on each trace then squaring the result. In general, the power spectrum of a signal indicates the relative magnitudes of the frequency components that combine to make up the signal. A GPR antenna with a frequency of 200 MHz will have most of the spectra within 100 to 400 MHz. A shift in the power spectra may indicate a target. Figure 10 shows an example of a hydrocarbon release within a sand tank, where after the release the power spectra completely changed.

Figure 14. Power spectra of GPR traces during an ethanol release in a tank: a) prior to release; b) 8 hours after release.



2.4 DISCLAIMER

Geophysical data provide objective information about the physical properties of the earths subsurface. Interpretation of modeled geophysical data often includes on site-specific correlation with information from direct observation methods such as drilling, excavation, or construction logs. In the absence of these logs or observations, HGI personnel interpret the data based on experience with similar features and environments. The geophysical methods employed on this project may not detect all subsurface features, such as geologic contacts or hydrogeological features. It is possible that interpreted features may not coincide with the results of invasive sampling, and the depth of investigation may not accurately resolve desired features at depth. Reports provide a professional opinion, and therefore no warranty is expressed, implied, or made as to the conclusions, advice or recommendations offered.

Table 3. Dielectric constants for some common materials.

AIR	1
SNOW	1-2
PVC	3
ASPHALT	3-5
FRESHWATER ICE	4
CONCRETE	4-11 (5)
BEDROCK	
GRANITE	4-7
SANDSTONE	6
SHALE	5-15
LIMESTONE	4-8
BASALT	8-9
SOILS AND SEDIMENTS	4-30
FRESH AND SALTWATER	81

3.0 METHODOLOGY

3.1 SURVEY AREA AND LOGISTICS

The multi-method pilot geophysical investigation was conducted between January 28th and February 2nd, 2022. Figure 3 through Figure 5 displays a detailed overview of the coverage for this investigation.

3.1.1 Electrical Resistivity and IP Data Acquisition

Two survey lines of combined electrical resistivity and IP data were acquired along the Lower Access Tunnel and Pearl Harbor Tunnel with survey parameters as detailed in Table 4. Stainless steel electrodes were placed every approximately 10 feet in predrilled holes through the concrete tunnel floor. The majority of the electrodes placements were into the materials or sediment underlying the concrete and produced low contact resistance values when tested in the data QA stage. However, a number of the electrodes appeared to hit concrete or other obstructions at the base of the drilled holes, with these requiring the holes to be packed with bentonite clay to produce an electrical contact with the underlying strata. A number of electrode arrays were tested for the Line 1 data collection, including the modified Wenner, dipole-dipole, and inverse Schlumberger arrays. The modified Wenner array provided the better data quality and only this array was collected for Line 2.

Table 4. Electrical resistivity survey details.

Line Name	Start Station (feet)	End Station (feet)	Electrode Spacing	Line Length (feet)
Line 1	00-500	00+790	~10 feet	~1,290
Line 2	00+230	2500+430	~10 feet	~430

The depth of investigation of the electrical resistivity method is controlled by a number of factors, with the length of cable deployed during data collection typically providing the upper limit on this depth. In general, the depth of investigation is approximately 20% of the cable length and therefore we would expect an upper imaging depth limit of approximately 250 feet for Line 1 and 85 feet for Line 2. In addition, the imaging depth can be impacted by the contact resistance between electrodes and the subsurface, which controls injected current, data quality, which can be affected by infrastructure, and the background noise, from grounded electrical signals from pumps for example. For the electrical resistivity model results for Line 1, this reduced the imaging depth to approximately 150 feet, as highlighted in Figure 15. The induced polarization model results were impacted to a higher degree and the imaging depth was reduced further to approximately 50 feet for Line 1, as highlighted in Figure 16. Therefore, the various model results for each method and

survey line are presented with varying imaging depths reflecting the survey line lengths and impact of additional controlling factors.

3.1.2 GPR Data Acquisition

Two survey lines of GPR data were acquired coincident to the electrical resistivity and IP survey lines detailed in Section 3.1.1 using 50, 100, and 200 MHz antenna. The survey parameters for these two survey lines are detailed in Table 3. For the 100 and 200 MHz antenna, survey lines of data were acquired on both sides of the tunnel. For the 50 MHz antenna, only one line could be acquired in the center of the tunnel based on its length (2 meters). Furthermore, the acquisition of each line was broken into segments based on obstructions to GPR progress (such as the HDPE pipeline running down the tunnel, stairways over the pipeline, thrust block construction, and materials stored within the tunnel), as indicated in Figure 4. Table 5 lists the GPR survey details.

For the 50 MHz frequency the antenna were separated by ~6.56 feet (2 meters), with a step size (trace spacing) of ~1.64 feet (0.5 meters). For the 100 MHz frequency the antenna were separated by ~3.28 feet (1 meters), with a step size (trace spacing) of ~0.82 feet (0.25 meters). For the 200 MHz frequency the antenna were separated by ~1.64 feet (0.5 meters), with a step size (trace spacing) of ~0.33 feet (0.1 meters).

In addition, GPR data was collected along the lower access tunnel in proximity to the storage tanks 17 through 20. Within the storage tank area, we limited the acquisition to the 200 MHz antenna since it appeared to provide the most detail closest to the floor. We used the GPR data here to find pipes that may have been lost over the years and historical fuel spills. The acquisition included a main line parallel to the tunnel direction and several perpendicular lines.

Table 5. GPR survey details.

Area	Line	Segments	Frequency (MHz)	Total Coverage Length (feet)
Fuel Leak	1	3	50	695
Fuel Leak	1	7	100	1,179
Fuel Leak	1	8	200	2,270
Fuel Leak	2	2	50	410
Fuel Leak	2	4	100	820
Fuel Leak	2	4	200	820
Storage Tank	1 through 16	16	200	703

3.2 EQUIPMENT

3.2.1 Resistivity Equipment

Data were collected using a Supersting™ R8 multichannel electrical resistivity system (Advanced Geosciences, Inc. (AGI), Texas) and associated cables, stainless steel electrodes, and battery power supply. The Supersting™ R8 meter is commonly used in surface geophysical projects and has proven itself to be reliable for long-term, continuous acquisition.

3.2.2 GPR Equipment

A pulseEKKO PRO system (Sensors and Software, Mississauga, ON Canada) was used for the GPR surveying, with antennae frequency of 50, 100, and 200 MHz. The pusleEKKO PRO system is a bistatic antennae system; meaning the transmitter and receiver are separated making it much easier to traverse constrained survey areas and provide flexibility for sites with limited information. The attached digital video logger provides a real-time view of the collected traces, allowing for data QC in the field.

3.3 QUALITY CONTROL

The data quality control (QC) and quality assurance (QA) procedures followed were outlined in *HGI-SOP-RES-001 - Electrical Resistivity and Induced Polarization - Standard Operating Procedure, HGI-SOP-RES-002 - Electrical Resistivity and Induced Polarization - Data QA and Processing,* and *HGI-SOP-GPR-001 - Ground Penetrating Radar - Standard Operating Procedure.* In summary, data were given a preliminary assessment for quality control (QC) in the field to assure quality of data before progressing the surveys. Following onsite QC, all data were transferred to the HGI server for storage and detailed data processing and analysis. Data quality was inspected and checked for consistency, and data files were saved to designated folders on the server. Records of survey configuration, location, equipment used, environmental conditions, proximal infrastructure or other obstacles, and any other useful information were recorded during data acquisition and were saved to the HGI server. The data QA forms for the survey are included in Appendix A.

3.4 DATA PROCESSING

3.4.1 Resistivity and IP Data Processing

The geophysical data for the resistivity survey, including measured voltage, current, measurement (repeat) error, and electrode position, were recorded digitally with the AGI SuperSting R8 resistivity meter. Quality control, both in-field and in-office, was performed throughout the survey to ensure data quality passed accepted standards. Data were assessed and data removal was performed based on degree of noise/other erroneous data. During data removal, those data that appeared to be extremely noisy and fell outside the normal range of accepted conditions were

manually removed within an initial Excel spreadsheet analysis. Examples of conditions that would cause data to be removed include, negative or very low voltages, high-calculated apparent resistivity, extremely low current, and high repeat measurement error. No resistivity data values were manipulated or changed, such as with smoothing routines or box filters; noisy data were only removed from the general population. The edited dataset was then formatted for input to the 2D inverse modeling software.

3.4.1.1 2D Resistivity Modeling

RES2DINVx64 software (Geotomo, Inc.) was used for inverting individual lines in two dimensions. RES2DINV is a commercial resistivity inversion software package available to the public from www.geotomosoft.com. The inversion process followed a set of stages that utilized consistent inversion parameters to maintain consistency between each model. Inversion parameters were chosen to maximize the likelihood of convergence. Convergence of the inversion was judged whether the model achieved an RMS of less than 5% within three to five iterations. Inversion parameter choices included the starting model, the inversion routine (robust or smooth), the constraint defining the value of smoothing and various routine halting criteria that automatically determined when an inversion was complete. Qualified in-house inversion experts subjected each profile to a final review.

The inverted data were output from RES2DINVx64 and were gridded and color contoured in Surfer (Golden Software, Inc.). Where relevant and recorded, field observations such as roads, fences or other features were plotted on the resistivity section to assist in data analysis.

3.4.2 GPR Data Processing

Data processing for the GPR wiggle trace data used the Ekko Project (Sensors and Software, Mississauga, ON Canada) GPR processing software. Any geometry changes to correct for errors made during the field acquisition were conducted within the headers for each profile. The GPR data was converted from travel time into depth by using the common midpoint gather velocity analysis function within Ekko Project. Data processing steps for all transects included; DEWOW median filter, lowpass filter (50% Nyquist frequency), background subtraction, and SEC gain function. The processed profiles were exported from Ekko Project and relevant line features were plotted on the GPR profiles to assist in data analysis.

Power spectra plots were created by conducting a fast Fourier transform and other mathematical functions using MATLAB (v. R2015a). A script was written to batch process the data and output in a form for contouring in Surfer.

4.0 RESULTS & SUMMARY

4.1 LOWER ACCESS TUNNEL INVESTIGATION

The inverse model results for the electrical resistivity and IP survey lines are presented as two-dimensional (2D) profiles in Figure 15 through Figure 17 and Figure 23 through Figure 24. A common color contouring scale is used for each method across all of the survey lines, where applicable, to provide the ability to compare intensity of targets from survey line to survey line. For the electrical resistivity profiles, electrically conductive (low resistivity) subsurface regions are represented by cool hues (magenta through green shades) and electrically resistive regions are represented by warm hues (orange through brown shades). For the IP profiles, the green values typify low chargeability materials, where charge cannot be stored (either due to short-circuiting from small pore spaces or from large pore spaces that lack the membrane polarization effect). The yellow to brown contours represent a mid-value IP effect and chargeability values, while the white and blue contours represent a stronger IP effect.

The GPR results are presented as wiggle trace profiles with distance versus time, the latter has been converted to depth using an average velocity of 0.16 meters per second, based on analyzed common mid-point gathers for these survey lines. In addition, the frequency content of the GPR results were analyzed through the power spectrum. The power spectrum is the square of the absolute value of the Fourier transform, and was conducted on each trace after removing the mean value (*Glaser et. al., 2012*). The resulting profiles are presented as distance versus frequency, with higher power represented by blue shades and lower power represented by green shades.

4.1.1 Line 1 Geophysical Results

Figure 15 displays the electrical resistivity model results for the array testing for Line 1, which was collected in a (b) (3) (A) to (b) (3) (A) direction. In general, the profiles displays a similar structure for each of the arrays in relation to the distribution of resistive and conductive regions, suggesting a good agreement between the measurements, data quality, and model results for the three arrays. The three profiles have imaging depths of the order of 150 feet below tunnel floor (btf), with the geology reflecting basalt across this interval. The resistivity method can image to a depth equal to approximately 20% of its line length (in this case between 150 and 160 feet), but often the resolvability of targets are lost at these depths if the targets are small. We typically expect basalt to display a resistive signature ranging between 10's to 10,000's of ohm-meters. The near surface layer and a significant proportion of the deeper sections of the three profiles display $\log_{10}$ resistivity values greater than 1.8 (60 ohm-meters), that are likely representative of the basalt.

A number of conductive regions are observed across the profiles, typically within depth interval of 10 to 50 feet btf. Those regions displaying highly conductive values, typically $\log_{10}$ resistivity

values less than 0 (1 ohm-meters), are associated with regions displaying a stronger IP effect (Figure 16). For example, the highly conductive region located at approximately 510 feet along the electrical resistivity profile correlates to a significant sized region in the IP profile displaying values greater than 50 mV/V. In general, chargeability values greater than 50 mV/V are associated with metallic infrastructure and therefore it would appear many of the conductive regions in the electrical resistivity are associated with infrastructure responses. This metallic infrastructure could be associated with the reinforcement in the tunnel floor, drains or pipelines running underneath the tunnel, grounded electrical systems within the tunnel, or related to the groundwater well and associated pumps and electrical system. Many of the responses appear to extend to significant depths in the IP profile, although this could reflect the interference from shallow infrastructure responses bleeding into deeper resistivity and IP measurements and therefore the model results. It is almost impossible to edit or process this interference in the measurements when it is associated with near surface effects. A summary of likely infrastructure responses is provided in Table 6 and highlighted in Figure 17. The shape and dimensions of the responses vary between the two methods based on the sensitivity to and the type of infrastructure creating the interference. In general, the zone of influence on the resistivity and IP measurements is much larger than the actual infrastructure size and so the outlined regions should only be used as a guide for infrastructure location.

Table 6. Summary of metallic infrastructure type responses in the electrical resistivity and IP model results.

Response	Start Station (feet)	End Station (feet)	Resistivity Response	IP Response
A-1	00-420	00-390	Yes – highly conductive	Yes - >50mV/V
A-2	00-350	00-285	Yes – highly conductive	No
A-3	00-190	00-185	Yes - conductive	Yes - >50 mV/V
A-4	00-20	00+20	Yes - conductive	Yes - >50 mV/V
A-5	00+45	00+65	Yes – highly conductive	~ 40 mV/V
A-6	00+120	00+185	Yes – highly conductive	Yes - >50 mV/V
A-7	00+385	00+400	Yes - conductive	Yes - >50 mV/V
A-8	00+425	00+445	Yes – highly conductive	Yes - >50 mV/V
A-9	00+475	00+490	Yes – conductive	Yes - >50 mV/V
A-10	00+510	00+525	Yes – highly conductive	Yes - >50 mV/V
A-11	00+540	00+560	Yes – highly conductive	Yes - >50 mV/V
A-12	00+610	00+620	Yes –conductive	Yes - >50 mV/V
A-13	00+640	00+650	Reduction in resistivity	Yes - >50 mV/V

A-14	00+695	00+685	Reduction in resistivity	Yes - >50 mV/V

A number of regions display low resistivity values with low to moderate chargeability values. For example, the conductive region between approximately stations 00+315 to 00+375 is associated with chargeability values between approximately 25 and 40 mV/V, labelled as B-1 in Figure 17. This region coincides with the area of the leak and could be a response to increased moisture or residual fuel product within the basalt bedrock. The slightly elevated IP response of this region could be indicative of hydrocarbons, clay, or volcanic materials such as tuff. A second conductive region is observed between approximately stations 00+240 and 00+300, which is associated with a range of chargeability values between approximately 15 and 50, labelled as B-2 in Figure 17. There is a small region at approximately station 00+300 where the chargeability is greater than 50 mV/V, suggesting that this region could have a metallic infrastructure component associated with it. If this is the case, the conductive region could be associated with interference from the infrastructure rather than a response to increased moisture or leaked products in the basalt bedrock.

In general, the electrical resistivity profile between the approximate station locations of 00-310 to 00-50 displays a number of regions of elevated conductivity values. In the first region, between approximately station 00-310 to 00-220 (labelled as B-3 in Figure 17), the conductive region extends from the tunnel floor down to the imaging depth interval of approximately 50 feet btf displayed in Figure 17. In contrast, the second region, between approximately stations 00-220 to 00-50 (labelled as B-4 in Figure 17), extends between approximately 25 to 50 feet btf. Both regions are associated with low to moderate chargeability values, between approximately 10 and 40 mV/V, suggesting they are not significantly impacted by metallic infrastructure. These regions could be a response to increased moisture, residual hydrocarbons, clay, or chargeable volcanic materials within the basalt bedrock. The increase in chargeability of the B-4 region coupled with the increased VOC concentrations from the soil vapor measurements (as indicated by the red dots at the top of the profiles in Figure 12) along the tunnel could be indicative of hydrocarbons. The VOC concentrations associated with the B-3 region display a variable trend, although generally lower concentrations compared to the B-4 region suggesting an increase in moisture in this region.

An example of the GPR wiggle trace profiles are displayed in Figure 18 along the Line 1 section by the fuel leak location, for the three frequencies collected. In general, the remainder of the GPR wiggle trace profiles collected along the other sections of Line 1 look very similar in terms of character and data quality for each of the frequencies. The three frequencies collected are all impacted to varying degrees by the metallic infrastructure in the tunnel and airwave reflections off the tunnel structure itself. Since the antenna were unshielded, a decision made to take advantage of the increased flexibility and maneuverability provided by a bistatic antenna system, the GPR signal is transmitted in all directions and therefore it is possible to receive reflection off the tunnel roof and walls. This is evident in the common midpoint gathers where a good proportion of the energy possess electromagnetic wave velocities associated with air. Metallic infrastructure, such

as the rail lines, pipelines along the tunnel wall, and metal grates on the floor, can act as secondary transmitters of the GPR and create interference or block the GPR signals into the ground.

The 50 MHz profile displays few coherent reflections, with much of the depth interval producing very muted amplitudes. This is likely reflecting the high degree of interference from the metallic infrastructure, with the long antenna length limiting the survey lines to the area over the rail lines. The 100 MHz profile again displays muted amplitudes for any reflections in the upper 15 feet, likely reflecting the high degree of interference from the metallic infrastructure in the lower frequencies. We do observe a degree of coherent reflections over the interval of approximately 15 to 30 feet btf, potentially reflecting the structure within the basalt bedrock. The 200 MHz profile displays coherent reflections over the upper 30 feet, indicating the 200 MHz antenna are less influenced by the metallic infrastructure. The imaging depths attained are very good for the frequency and it appears the 200 MHz antenna are providing the greatest information over the upper 30 feet interval. There is still a degree of air wave reflections in the profiles indicated by the wave velocities from the common midpoint gathers, likely from reflections off the tunnel roof. The reflections from the subsurface could be related to variations within the basalt, potentially related to clinker zones, different flow layers, fracture zones, jointing, or similar structural features that could present a contrast in dielectric properties. The majority of the reflections are not laterally extensive, likely indicating a heterogeneous basalt bedrock.

Considering the degree of interference from the infrastructure and the processing steps applied to the wiggle trace profiles it is unlikely we would observe the subtle influence of fuel products in the basalt bedrock. Typically, the presence of hydrocarbons can affect the amplitude of the GPR signals in the area of the fuel. However, in this case it would be difficult to isolate the subtle variations in GPR amplitude from the fuel from those associated with the infrastructure.

The frequency content of the GPR results were analyzed through the power spectrum with the Line 1 results for the 50, 100, and 200 MHz antenna presented in Figure 19 to Figure 21 respectively. In general, we should observe higher power over the range of half to double the antenna frequency, with a sharp drop in power on either side of this range. Therefore, for the 50 MHz antenna we should observe higher power between approximately 25 and 100 MHz, with significantly lower power outside this range. The presence of hydrocarbons has been shown to affect the power spectrum over various frequencies, and therefore could alter these trends across the profiles. We do not have any ground truthing to correlate with the power spectrum; therefore, we are mostly trying to identify contrasting behavior across the profiles. The 50 and 100 MHz power spectra appear to be influenced by the metallic infrastructure, most notable by the lower power notches associated with the lower frequencies.

The 200 MHz power spectra still display a degree of interference from metallic infrastructure although it appears to be much reduced, and the profile contains more detailed information based on improved data quality of the wiggle trace profiles. The majority of the section of power spectra

between approximately station 00+610 and 00+800 on both sides of the tunnel display a fairly consistent trend across the 100 to 400 MHz range (Figure 21). This section of Line 1 displays on average more resistive values in the electrical resistivity profile, potentially indicating predominately unimpacted basalt in this region (Figure 22). We observe a significant lower power notch in the lower frequencies on both sides of the tunnel between approximately station 00+680 and 00+700. This coincides with the A-14 feature from the electrical resistivity and IP profiles and further confirms this is associated with metallic infrastructure in this location.

The section to the (b) (3) (A) of this, between approximately station 00+370 and 00+610, displays a choppy nature to the power spectra over the frequency interval 100 to 400 MHz. This coincides with multiple interpreted metallic infrastructure responses in the electrical resistivity and IP profiles. In addition, the most impacted section between station 00+370 to 00+390 is associated with a section of the profiles where the antenna were resting on the rail lines due to the constrained width of tunnel. Between approximately station 00+240 and 00+370 the power spectra on both sides of the tunnel display a significant reduction of power of frequencies towards the upper end of the 100 to 400 MHz range (labelled as C-1 in Figure 22). It is interesting to note this occurs in the area of the leak and is associated with a number of the more conductive regions that were interpreted as potential increased moisture, fuel product, or clay responses. In addition, these sections corresponds to increasing VOC concentrations for the soil vapor measurements along the tunnel (as indicated by the red dots at the top of the profiles in Figure 22). Therefore, this could be a response to the dispersive effect of hydrocarbons in the basalt reducing the power across these frequencies.

Moving to the (b) (3) (A) we observe additional significant metallic infrastructure interference in the power spectra at approximately stations 00+240, 00+110, 00-320, and 00-350, which correspond to surface features noted along the tunnel. The sections between approximately station 00+180 and 00-490 the higher power section appears to narrow, with the frequencies above approximately 330 MHz displaying a significant decrease in power (labelled as C-2 in Figure 22). This section correlates to a number of metallic infrastructure responses in the electrical resistivity and IP profiles, although that generally manifests as the discontinuous nature of the higher power signal in the power spectra. There are a number of more conductive regions that were interpreted as potential increased moisture or fuel product, or clay responses, which also correlate to elevated VOC concentrations for the soil vapor measurements. Therefore, this could be a response to the dispersive effect of hydrocarbons in the basalt reducing the power across these frequencies in this section. Alternatively, since this narrowing continues past the sump location, where the VOC concentrations also decrease significantly, it could be related to increased moisture within the upper basalt units.

4.1.2 Line 2 Geophysical Results

Figure 23 displays the electrical resistivity and IP model results for the Alt-3 Wenner array for Line 2, which was collected in a (b) (3) (A) to (b) (3) (A) direction. The Alt-3 Wenner array was chosen based on an initial review of the Line 1 results, which displayed improved data quality and model convergence. The electrical resistivity profile has an imaging depth of the order of 60 feet btf, while the IP profile has a reduced imaging depth of the order of 20 feet due to significant interference from the potential infrastructure along this section of tunnel.

A resistive near surface layer is again observed, with $\log_{10}$ resistivity values greater than 1.8 (60 ohm-meters) that is likely representative of the basalt. Below this layer the electrical resistivity profile is generally more conductive, with the only region displaying typical basalt resistivity values confined to the lower (b) (3) (A) section of the model results. A number of conductive regions are observed across the profiles, typically within depth interval of 10 to 40 feet btf. Those regions displaying highly conductive values, typically $\log_{10}$ resistivity values less than 1 (10 ohm-meters), are associated with regions displaying a stronger IP effect (Figure 23). For example, the highly conductive region located between approximately 260 and 300 feet along the electrical resistivity profile correlates to a significant sized region in the IP profile displaying values greater than 50 mV/V. In general, chargeability values greater than 50 mV/V are associated with metallic infrastructure and therefore it would appear many of the conductive regions in the electrical resistivity are associated with infrastructure responses. This metallic infrastructure could be associated with the reinforcement in the tunnel floor, drains or pipelines running underneath the tunnel, grounded electrical systems within the tunnel, or related to the groundwater well and associated pumps and electrical system. Many of the responses appear to extend to significant depths in the IP profile, although this could reflect the interference from shallow infrastructure responses bleeding into deeper resistivity and IP measurements and therefore the model results. It is almost impossible to edit or process this interference in the measurements when it is associated with near surface effects. A summary of likely infrastructure responses is provided in Table 7 and highlighted in Figure 24. The shape and dimensions of the responses vary between the two methods based on the sensitivity to and the type of infrastructure creating the interference. In general, the zone of influence on the resistivity and IP measurements is much larger than the actual infrastructure size and so the outlined regions should only be used as a guide for infrastructure location.

A number of regions display conductive resistivity values with low to moderate chargeability values. For example, the conductive region between approximately 75 and 90 feet along the electrical resistivity profile is associated with chargeability values between approximately 10 and 30 mV/V, labelled as G-1 in Figure 24. This region could be a response to increased moisture or residual fuel product, clays, or tuffaceous materials within the basalt bedrock. The slightly elevated IP response of this region coupled with the increased VOC concentrations from the soil vapor measurements along the tunnel could be indicative of hydrocarbons. A second conductive

region is observed between approximately 130 and 155 feet along the electrical resistivity profile, which is associated with a range of chargeability values between approximately 10 and 50, labelled as G-2 in Figure 24. The higher chargeability values in this range could be related to bleed over to the F-3 response, in which case this could represent increased moisture, residual fuel product, clays, or tuffaceous materials within the basalt bedrock. The soil vapor measurements indicate slightly elevated VOC concentrations over this interval, before they begin dropping after 175 feet along the profile.

The GPR wiggle trace display similar trends to that observed for Line 1, with the lower frequencies being impacted to a greater degree by the metallic interference and the 200 MHz antenna providing improved data quality (Figure 25). In general, the 200 MHz profile displays coherent reflections over the upper 30 feet, indicating the 200 MHz antenna are less influenced by the metallic infrastructure. There is still a degree of air wave reflections in the profiles indicated by the wave velocities from the common midpoint gathers, likely from reflections off the tunnel roof. The reflections from the subsurface could be related to variations within the basalt, potentially related to clinker zones, different flow layers, fracture zones, jointing, or similar structural features that could present a contrast in dielectric properties. The majority of the reflections are not laterally extensive, likely indicating a heterogeneous basalt bedrock.

Table 7. Summary of metallic infrastructure type responses in the electrical resistivity and IP model results.

Response	Start Station (feet)	End Station (feet)	Resistivity Response	IP Response
F-1	20	50	Yes – conductive	Yes - >50mV/V
F-2	50	80	No	Yes - >50mV/V
F-3	110	140	Yes – highly conductive	Yes - >50 mV/V
F-4	160	180	Subtle conductive	Yes - >50 mV/V
F-5	200	230	Yes – conductive	Yes - >50 mV/V
F-6	230	260	Yes – conductive	Yes - >50 mV/V
F-7	260	290	Yes – highly conductive	Yes - >50 mV/V
F-8	300	320	Yes – highly conductive	Yes - >50 mV/V
F-9	330	370	Yes – conductive	Yes - >50 mV/V
F-10	380	400	Yes – conductive	Yes - >50 mV/V

The observations mentioned above are also reflected in the power spectra for the three frequencies (Figure 26 to Figure 28) and therefore we will concentrate on the 200 MHz results for the discussion. The 200 MHz power spectra still displays a degree of interference from metallic infrastructure but it appears to be much reduced, with the wiggle trace data indicating the profiles

contain more detailed information. The majority of the section of power spectra between approximately 260 and 460 feet along the profile for both sides of the tunnel displays low power (labelled as H-1 in Figure 29). The power spectra over the frequency interval 100 to 400 MHz appears discontinuous, with a sharp reduction in power for frequencies above 300 MHz. This could be related to the increase in conductivity observed in the electrical resistivity profile and may reflect interference from the metallic infrastructure suggested by the high chargeability regions along this section. The remainder of the profile displays a more consistent power spectra over the 100 to 400 MHz frequency interval for both sides of the tunnel. There are a number of lower power notches in the lower frequencies on both sides of the tunnel between approximately 110 and 125H-2, 130 and 150, and 210 and 260 feet along the profiles. These tend to coincide with sections of the profiles where the antenna cross surface metal features such as the rail lines and switching equipment for the rail lines. In addition, these sections display a choppy nature to the power spectra over the frequency interval 100 to 400 MHz, which we have observed for metallic interference in the profiles.

In general, we do not observe any significant contrasts in the properties of the power spectra associated with the locations of the conductive regions G-1 and G-2, which are interpreted as potential moisture or hydrocarbon responses. In addition, the profile sections associated with the elevated VOC concentrations, essentially the initial 100 feet of the profiles, display consistent power spectra with no obvious patterns associated with the power or frequency distribution. This could reflect no detectable hydrocarbons, or at least free product, by the GPR spectra or the features are related to increased moisture within the basalt.

Figure 15. Line 1 electrical resistivity inverse model results for array testing.

(b) (3) (A)

[redacted]

Figure 16. Line 1 electrical resistivity and IP inverse model results for the Alt-3 Wenner array.

(b) (3) (A)

[redacted]

Figure 17. Line 1 electrical resistivity and IP inverse model results for the Alt-3 Wenner array, with overlaid interpretations.

(b) (3) (A)

[redacted]

Figure 18. Line 1 example GPR wiggle trace profiles for the 50, 100, and 200 MHz antenna.

(b) (3) (A)

[redacted]

Figure 19. Line 1 GPR power spectra for the 50 MHz antenna frequency.

(b) (3) (A)

[redacted]

Figure 20. Line 1 GPR power spectra for the 100 MHz antenna frequency.

(b) (3) (A)

[redacted]

Figure 21. Line 1 GPR power spectra for the 200 MHz antenna frequency.

(b) (3) (A)

[redacted]

Figure 22. Line 1 combined electrical resistivity profile and 200 MHz GPR power spectra, with overlaid VOC concentrations and interpretations.

(b) (3) (A)

[redacted]

Figure 23. Line 2 electrical resistivity and IP inverse model results for the Alt-3 Wenner array.

(b) (3) (A)

[redacted]

Figure 24. Line 1 electrical resistivity and IP inverse model results for the Alt-3 Wenner array, with overlaid interpretations.

(b) (3) (A)

[redacted]

Figure 25. Line 2 example GPR wiggle trace profiles for the 50, 100, and 200 MHz antenna.

(b) (3) (A)

[redacted]

Figure 26. Line 2 GPR power spectra for the 50 MHz antenna frequency.

(b) (3) (A)

[redacted]

Figure 27. Line 2 GPR power spectra for the 100 MHz antenna frequency.

(b) (3) (A)

[redacted]

Figure 28. Line 2 GPR power spectra for the 200 MHz antenna frequency.

(b) (3) (A)

[redacted]

Figure 29. Line 2 combined electrical resistivity profile and 200 MHz GPR power spectra, with overlaid VOC concentrations and interpretations.

(b) (3) (A)

[redacted]

4.2 STORAGE TANK INVESTIGATION

Figure 30 through Figure 33 display the wiggle trace profiles and power spectra for the 200 MHz GPR survey lines for the storage tank investigation; Line 1 through 16. The 200 MHz antenna were chosen based on the superior data quality comparted to the lower frequencies and significant imaging depths achieved in the tunnel surveys. The primary objective was similar to the previous survey, to identify potential evidence for any fuel releases in the basalt units. In addition, the GPR was deployed in this area to attempt to image a sub tunnel drain thought to run along the lower access tunnel in this area. In order to achieve these objectives two survey lines running parallel to the axis of the lower access tunnel were collected, one running the 290 feet length of the survey area and a second shorter survey line in the area of the sump. A series of cross-lines were collected perpendicular to the axis of the lower access tunnel.

The wiggle trace profiles again display coherent reflections over the upper 20 feet, reflecting the good imaging depths attainable in this environment. The profiles contain a degree of airwave reflections, indicated by the wave velocities from the common midpoint gathers, likely from reflections off the tunnel roof and associated overhead infrastructure. The reflections from the subsurface could be related to variations within the basalt, potentially related to clinker zones, different flow layers, fracture zones, jointing, or similar structural features that could present a contrast in dielectric properties. The majority of the reflections are not laterally extensive, likely indicating a heterogeneous basalt bedrock.

All of the profiles display some degree of interference or response to the metallic infrastructure on the ground surface of the tunnel. This includes the metal plates across the doorways, where the GPR signal is essentially blocked from the subsurface, the metal grates over pipeline runs, which display varying levels of interference. In addition, the rail lines display varying degrees of interference on the collected cross-lines. For reference, the location of this infrastructure has been marked on each profile. A number of features have been identified in the wiggle trace profiles that could represent reflections off pipelines, drains, or similar type infrastructure underlying the tunnel floor. These are all located along the Line 1 profile at approximately 4, 142 and 241 feet along the profile (highlighted by the blue circles in Figure 31). This would tend to suggest the features, if associated with linear drains or pipelines, are not running parallel to the lower access tunnel and therefore could be related to other infrastructure underlying the tunnel. Alternatively, these could represent side drains running to a main drain parallel to the lower access tunnel for example, with the latter not being detected by the cross-lines. This could be possible since the majority of the cross-lines are short and have a high degree of scatter and diffractions associated with the large amount of metallic infrastructure they traverse. In addition, the 200 MHz antenna may not have the necessary resolution to detect a shallow drain very well based on the wavelength of the signal and thickness of the concrete floor.

The frequency content of the GPR survey lines were analyzed through the power spectrum with results for the 200 MHz antenna presented in Figure 32 and Figure 33. In general, we observe higher power over the range 100 to 330 MHz for Lines 1 through 16. The power spectra display obvious interference associated with the metallic infrastructure on the ground surface relating to the metal plates, grates, and rail lines. Outside of these areas there are a number of regions where the power spectra displays contrasting trends when compared to the average background. For example on Line 1 between approximately 25 and 30 feet along the profile we observe lower power over the 100 to 300 MHz interval and higher power at frequencies above 330 MHz. This contrasts with the surrounding areas and could be a response to increased moisture or fuel product in the basalt bedrock. We do not have any ground truthing data associated with soil vapor measurements or fuel leak locations to further constrain these interpretations. Similar regions displaying contrasting trends are summarized in Table 8 and Figure 34 and Figure 35.

Table 8. Summary of potential fuel product responses in the GPR power spectra.

Response	Line	Start (feet)	End (feet)
L-1	1	0	5
L-2	1	25	30
L-3	1	140	155
L-4	1	165	175
L-5	1	210	220
L-6	1	240	250
L-7	3	35	45
L-8	9	5	20
L-9	10	5	12
L-10	10	17	22
L-11	15	5	12
L-12	16	0	12

Figure 30. GPR wiggle trace profiles for the 200 MHz antenna for Line 1 through 9.

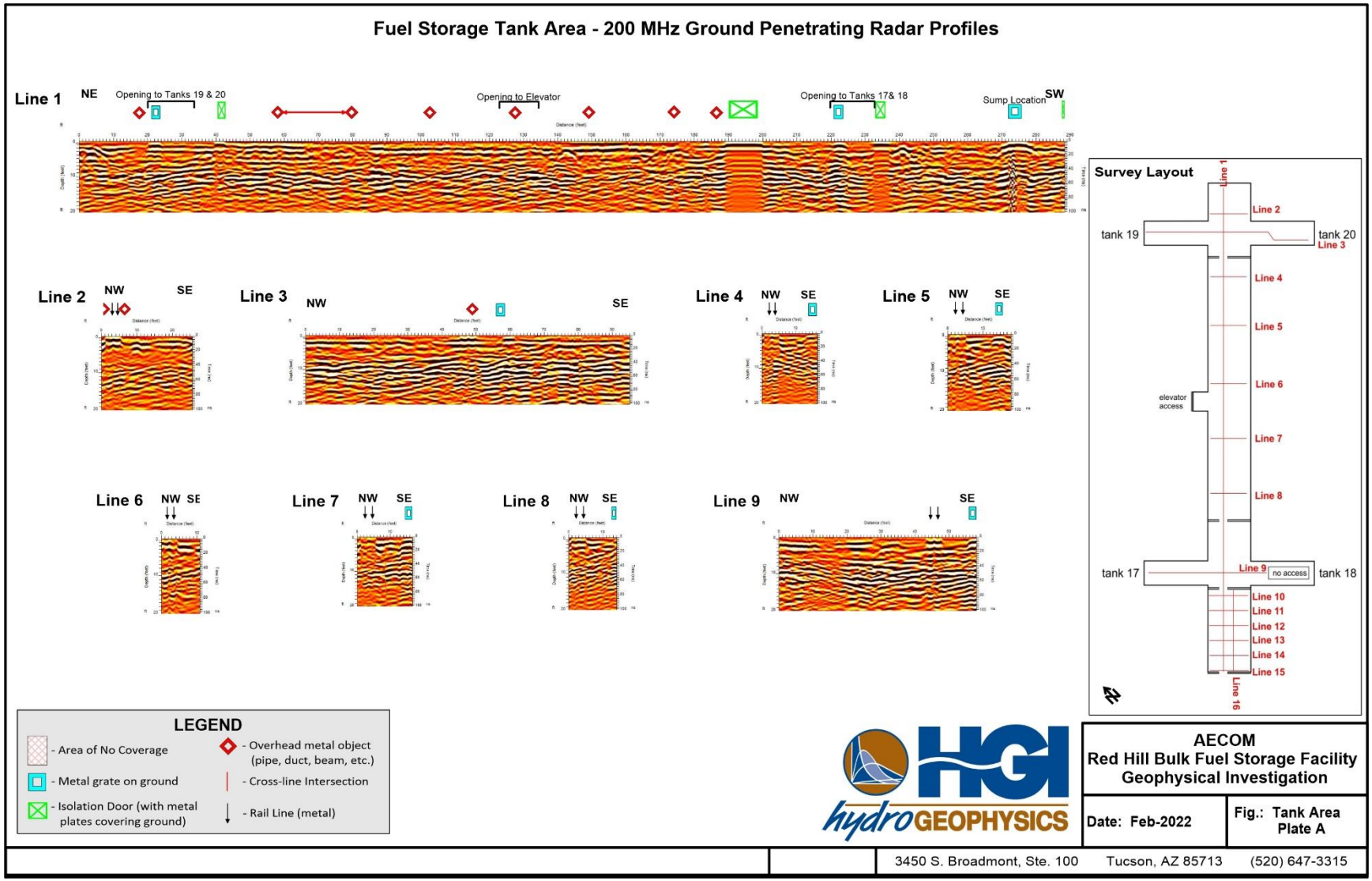


Figure 31. GPR wiggle trace profiles for the 200 MHz antenna for Line 1 and 10 through 16.

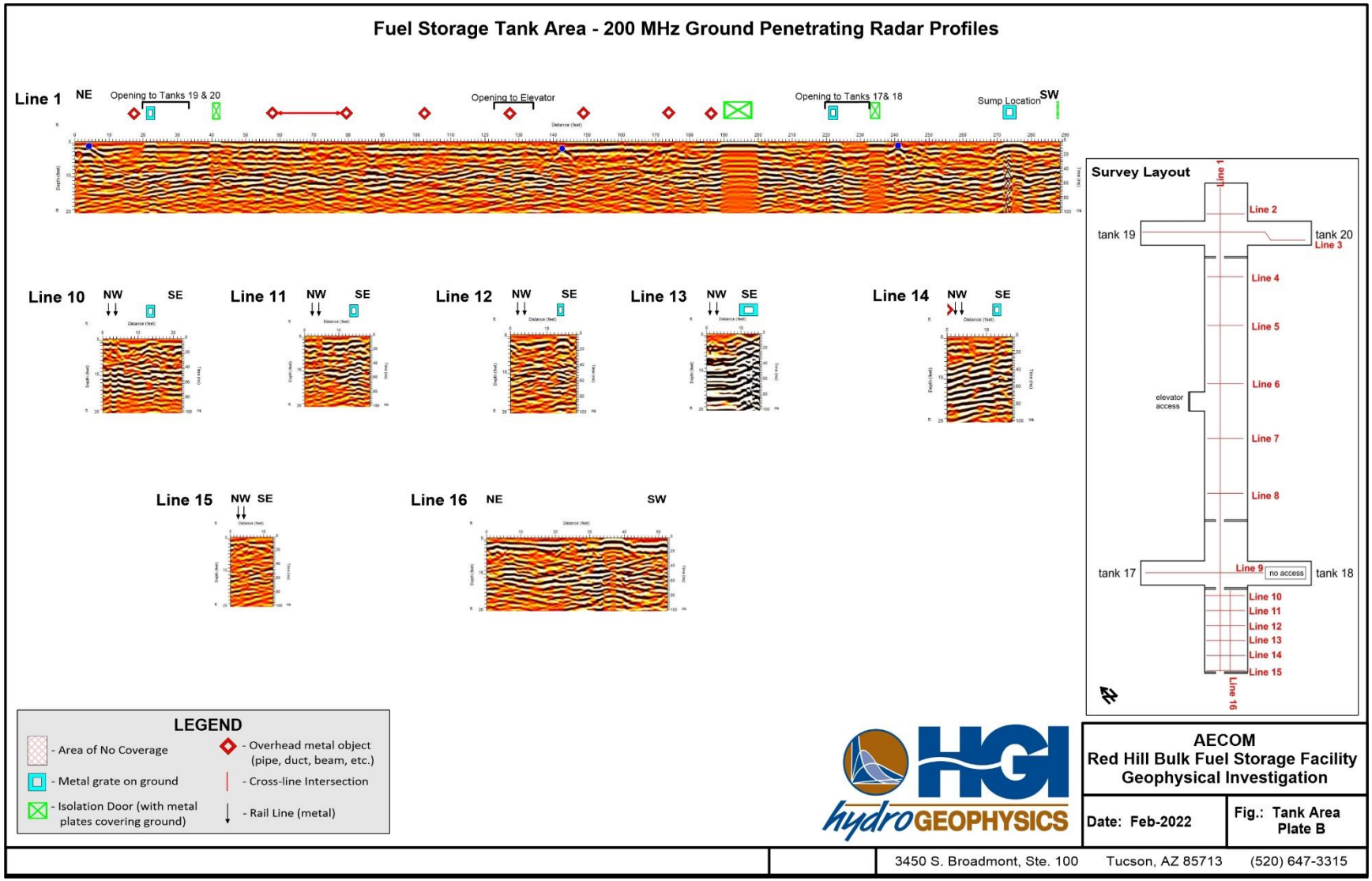


Figure 32. Line 1 through 9 GPR power spectra for the 200 MHz antenna frequency.

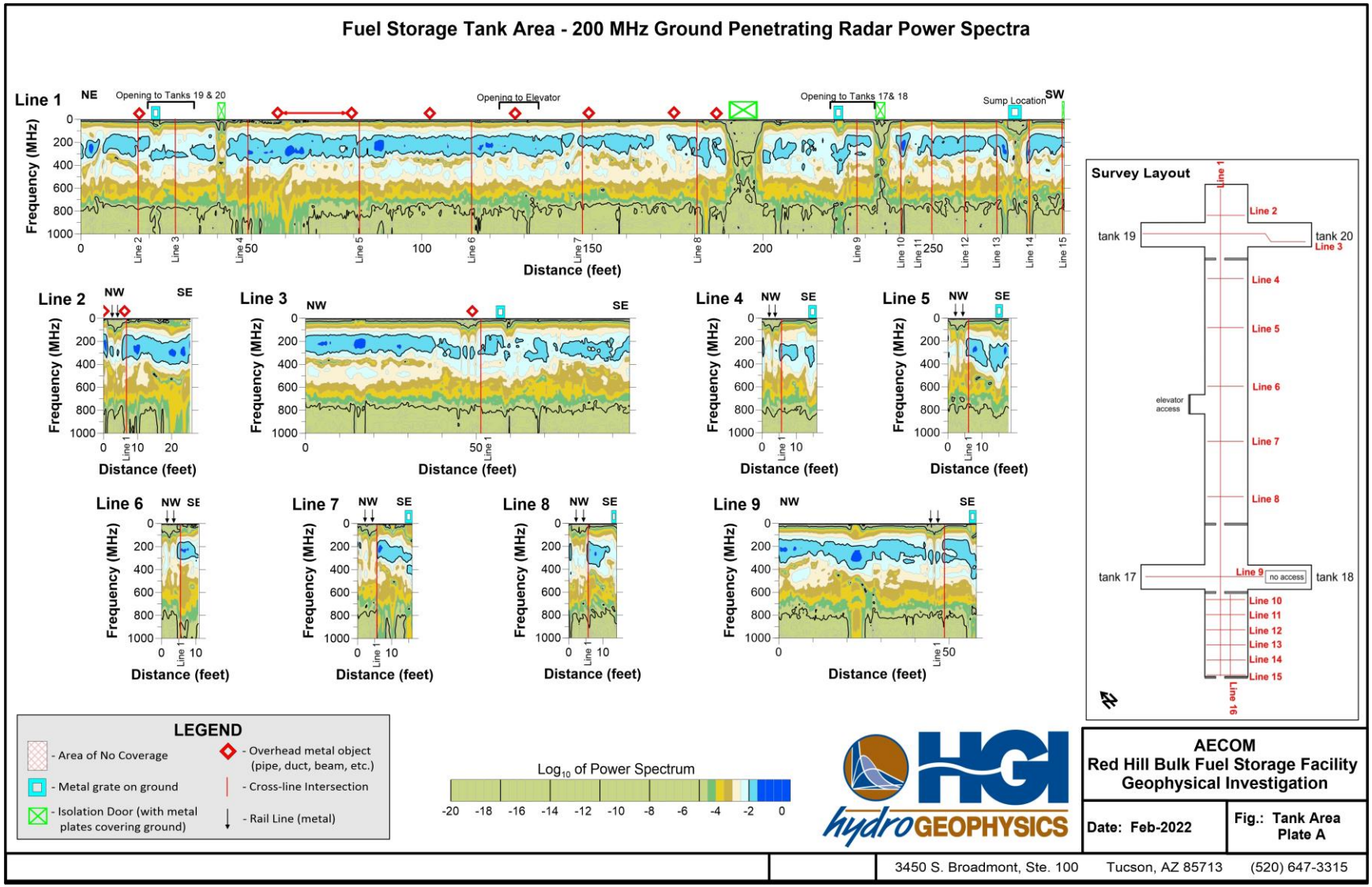


Figure 33. Line 1 and 10 through 16 GPR power spectra for the 200 MHz antenna frequency.

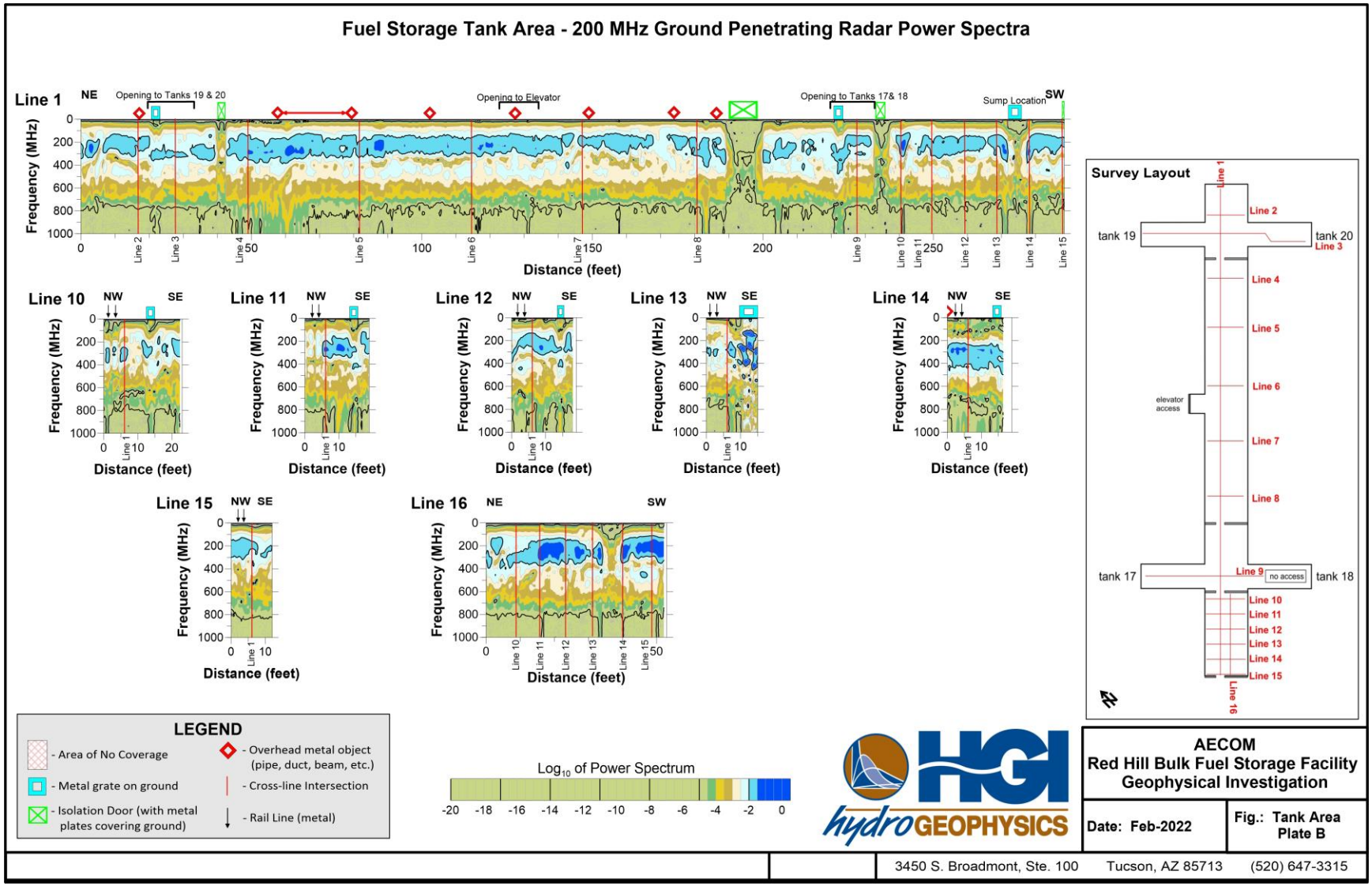


Figure 34. Line 1 through 9 GPR power spectra for the 200 MHz antenna frequency, with overlaid interpretations.

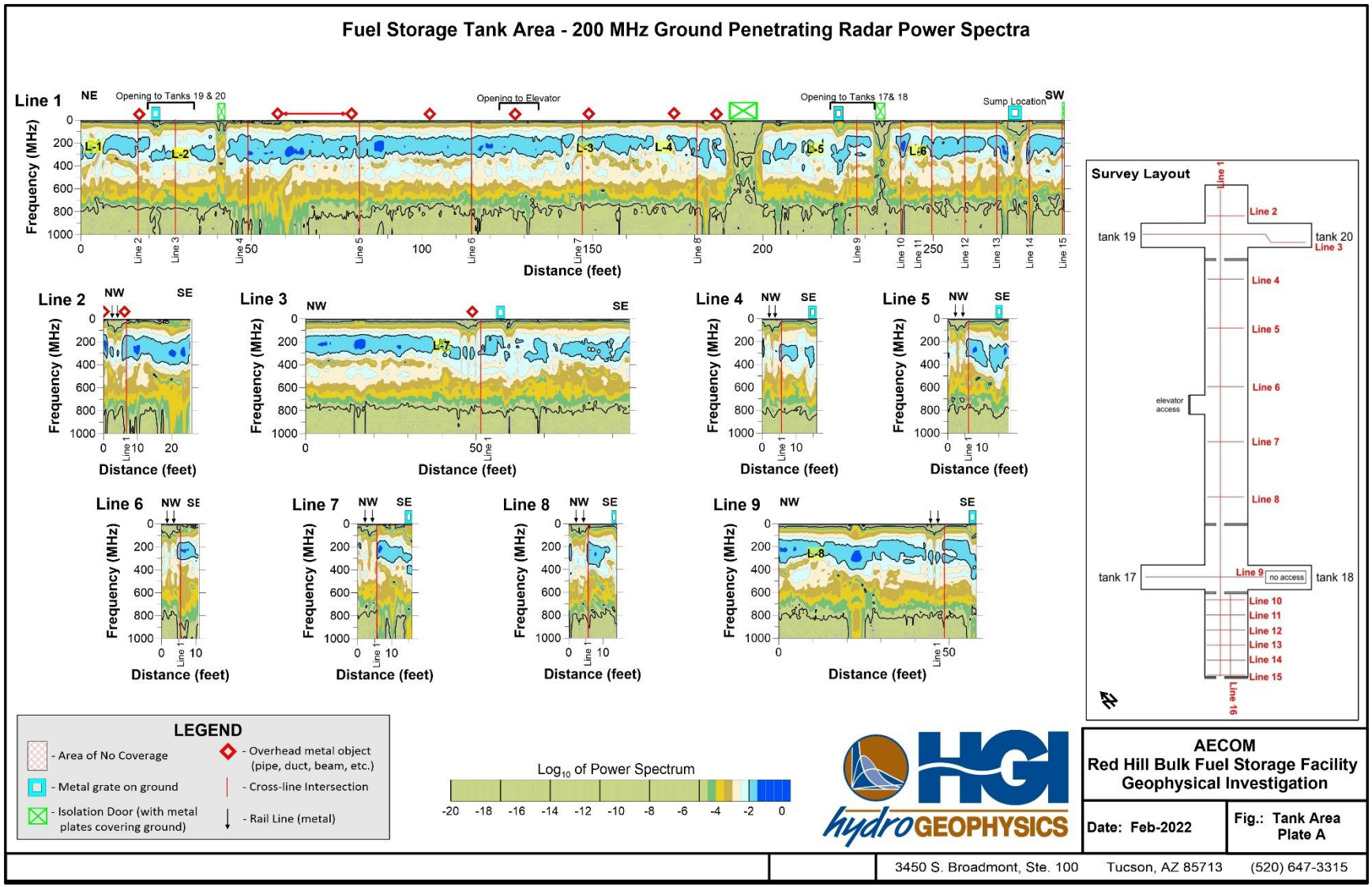
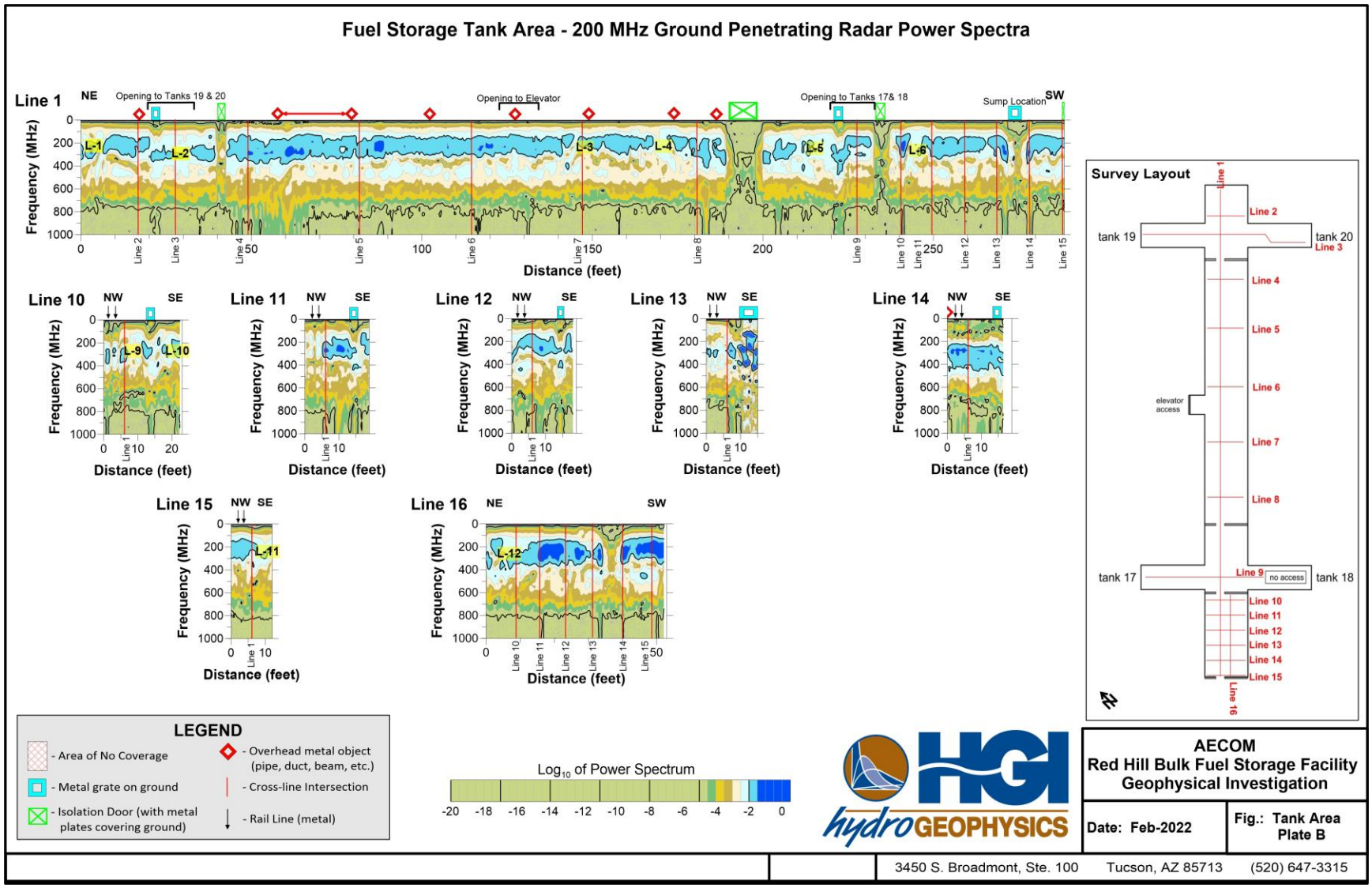


Figure 35. Line 1 and 10 through 16 GPR power spectra for the 200 MHz antenna frequency, with overlaid interpretations.



5.0 SUMMARY

A multi-method pilot geophysical investigation was conducted between January 28th and February 2nd, 2022. The electrical resistivity, IP, and GPR methods were applied to investigate sections of the Lower Access Tunnel at the U.S. Navy Red Hill Bulk Fuel Storage Facility following a leak from an overhead pipe on or about November 20, 2021. Two coincident survey lines of electrical resistivity, IP, and GPR were collected in the sections of the lower access and Pearl Harbor tunnels in proximity to the fuel leak. The GPR survey consisted of antenna frequencies 50, 100, and 200 MHz. In addition, a 200 MHz GPR survey consisting of 16 survey lines was conducted in the lower access tunnel in the vicinity of storage tanks 17 through 20.

The objective of the pilot geophysical investigation was to:

- Test a number of geophysical methods to determine their effectiveness for imaging and delineating potential hydrocarbon sources in the underlying fractured basalt.
- Determine if the geophysical methods could image any void space, preferential pathways for water or fluid movement, and fracture zone or faults within the basalt bedrock.
- In addition, the ground penetrating radar method was applied to the storage tank area to determine if a sub-tunnel drain could be imaged.

Minimal subsurface information was available in the lower access tunnel to ground truth the geophysical model results, although VOC concentrations from soil vapor measurements used to correlate to the geophysical responses in the vicinity of the leak. A summary of the interpretations are provided below:

- The IP model results for Lines 1 and 2 for the leak investigation are heavily impacted by interference from metallic and electrical infrastructure. The majority of the profiles are biased by this interference and not useful for the objective of identifying hydrocarbon sources. However, the responses in the IP profiles were useful in order to identify metallic infrastructure in the subsurface and constrain responses in the other geophysical methods.
- Metallic and electrical infrastructure impacted the electrical resistivity measurements to a lesser degree and the model results overall displayed good converge and RMS errors.
- The GPR wiggle trace profiles for the 50 and 100 MHz antenna for Lines 1 and 2 were again significantly impacted by airwave reflections off the tunnel roof and the large degree of metallic infrastructure within the tunnel. The 200 MHz antenna displayed coherent reflections from the underlying basalt bedrock down to imaging depths of approximately

30 feet. The 200 MHz antenna appeared to also provide the better power spectra, resulting in detailed profiles and trends.

- A number of infrastructure responses were identified were identified in the electrical resistivity and the GPR power spectra profiles, many of which correlated to high chargeability regions in the IP indicating metallic infrastructure. The location of the responses are summarized in Table 6 and Table 7.
- Additional regions that could represent increased moisture or fuel product responses were identified in electrical resistivity and GPR power spectra profiles. Typically, these are responses present as conductive region in the electrical resistivity profiles and lower power regions within the power spectra of the 200 MHz antenna GPR profiles. Many of these responses correlate to elevated VOC concentrations from the soil vapor measurements. These regions should be considered for follow up with more direct sampling or investigative methods such as drilling or pot holing to confirm the presence of hydrocarbon products. A summary of the locations of the responses is provided in Table 9.

Table 9. Summary of the regions interrupted to be responses to potentially increased moisture or fuel products for follow up investigations.

Response	Line #	Start Station (feet)	End Station (feet)	Resistivity Response	GPR Power Spectra Response
B-1	1	00+315	00+375	Yes – conductive	Yes – associated with C-1
B-2	1	00+240	00+300	Yes – conductive	Yes – associated with C-1
B-3	1	00-310	00-220	Yes – subtle conductive	Yes – associated with C-2
B-4	1	00-220	00-50	Yes – conductive	Yes – associated with C-2
C-1	1	00+240	00+370	Yes – associated with B-1 and B-2	Yes
C-2	1	00-490	00+180	Yes – associated with B-3 and B-4	Yes
G-1	2	2500+75	2500+90	Yes – conductive	Not significant
G-2	2	2500+130	2500+155	Yes – conductive	Not significant

- The storage tank area survey identified a number of features that could represent reflections off pipelines, drains, or similar type infrastructure underlying the tunnel floor. These are all located along the Line 1 profile at approximately 4, 142 and 241 feet along the profile.

- The GPR power spectra for the storage tank survey area overall appeared to be much cleaner looking than the results from the fuel leak area. A number of responses were identified, summarized in Table 8, which could be a response to increased moisture or fuel product in the basalt bedrock.

5.1 RECOMMENDATIONS

- In order to avoid the impact of the infrastructure on the electrical resistivity we would recommend acquiring a series of survey lines from the surface, as illustrated in Figure 36. This would improve the sensitivity of the electrical method to any fuel product signatures, increase coverage of the characterization of the basalt bedrock for clinker zones, void spaces, and fracture zones, as well as imaging down to the elevations of the lower access tunnel and below.

Figure 36. Proposed surface electrical resistivity survey layout for follow on investigations.

(b) (3) (A)

[redacted]

- There are several areas in the Lower Access Tunnel that should be investigated further with direct evidence (i.e., drilling, coring, sampling, and testing). Our strategy for sampling is finding areas that have highs and lows in the geophysical datasets. In this case, we have high and low values for VOCs, resistivity, and chargeability using IP. We found those areas within the survey lines and Table 10 lists the conditions along with the locations on

both Lines 1 and 2. Figure 37 shows the drilling locations along the two resistivity survey lines for reference.

Table 10. Recommended drill sites along Lines 1 and 2 in the Lower Access Tunnel

Line	VOC	Resistivity	Chargeability	Drilling Position in Tunnel (station number)
L-1	Low	Low	Low	-445
L-1	Low	High	High	-45
L-1	Low	Low	Low	+415
L-1	Low	High	High	+305
L-1	High	Low	Low	-250
L-1	High	High	High	+151
L-1	High	Low	Low	+287, +354
L-1	High	High	High	+314
L-2	Low	Low	Low	+150, +276
L-2	Low	High	High	+195
L-2	Low	Low	Low	+120
L-2	Low	High	High	+245
L-2	High	Low	Low	+82
L-2	High	High	High	+104
L-2	High	Low	Low	n/a
L-2	High	High	High	+60

- The 200 MHz GPR results display impressive imaging depths and coherent reflection content for the wiggle trace profile. This was reflected in the power spectra for the two survey areas, which were interpreted to contain a number of features indicative of increase moisture or fuel product in the basalt bedrock. Based on the experience gained on this pilot investigation it is recommended to conduct additional GPR surveying using shielded antenna. This would potentially reduced the impacted from reflections off the tunnel roof and infrastructure along the tunnel walls and roof, thus improving the data quality further. We recommended collecting data using frequencies of 250 and 500 MHz, which would provide imaging of up to 30 to 40 feet below the tunnel floor and have dimensions small

enough to avoid much of the metallic infrastructure on the tunnel floor. In addition, the higher frequencies should allow improved resolution for imaging drains and other features below the concrete of the tunnel floor.

Figure 37. Recommended drill sites along Lines 1 and 2 in the Lower Access Tunnel.

(b) (3) (A)

[redacted]

6.0 REFERENCES

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7.0 APPENDIX A – DATA QA FORMS

Electrical Resistivity & Induced Polarization HGI-SOP-RES-001

ELECTRICAL RESISTIVITY & INDUCED POLARIZATION QA PROCEDURE & DOCUMENTATION FORM

GENERAL

Project Name & Manager: (b) (6)	Project Site:	Date(s) of collection:
2022-004 AECOM	RED HILL BULK FUEL STORAGE FACILITY	1/28/22 – 1/31/22
Line ID:	**Field Operator(s):**	**Weather:**
LINE 1	(b) (6)	SUNNY, HUMID, 70-80 F IN A TUNNEL THOUGH

EQUIPMENT (See back of for detailed instructions and procedures)

SuperSting (SS) Serial #:

√	STING ID	Serial #
	SOPHIE	SS1408074
✓	WIVY	SS1603154
	DECLAN	SS0010107
	OLD PUEBLO	SS0207151
	FLORENCE	SS1810054
	MiniSting	SS0608049

Switch Box (SB) Used & Addressing:

√	Switchbox ID	Serial #	Board 1 Address	Pass/Fail	Board 2 Address	Pass/Fail	Board 3 Address	Pass/Fail
✓	SB1	SB0201291	1-28	P/F	29-56	P/F		
✓	SB2	SB061026	57-84	P/F	N/A	P/F		
✓	SB3	SB089606	85-112	P/F	113-140	P/F		
	SB4	SB060630		P/F		P/F		
	SB5	SB1810094		P/F		P/F		
	SB84	SB0401292		P/F		P/F		P/F
	SB28	SB0711299		P/F		P/F		
				P/F		P/F		P/F
				P/F		P/F		P/F
				P/F		P/F		P/F

Passive Cables

DESCRIPTOR	SPACING	SURVEY POSITION
1-84	3m	
85-130	3m	

Survey Design Sketch and Notes:

DIAGNOSTIC TESTING (See back of for detailed instructions and procedures)

Switchbox Relay Test

Pass Criteria: Instrument pass

Switchbox	Address from-to	Pass/ Fail

Receiver Test

Pass Criteria: All Channels = 500mΩ (±25)

Channel	mΩ	Pass/ Fail

Program Cable Addresses

Section	AddrL		AddrH
1	1	to	130

18

Electrical Resistivity & Induced Polarization HGI-SOP-RES-001

SB1	1-56	P/F	1	489.6	P/F
SB2	57-84	P/F	2	494.0	P/F
SB3	85-140	P/F	3	494.2	P/F
SB4		P/F	4	492.5	P/F
SB5		P/F	5	493.3	P/F
SB84		P/F	6	492.8	P/F
SB28		P/F	7	491.8	P/F
		P/F	8	492.0	P/F

Contact Resistance Testing

1 – HVOL (missing clip, repeat <1k)
2-15 – <1k
16 – HVOL (skipped)
17-23 <1k
21 – HVOL (skipped)
22 – HVOL (loose, packed with bentonite <1k)
23 – 1k
24-80 – <1k
81-83 – 1-2k
84-85 – <1k
86 – 1k
87-103 – <1k
104-107 – 1-2k
108-130 – <1k

Skipped Electrode List

16, 21
in middle of walkway
under boards

DATA COLLECTION SETUP (See back of for detailed instructions and procedures)

Line Details:

File Name	L1A.stg
Command File	A113-130.2.cmd
Array type	A113-3
# Electrodes	130
Electrode Spacing	10ft (~3m)
Collection Orientation	
HGI type Roll-along?	Y / N

SS Line Geometry:

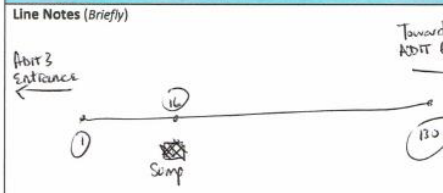
SS Option	User Entry
Units	m
Scaling Factor	1
Start X =	0
Start Y =	0
Start Z =	0
Start Command Line =	1
Roll along	No
End Address	No

SS Measurement Settings:

#	DESCRIPTION	SETTING:
1	No. Cycles:	2
2	Max Error	4%
3	Max Repeat	1
4:	Max Current:	1 Amp
5	Measure Time:	2 sec
6	Separate potential :	OFF
7	Measure mode:	~~RES~~ or RES/IP
8	Defaults:	

FIELD DATA

Line Notes (*Briefly*)



GPS Information

GPS Type: N/A

(WAAS / RTK / DGPS / Client / _____?)

Datum Used

(WGS84 / NAD83 / Local / _____?)

Coordinate Format

(UTM Z___ M / DD.DDDD /

Other _____?)

19

Electrical Resistivity & Induced Polarization *HGI-SOP-RES-001*

	More?

DATA QUALITY ACCEPTANCE

Measurement Error Evaluation	Project Manager Approval
Pass Criteria: 70% of measurement error values less than 5% Circle One: Pass or Fail	(b) (6) [redacted]

COMMENTS *(Briefly Describe Site Activities, Data Collection Notes or other information important for processing)*

File name continued from L1A.stg to L1A-5.stg as battery change over occurred.

SIGNATURE

By signing, I certify that data collection instrumentation pass all required tests and the data collection process followed all required setup and programming instructions listed within this procedure.	By signing, I certify that measured data pass all required data quality tests listed within this procedure.
(b) (6) [redacted] 1/31/22	(b) (6) [redacted] 1/31/22
Field Operator Signature/Date	*Data Inspector Signature/Date*

20

Electrical Resistivity & Induced Polarization *HGI-SOP-RES-001*

ELECTRICAL RESISTIVITY & INDUCED POLARIZATION QA PROCEDURE & DOCUMENTATION FORM

GENERAL

Project Name & Manager:	Project Site:	Date(s) of collection:
(b) (6) [redacted] 2022-004 AECOM	Red Hill Bulk Fuel Storage Facility	1/31/22 — 1/31/22
Line ID:	**Field Operator(s):**	**Weather:**
Line 2	(b) (6) [redacted]	Sunny, Humid, 70-80 F in Tunnel

EQUIPMENT (See back of for detailed instructions and procedures)

SuperSting (SS) Serial #:

√	STING ID	Serial #
	SOPHIE	SS1408074
✓	WIVY	SS1603154
	DECLAN	SS0010107
	OLD PUEBLO	SS0207151
	FLORENCE	SS1810054
	MiniSting	SS0608049

Switch Box (SB) Used & Addressing:

√	Switchbox ID	Serial #	Board 1 Address	Pass/ Fail	Board 2 Address	Pass/ Fail	Board 3 Address	Pass/ Fail
✓	SB1	SB0201291	1-23	P/F	29-36	P/F	[redacted]	
	SB2	SB061026		P/F		P/F	[redacted]	
	SB3	SB089606		P/F		P/F	[redacted]	
	SB4	SB060630		P/F		P/F	[redacted]	
	SB5	SB1810094		P/F		P/F	[redacted]	
	SB84	SB0401292		P/F		P/F		P/F
	SB28	SB0711299		P/F		P/F	[redacted]	
				P/F		P/F		P/F
				P/F		P/F		P/F
				P/F		P/F		P/F

Passive Cables

DESCRIPTOR	SPACING	SURVEY POSITION
1 – 44	3m	2023 – 2500+43

Survey Design Sketch and Notes:

DIAGNOSTIC TESTING (See back of for detailed instructions and procedures)

Switchbox Relay Test	Receiver Test	Program Cable Addresses
Pass Criteria: Instrument pass	Pass Criteria: All Channels = 500mΩ (±25)	Section AddrL AddrH
Switchbox / Address from-to / Pass/ Fail	Channel / mΩ / Pass/ Fail	1 1 to 44

18

Electrical Resistivity & Induced Polarization *HGI-SOP-RES-001*

SB1	1-56	P/F
SB2		P/F
SB3		P/F
SB4		P/F
SB5		P/F
SB84		P/F
SB28		P/F
		P/F

1	492.3	P/F
2	493.4	P/F
3	494.9	P/F
4	493.1	P/F
5	494.5	P/F
6	493.4	P/F
7	492.3	P/F
8	492.7	P/F

Contact Resistance Testing

1 – 44 < 1k

Skipped Electrode List

N/A

DATA COLLECTION SETUP (See back of for detailed instructions and procedures)

Line Details:

File Name	LNZA
Command File	Alt3-130.cmd
Array type	Alt-3
# Electrodes	44
Electrode Spacing	10 feet (~3m)
Collection Orientation	00+230 to 2500+430
HGI type Roll-along?	Y / N

SS Line Geometry:

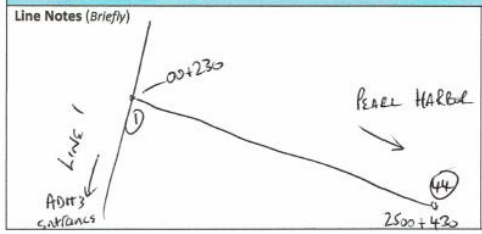
SS Option	User Entry
Units	M
Scaling Factor	1
Start X =	0
Start Y =	0
Start Z =	0
Start Command Line =	1
Roll along	No
End Address	~~48~~ Y (44)

SS Measurement Settings:

#	DESCRIPTION	SETTING:
1	No. Cycles:	2
2	Max Error	4%
3	Max Repeat	1
4:	Max Current:	1 Amp
5	Measure Time:	2 sec
6	Separate potential :	OFF
7	Measure mode:	~~RES~~ or RES/IP
8	Defaults:	

FIELD DATA

Line Notes (*Briefly*)



GPS Information

GPS Type: N/A

(WAAS / RTK / DGPS / Client / _____?)

Datum Used

(WGS84 / NAD83 / Local / _____?)

Coordinate Format

(UTM Z___ M / DD.DDDD /

Other _____?)

19

Electrical Resistivity & Induced Polarization *HGI-SOP-RES-001*

More?

DATA QUALITY ACCEPTANCE

Measurement Error Evaluation

Pass Criteria: 70% of measurement error values less than 5%

Circle One: Pass or Fail

Project Manager Approval

COMMENTS (*Briefly Describe Site Activities, Data Collection Notes or other information important for processing*)

SIGNATURE

By signing, I certify that data collection instrumentation pass all required tests and the data collection process followed all required setup and programming instructions listed within this procedure.

[redacted] (b) (6) 2/1/22

Field Operator Signature/Date

By signing, I certify that measured data pass all required data quality tests listed within this procedure.

[redacted] (b) (6) 2/2/22

Data Inspector Signature/Date

20

RPT-2022-004a, Rev. 3

RED HILL BULK FUEL STORAGE FACILITY - PHASE II GPR SURVEY

[redacted] (b) (6), PhD
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hydroGEOPHYSICS
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Date Published
February 2023

Prepared for AECOM

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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

In November 2022, hydroGEOPHYSICS, Inc. (HGI), under contract to AECOM, performed a Phase II geophysical investigation of the Lower Access Tunnel at the United States (U.S.) Navy Red Hill Bulk Fuel Storage Facility, Oahu, Hawaii. The Phase II study was limited to the use of ground penetrating radar (GPR) near the entrance of Adit 3, from station 00+500 to 00-670. On or about November 20, 2021, a leak into the tunnel created a significant risk to the underlying groundwater. The source of the leak was from a pipeline nearly (b) (3) (A) from the entrance of the tunnel; the leak entered the host rock from the tunnel floor from the leak point to a sump near the entrance.

1.2 SITE LOCATION

The Red Hill Bulk Fuel Storage Facility is located approximately 2.5 miles northeast of Pearl Harbor. The Facility lies along the western edge of the Koolau Range and is situated on a topographic ridge that divides the Halawa Valley and the Moanalua Valley. Figure 1 and Figure 2 display the general location of the Phase II geophysical investigation.

1.3 OBJECTIVE OF INVESTIGATION

The objective of the Phase II geophysical investigation was to:

- Map the tunnel with GPR utilizing three high frequency, shielded antennas to determine their effectiveness for imaging and delineating potential hydrocarbon sources in the underlying fractured basalt.
- Identifying geological structure or perched water tables important for mapping LNAPL

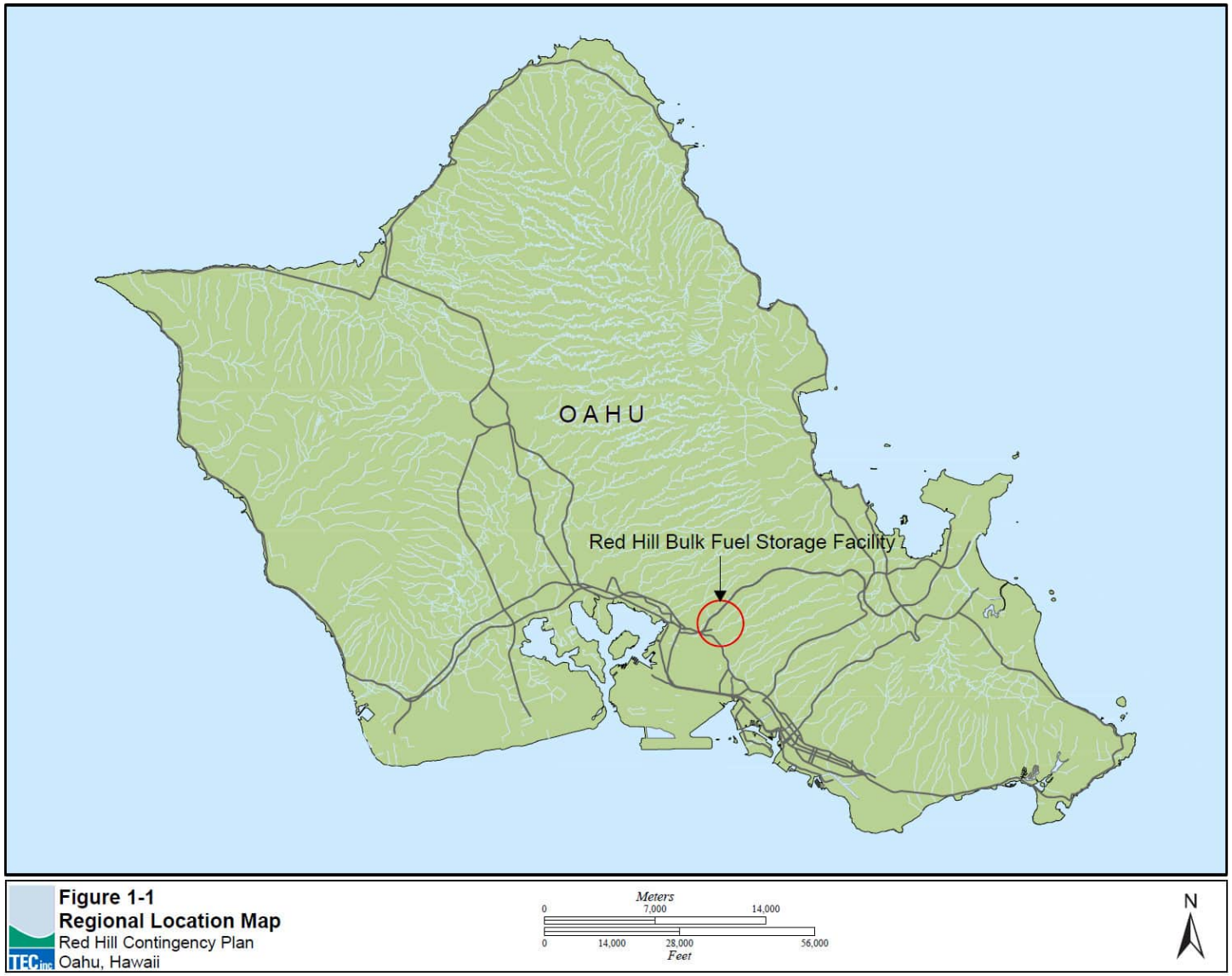
1.4 SCOPE OF INVESTIGATION

Three GPR antenna were employed and co-analyzed to investigate sections of the lower access tunnel in proximity to the leak location. The chosen antenna frequencies were 250, 500, and 1,000 MHz. Figure 3 displays a detailed coverage map of the GPR investigation, with lines of GPR data collected along the (b) (3) (A) l, and (b) (3) (A) sides of the tunnel.

The acquisition was divided into five sections, with the section boundaries shown in Figure 3. Section 1 covers the leak and Section 5 is nearest the opening at Adit 3. Tunnel coverage varied along each section due to obstructions preventing access to specific parts of the tunnel. For example, the (b) (3) (A) side of Section 4 was obstructed by the large HDPE pipe. The results will be divided into the different sections for ease of describing the different aspects of the data. Based

on the results and uncharacteristic changes in the GPR data, several exploration anomalies were identified for a follow up, invasive investigation (i.e., drilling).

Figure 1. General Location Map.



Taken from: Red Hill Bulk Fuel Storage Facility Final Groundwater Protection Plan, 2008 by TEC Inc.

Figure 2. General overview of the Red Hill Bulk Fuel Storage Facility on Oahu, Hawaii.

(b) (3) (A)

[redacted]

Figure 3. Survey Coverage for the Phase II GPR Investigation.

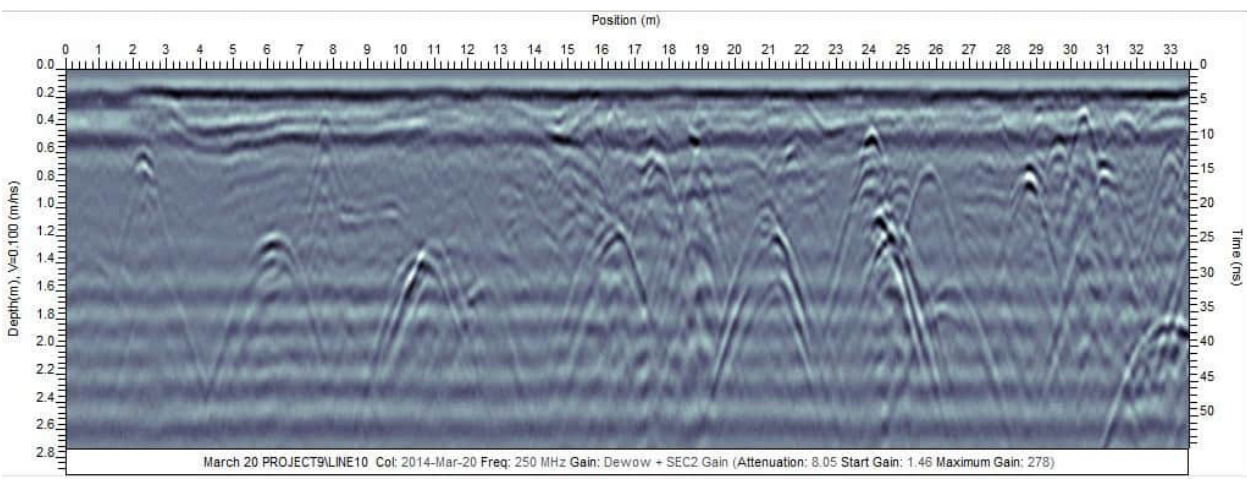
(b) (3) (A)

2.0 GEOPHYSICAL THEORY

2.1 GROUND PENETRATING RADAR (GPR)

GPR uses high-frequency radio waves, typically in the range 10 MHz to 1.2 GHz to image subsurface structures and features. A transmitter antenna emits electromagnetic (EM) energy into the subsurface. When this energy encounters a buried object or an interface between materials having different values of relative dielectric permittivity (ε_r), part of the energy is reflected back to the surface. A receiving antennae records the variations in the return signal as a trace (or voltage amplitude) over time. The signals are plotted in real-time as distance versus EM wave travel time allowing an assessment of the results as the survey progresses (Figure 4), typically presented as a radargram (or wiggle trace plot). Target depth is proportional to the time taken for the signal to travel down and back to a given layer.

Figure 4. Example processed GPR radargram illustrating diffraction hyperbola responses produced by subsurface features, such as void spaces and boulders.



GPR responds to changes in electrical properties (dielectric permittivity and electrical conductivity) which are a function of soil and rock material, moisture content, and metal. For example, it is possible to map a shallow water table because the saturation increases the ε_r by a factor of 3 to 4 above unsaturated soils, but depends on the sharpness of the transition and the thickness of the capillary zone above it. Electrically conductive materials, such as clay rich sediments, will limit radar signal penetration and hence imaging depths by attenuating the EM waves. The relative dielectric permittivity is a dimensionless measure of a materials capacity to store a charge when an electric field is applied (Table 1). This constant is primarily controlled by water content. Differences in dielectric constants at interfaces cause reflections in the GPR data, and the strength of reflections is controlled by the contrast in the dielectric constants. Dielectric

differences as small as one, such as the difference between air and snow, can produce reflections in GPR data.

Table 1. Relative dielectric permittivity values for some common materials.

AIR	1
SNOW	1-2
PVC	3
ASPHALT	3-5
FRESHWATER ICE	4
CONCRETE	4-11 (5)
BEDROCK	
GRANITE	4-7
SANDSTONE	6
SHALE	5-15
LIMESTONE	4-8
BASALT	8-9
SOILS AND SEDIMENTS	4-30
FRESH AND SALTWATER	81

Specific to imaging below the tunnel at Red Hill, there were generally two types of anomalies we observed in the data: stratigraphic layers of different materials such as concrete, gravel, basalt, and potentially the water table; and isolated pieces of metal such as rebar, buried beams, and rails. Figure 5 shows a portion of a radargram collected on the (b) (3) side of Section 5 (near the entrance at Adit 3) with the 250 MHz antenna. The top plot shows the data and the bottom plot shows the interpreted layers that were resolvable by the GPR, along with the water table (in blue) calibrated from an existing well. There are several items of note in Figure 5, for example, the shape of the response due to isolated metal and the layering showing seeming similar and parallel strata. For the metal, Figure 6 demonstrates that when the GPR antennae move over buried rebar or similar, the reflections are very strong and appear hyperbolic in shape due to simply to the geometry. The electromagnetic waves generated by the radar (at the transmitter, TX) can be simplified as a series of rays emanating in all directions, with one in particular hitting the rebar (Figure 6A), then reflecting back and recorded at the receiver (RX). The result in the radargram (Figure 6B) is a hyperbola, with its vertex closest to the surface, overlain on the other layered reflections recorded by the RX. Within the tunnel, there were many diffraction hyperbolas recorded, particularly along the center line.

Figure 5. Example radargram showing layering due to different strata and diffraction hyperbola.

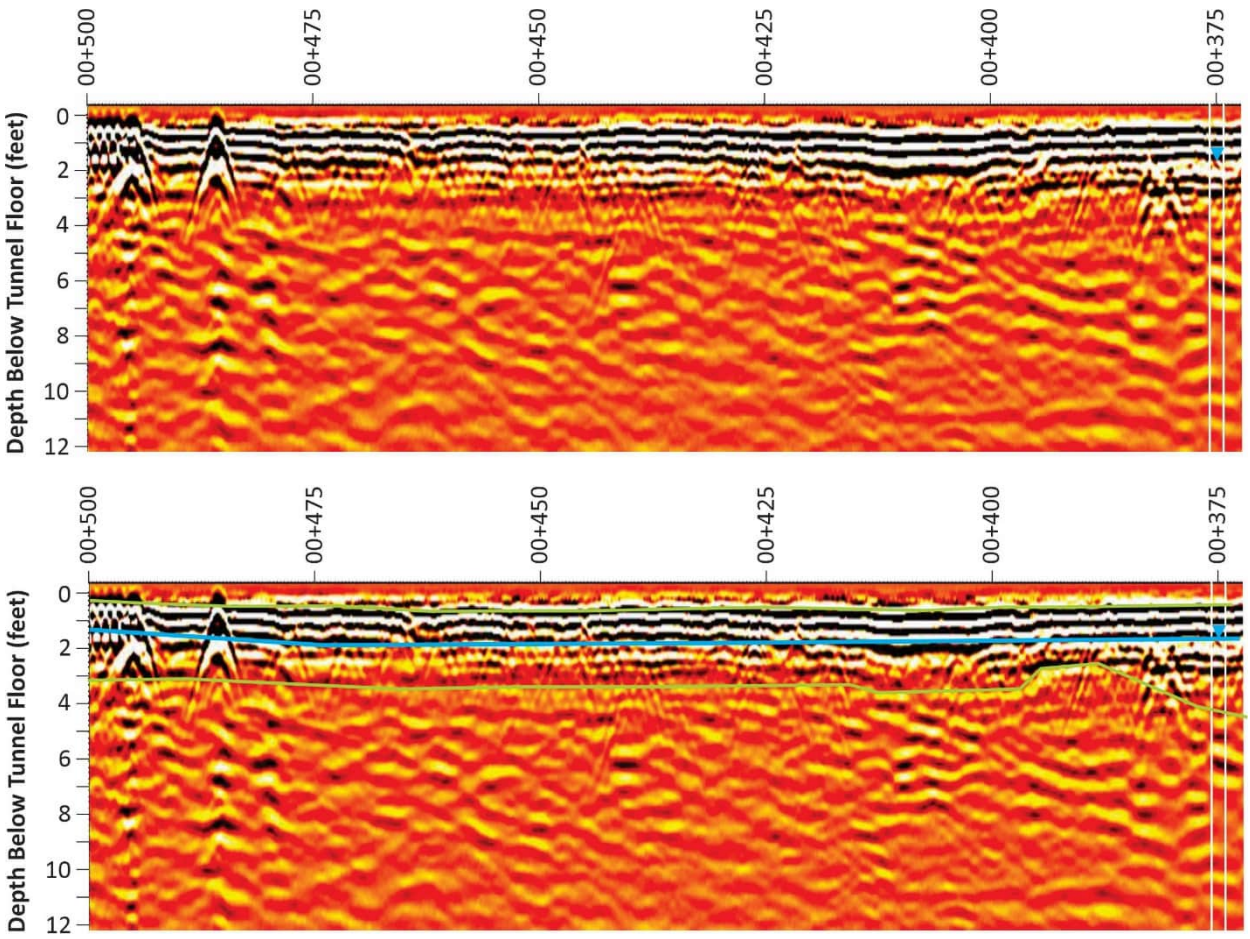
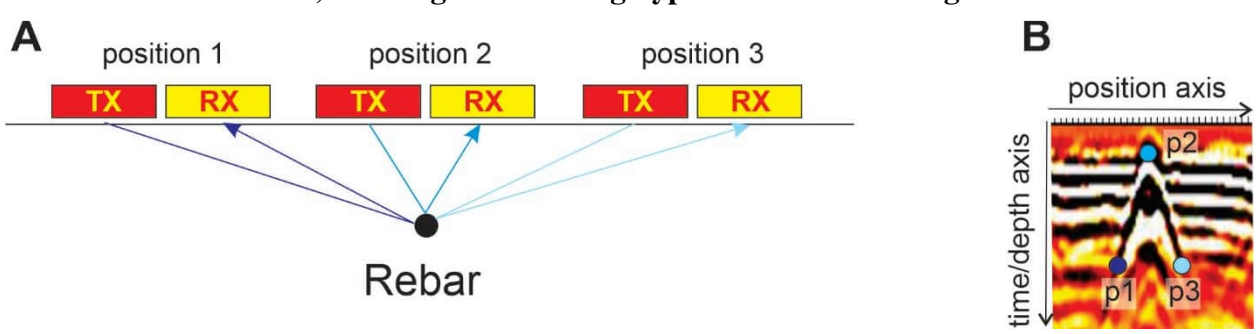


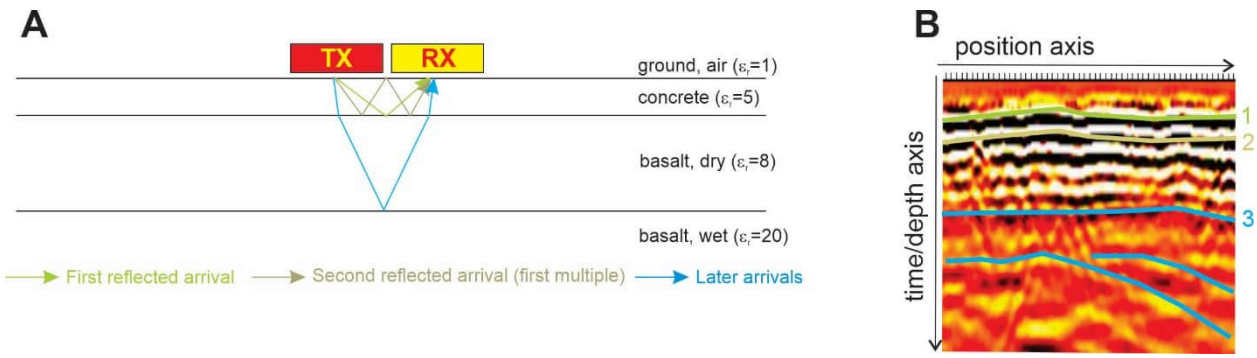
Figure 6. Schematic of radar traversing buried metal: A) showing the ray diagram, and B) showing the resulting hyperbola in the radargram.



For stratigraphic mapping with radar, we looked for flat lying layers resulting from reflections at the transition from one material to the next with different relative dielectric permittivity values. The first arrival in the radargram, after the direct wave through the air, was the reflection at the base of the concrete in the tunnel. The reflection was caused by a change in dielectric permittivity from concrete (ε_r=5) to basalt (ε_r=8). Figure 7A shows the schematic of the first reflected arrival

in green. In Figure 7B we demonstrate the location and depth of this reflection as layer 1. After the first reflected arrival, we typically observe multiple reflections based on that first layer and the second reflection in both Figures 7A and 7B highlight one such multiple. Multiples are not generated from reflections of deeper strata and therefore we ignore their influence. Deeper strata are typically recognized as having structure that is different from the set of multiples, similar to layer 3 (in blue) in Figure 7B. Deeper strata can be missed if the arrival of a multiple and reflection from a deeper strata occur at the same time, which happens when the deeper layer is thin and air filled. Also, it can be difficult confidently map deeper strata based on the attenuation of the EM wave with respect to time/depth.

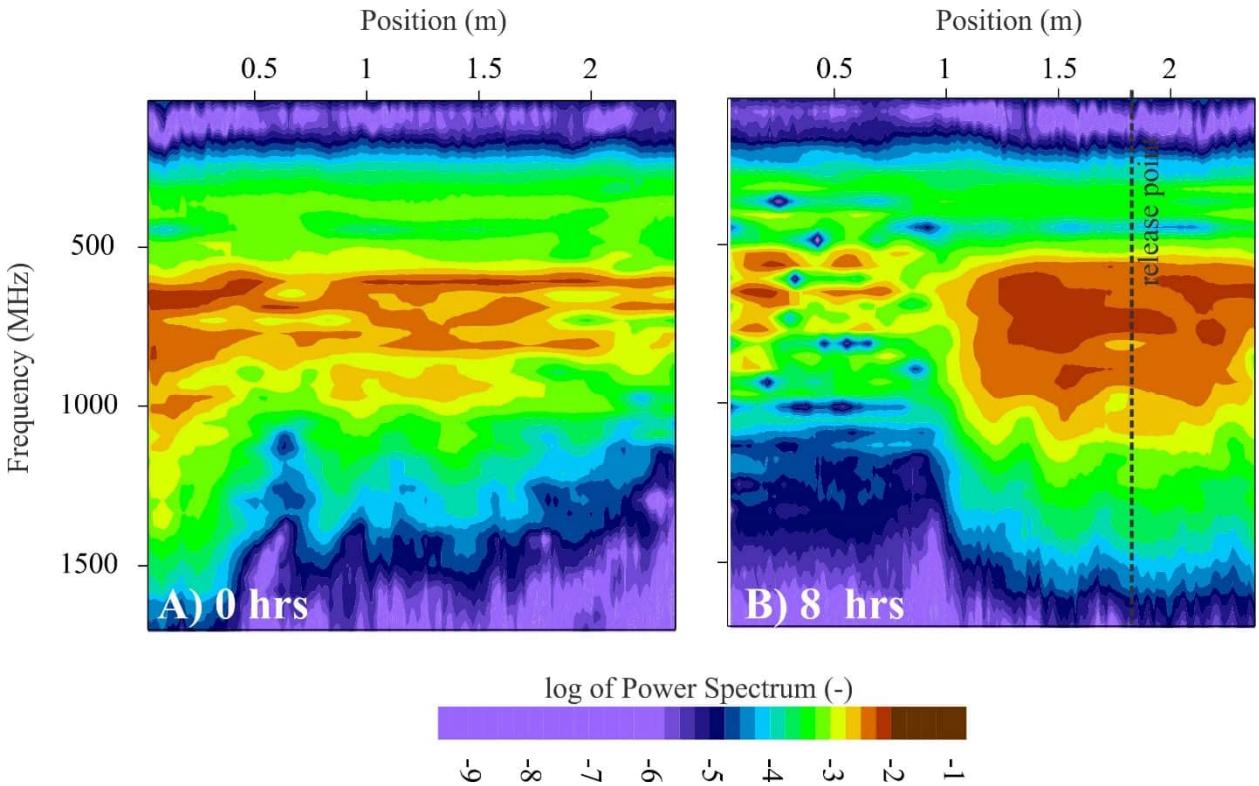
Figure 7. Schematic of radar mapping layered strata: A) showing the ray diagram, and B) showing the resulting reflections in the radargram.



When mapping the water table, the reflections will look similar to any other reflection where there is a difference in relative dielectric permittivity. Although saturated materials have much large values of ε_r, which in theory should cause a larger reflected amplitude, attenuation of the EM wave often dampens the amplitude, making it difficult to distinguish from any other type of material. The wells locating the water table periodically along the tunnel helped to calibrate its depth.

Another method of examining GPR data is to investigate the frequency content of the received trace to determine shifts within the power spectra. The power spectra is calculated by conducting a Fourier transform on each trace then squaring the result. In general, the power spectrum of a signal indicates the relative magnitudes of the frequency components that combine to make up the signal. A GPR antenna with a frequency of 1,000 MHz will have most of the spectra within 500 to 2,000 MHz. A shift in the power spectra may indicate a target. Figure 8 shows an example of a hydrocarbon release within a sand tank. Prior to the release (Figure 8A), the spectra shows high power (in red contours) between 600 and 900 MHz consistently across the tank. After release (Figure 8B) the power spectra at the release point completely changes due to the decreased dielectric permittivity of ethanol filled pores compared to water filled pores. Other materials in the subsurface, such as oils, salt, and even the grain size, could also influence the power spectra (Levitskaya and Sternberg, 1994). A change in saturation may change the power spectra if it causes attenuation of higher frequency components, but will not help with locating the depth of the water table because the axis orthogonal to position or tunnel distance is frequency.

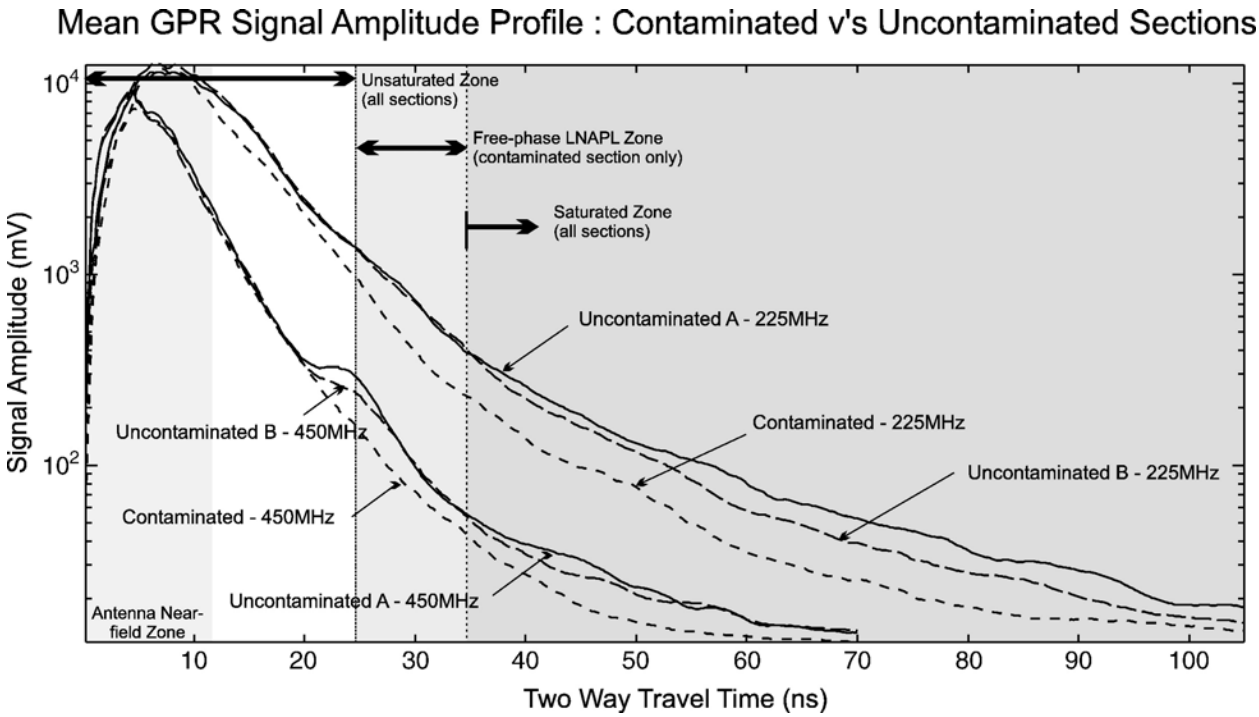
Figure 8. Power spectra of GPR traces during an ethanol release in a tank: a) prior to release; b) 8 hours after release.



Others have used attributes from the GPR signal in the time domain to investigate hydrocarbon releases. Cassidy (2007) used attenuation and amplitude dampening to investigate regions contaminated by a light non-aqueous phase liquid (LNAPL) originating from a fuel spill. His work tested both 225 and 450 MHz antenna GPR systems in clean and contaminated soils. Figure 9 shows how the filtered mean amplitude for a group of radar traces in contaminated and uncontaminated compared to each other, with smaller mean amplitudes attributed to contamination. He applied a simple Gaussian filter to smooth the mean trace data.

For our work, we will present amplitude data first as an unfiltered, color-contoured section that shows both positive and negative amplitude reflections with color highlighting the strength of the amplitude. This is different than the traditional radargram of Figure 5, where all positive amplitude values are black, all negative amplitudes are white, and values near zero are orange. Second, similar to that of Cassidy, we took the absolute value of the amplitude and filtered it across time to smooth out variations. These data along with the frequency content and power spectra will be used to assess whether the high frequency antenna can distinguish between clean and contaminated soils when compared to soil vapor data provided by AECOM. We are not using the amplitude attributes to distinguish different layers – this is the purpose of the radargrams.

Figure 9. Mean amplitude for clean and contaminated soils using 225 and 450 MHz antennae (from Cassidy, 2007).



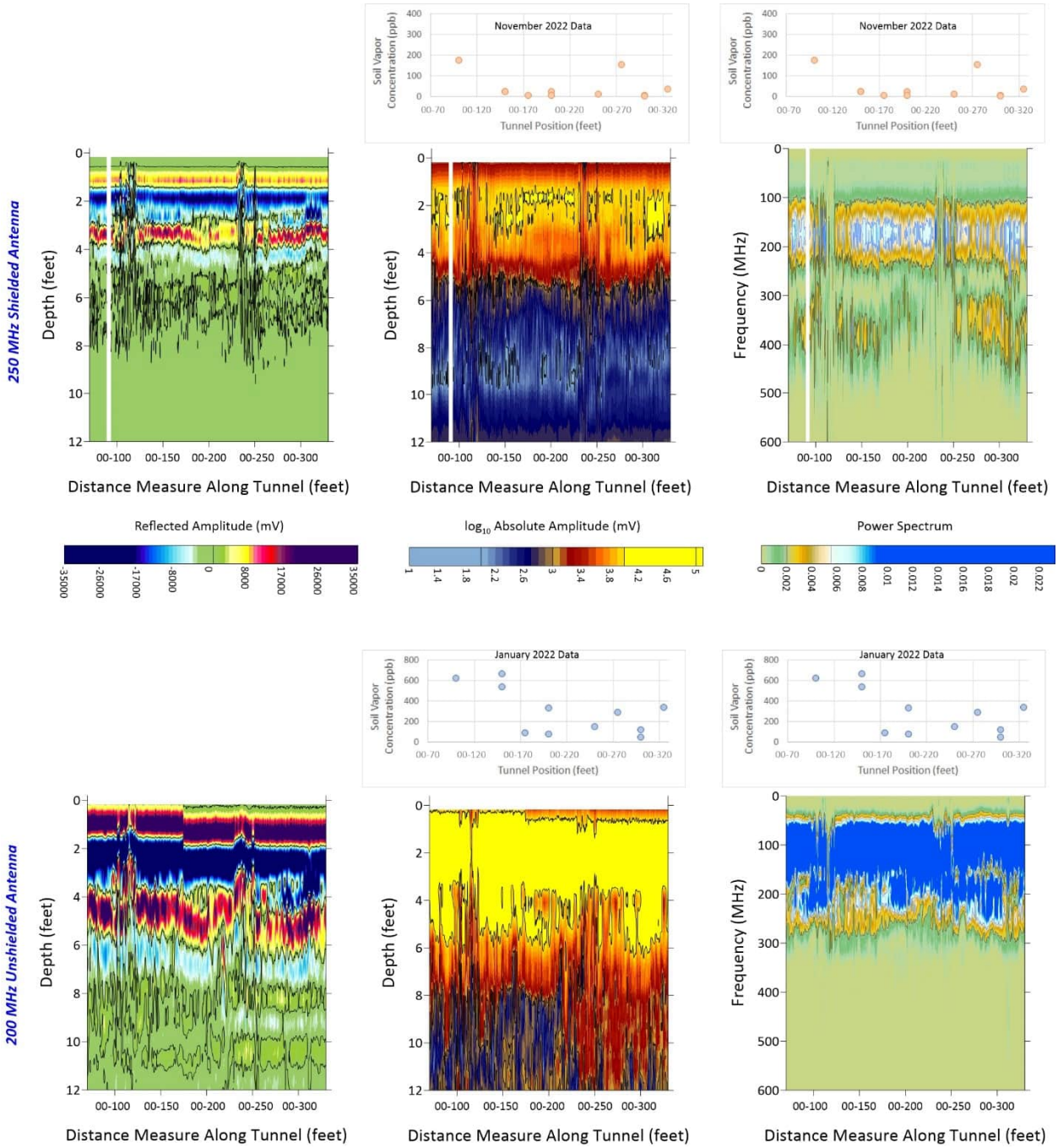
An example of our data presentation is shown in Figure 10 for both the new data collected with 250 MHz shielded antenna and the original pilot GPR acquisition from January 2022, using a 200 MHz unshielded antenna. Note that around 100 and 240 feet along the profiles, subsurface metal obstructs much of the data and will be ignored. The left row of contours shows each trace from about station 00+70 to 00+330 with values in mV. To help draw the eye to the null value of zero, we added a solid black line at zero. This black line is not to be confused with distinguishing different layers within the subsurface. The shielded antenna (top left) shows a positive-negative-positive reflection pattern with the first positive peak arriving around 1.15 feet assuming a velocity of 0.13 m/ns (0.42 ft/ns) and the first negative peak arriving at around 1.85 feet. Based on the lithology, the upper 0.5 to 8 feet is comprised of loose A'a clinker followed by alternating layers of massive A'a basalt and loose A'a clinker. Below about 70 feet, the material changes to Pahoehoe basalt. The reflections in the shielded data could simply be these lithological changes. In the unshielded 200 MHz data (bottom left) we observe broader reflections with higher amplitudes. The broader reflections are likely airwave reflections originating from the pipes, walls, and ceiling of the tunnel adding constructively to the subsurface reflections making them appear broader than the unshielded antenna. Unshielded antennae are also known to be of significantly higher power with upwards of double the amplitude compared to the shielded.

The middle column of contour plots shows the converted and filtered amplitude of each trace; the amplitudes have been log transformed. From these data, we would expect to see signal attenuation from the presence of LNAPL. Atop the most recent data collected in November (top middle), we

show the scatter of measured soil vapor coincident with positions of the GPR. At 100 and 275 feet along the profile, the soil vapor is elevated to near 200 ppb and very low elsewhere. There appears to be a loose qualitative association with dampened amplitude and high soil vapor. The data from January 2022 (bottom middle) shows a broad amplitude between 10,000 and 30,000 mV without much differentiation or correlation to the soil vapor data.

The last series of data shows frequency content. Similarly, we would expect a frequency dependent response to change in the presence of elevated soil vapor. The shielded antenna (top right) shows two main lobes of frequency with higher power at 170 and 340 MHz. The power at 340 MHz is highly variable and there is not an obvious correlation with the soil vapor. For the unshielded antenna (bottom right), the highest power is over a broad spectrum from 60 to 220 MHz with some of the higher frequency data occasionally muted. Again, there is no obvious relationship with power and the soil vapor in January 2022 over this short section.

Figure 10. GPR attribute processing comparing shielded to unshielded antenna.



2.2 PERFORMANCE OBJECTIVES

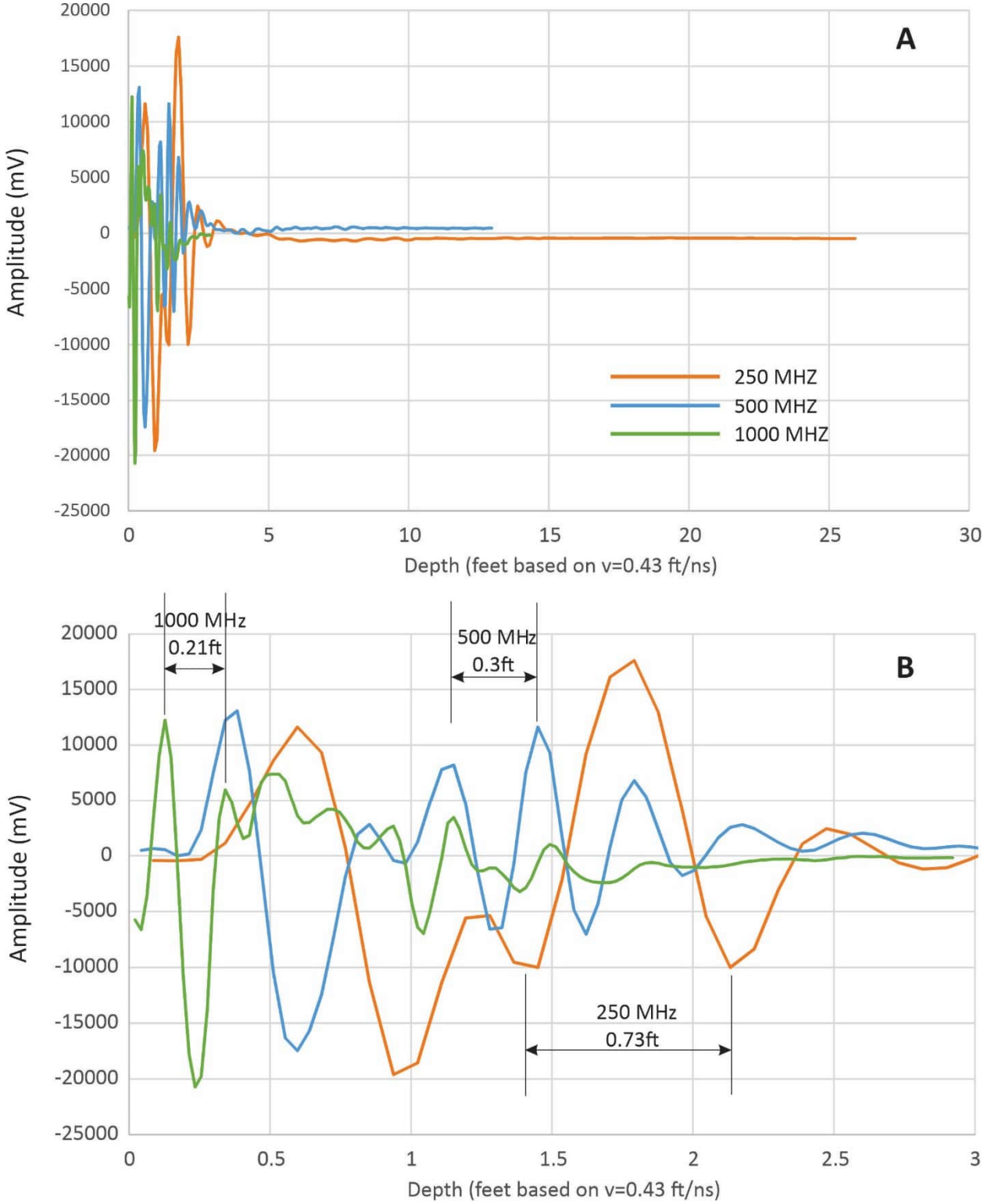
To investigate the material below the tunnel floor, we tested antennae frequencies of 250, 500, and 1000 MHz, each shielded to prevent backscatter of energy from infrastructure in the tunnels. Unshielded antennae were used in the first survey in January 2022 with much lower frequencies. The results from unshielded antennae were noisy and of lower resolution than desired. Based on performance and feedback from stakeholders, the current configuration of antenna frequencies were chosen.

The depth of investigation and target resolution is a direct function of both antenna frequency and subsurface properties. In general, depth of investigation decreases with increasing frequency due to the dependence of attenuation of EM energy on frequency. Figure 11 shows an example of three traces collected at the same position within the tunnel. The Figure 11A shows the full range of data acquired for each frequency, with 250 MHz recorded to 26 feet, 500 MHz recorded to 12 feet, and 1000 MHz recorded to 6 feet. For the 250 MHz, resolving anomalies as indicated by a positive amplitude arrival is difficult past 12 feet, and therefore most data will be limited to 12 feet in the plots presented in the Results section. For the 500 MHz and 1000 MHz, depth of investigation was limited to 6 feet and 3 feet, respectively.

Figure 11B focuses on the top 3 feet of each frequency to highlight and compare the details within each frequency. First, we note that the amplitude of the first positive peak are the same for all of the frequencies, which is attributed to the similar amount of power that each use. We then used the peak-to-peak (PTP) difference to calculate the expected resolution, or the minimum thickness that each frequency is capable of imaging. For 250 MHz, the PTP distance is about 0.73 feet or 9 inches. The resolveability for the 500 MHz is better at around 0.3 feet (less than 4 inches). The minimum thickness for 1000 MHz is approximately 0.2 feet (less than 3 inches). Therefore, as long as multiples are not obscuring the arrivals, we are able to map layers with the 250 MHz antenna at ±9 inches.

When investigating and evaluating amplitude attributes, there may not be a physical causation that can necessarily explain all of the anomalous patterns we observe. What we try to highlight with these data are slight changes that possibly correlate to elevated readings of soil vapor, which in turn is related to elevated LNAPL below the tunnel. Our recommended anomalies for additional exploration simply reflect a change in patterns within the attributes.

Figure 11. Amplitude traces for 250, 500, and 1000 MHz at station 00-405, north line: A) full range of recorded data, B) limited view to 3 feet with resolution for each frequency.



2.3 DISCLAIMER

Geophysical data provide objective information about the physical properties of the earths subsurface. Interpretation of modeled geophysical data often includes on site-specific correlation with information from direct observation methods such as drilling, excavation, or construction logs. In the absence of these logs or observations, HGI personnel interpret the data based on experience with similar features and environments. The geophysical methods employed on this project may not detect all subsurface features, such as geologic contacts or hydrogeological features. It is possible that interpreted features may not coincide with the results of invasive sampling, and the depth of investigation may not accurately resolve desired features at depth. Reports provide a professional opinion, and therefore no warranty is expressed, implied, or made as to the conclusions, advice or recommendations offered.

3.0 METHODOLOGY

3.1 SURVEY AREA AND LOGISTICS

The multi-antenna GPR investigation was conducted between November 10th and November 12th, 2022. Figure 3 displays a detailed overview of the coverage for this investigation.

3.2 GPR DATA ACQUISITION

Three lines of GPR data were acquired using 250, 500, and 1000 MHz antenna. The survey parameters for the lines are detailed in Table 2. Furthermore, the acquisition of each line was broken into segments based on obstructions to GPR progress (such as the HDPE pipeline running down the tunnel, stairways over the pipeline, thrust block construction, and materials stored within the tunnel), as indicated in Figure 3.

Table 2. GPR survey details.

Section	Region	Frequency (MHz)	Total Length Covered (ft)
1	(b) (3) (A) [redacted]	250	180
		500	183
		1000	182
1		250	180
		500	182
		1000	181
1		250	328
		500	328
		1000	328
2		250	132
		500	138
		1000	140
2		250	223
		500	224
		1000	224
2		250	246
		500	247
		1000	247
3		250	95
		500	95
		1000	95
3		250	95
		500	95
		1000	94
3		250	95

Section	Region	Frequency (MHz)	Total Length Covered (ft)
	(b) (3) (A) [redacted]	500	95
		1000	95
4		250	270
		500	182
		1000	182
4		250	161
		500	270
		1000	270
5		250	200
		500	200
		1000	200
5		250	189
		500	192
		1000	192
		Total Coverage (feet)	7255

3.3 EQUIPMENT

A Noggin SmartTow system (Sensors and Software, Mississauga, ON Canada) was used for the GPR surveying, with antennae frequencies of 250, 500, and 1,000 MHz. The Nogging SmartTow system is a monostatic shielded antennae system; meaning the transmitter and receiver are incorporated into one shielded housing. The attached digital video logger provides a real-time view of the collected traces, allowing for data QC in the field.

3.4 QUALITY CONTROL

The data quality control (QC) and quality assurance (QA) procedures followed were outlined in *HGI-SOP-GPR-001 - Ground Penetrating Radar - Standard Operating Procedure.* In summary, data were given a preliminary assessment for quality control (QC) in the field to assure quality of data before progressing the surveys. Following onsite QC, all data were transferred to the HGI server for storage and detailed data processing and analysis. Data quality was inspected and checked for consistency, and data files were saved to designated folders on the server. Records of survey configuration, location, equipment used, environmental conditions, proximal infrastructure or other obstacles, and any other useful information were recorded during data acquisition and were saved to the HGI server.

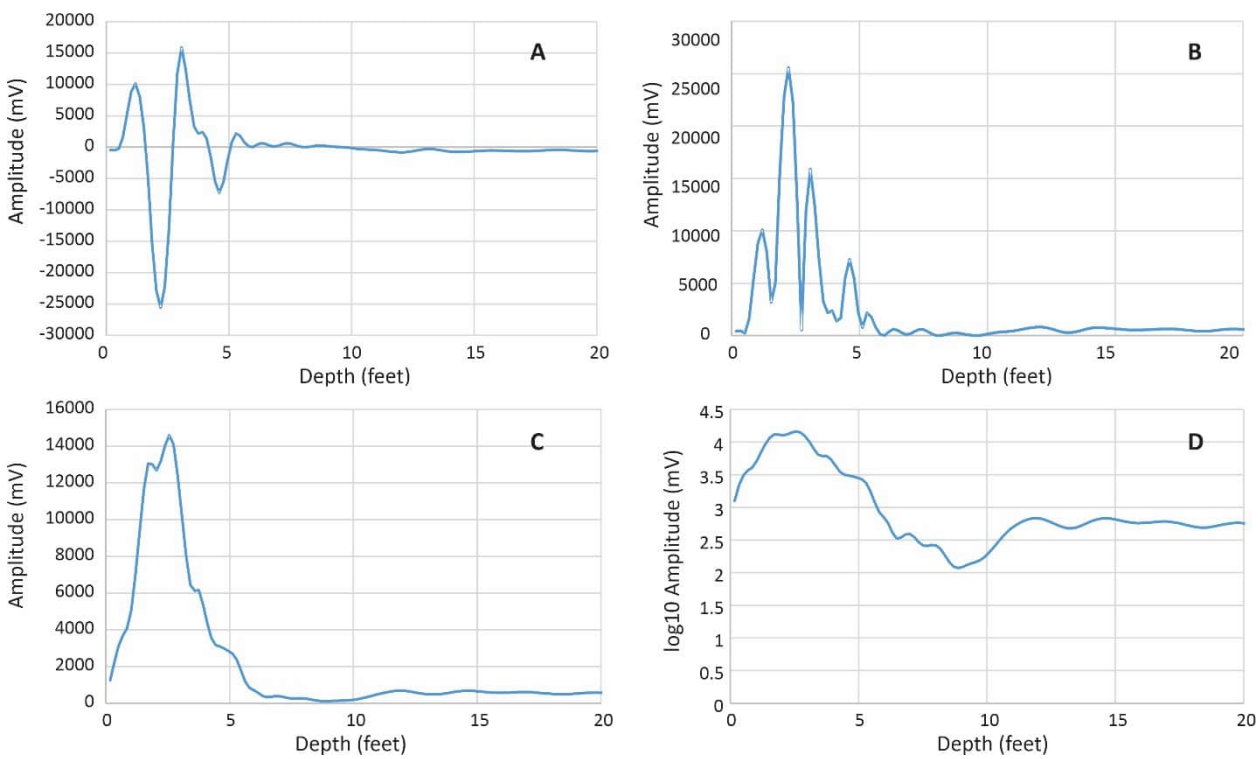
3.5 DATA PROCESSING

Data processing for the GPR radargram data used the Ekko Project (Sensors and Software, Mississauga, ON Canada) GPR processing software. Any geometry changes to correct for errors made during the field acquisition were conducted within the headers for each profile. The GPR

data was converted from travel time into depth by using the common midpoint gather velocity analysis function within Ekko Project. Data processing steps for all transects included; DEWOW median filter, background subtraction, and SEC gain function. The processed profiles were exported from Ekko Project and relevant line features were plotted on the GPR profiles to assist in data analysis.

Power spectra plots were created by conducting a fast Fourier transform and other mathematical functions using MATLAB (v. R2015a). A script was written to batch process the data and output in a form for contouring in Surfer. Attribute analyses were also scripted in MATLAB and plotted either in MS Excel or Surfer. As an example of our methodology, Figure 12 shows the steps from the initial acquired GPR Trace (Figure 12A) with reflected positive and negative arrivals. Figure 12B was created by taking the absolute value of the trace and Figure 12C was created by applying a trapezoid windowed filter of length 4 ns. Finally, Figure 12D shows the logarithmically transformed filtered amplitude akin to Figure 8 and Cassidy (2007). For our analyses below, we present the contour plots of Figures 12A and 12D to discern potential free product in the subsurface.

Figure 12. GPR amplitude processing steps.

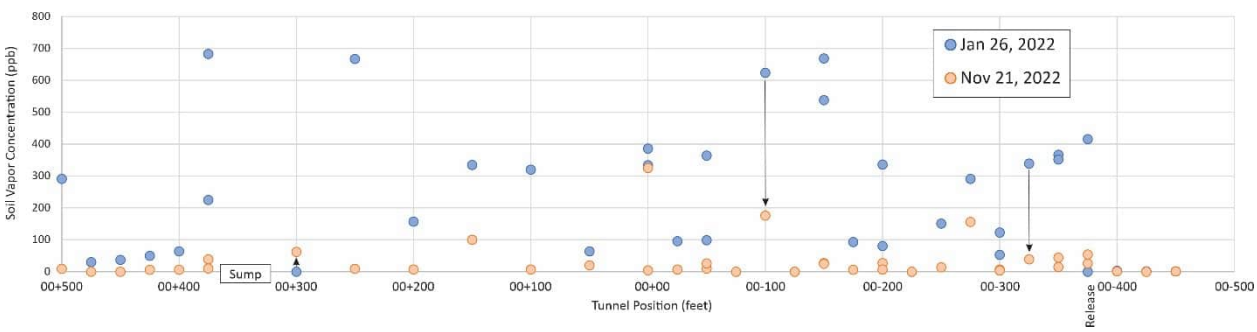


4.0 GPR RESULTS

The GPR results are presented in a number of different formats to exploit the information within attributes of the reflected amplitude, including the raw amplitude and converted amplitude. We also present the power spectrum within the frequency content of each trace. These data will then be compared to the soil vapor information to discern patterns and correlation for interpreting between the discrete soil vapor locations. To simplify the discussion, we have divided the results into the five sections highlighted in Figure 3. In the appendix, full engineering drawings are presented to show all data along the entire tunnel and along particular sides, whether (b) (3) (A) (between the rail tracks) or (b) (3) (A)

The soil vapor monitoring data have been collected approximately every 25 feet along the tunnel, starting shortly after the leak occurred. Figure 13 compares these measurements and shows that the soil vapor concentration, an indication of free product in the pore space, has dropped significantly over the timespan of the two geophysical investigations. In many case, the values are at or near 0 ppb.

Figure 13. Soil vapor measurements from the Phase I and Phase II geophysical investigations.



4.1 SECTION 1

Figure 14 through 16 shows a series of radargrams that highlight reflections through Section 1 of the tunnel. Layers were identified by having unique reflection patterns and we ignored the multiples that ring below the initial layer's reflection. We interpreted the layers with a faint green line. Towards the beginning of the section we see where the patterns in the radargram change as the GPR traverses the metal infrastructure at a door – we were not confident in interpreting layers at this location. Additionally, we observe that the large number of buried, periodic metal cross-rails between the tracks of the (b) (3) (A) line prevented useful interpretation. It should also be noted that the horizontal length scale of the (b) (3) (A) and (b) (3) (A) lines are different than the longer (b) (3) (A) line.

Three layers are easily identified in the 250 MHz data in Figure 14, with depths roughly 0.5, 2.3, and 4.2 feet. The first reflection is likely from the base of the concrete floor with the others potentially reflecting changes in the basalt composition. However, it is not possible to determine the makeup of the basalt based on the reflections, only the position of different transitions. Figure 15 shows reflections in the 500 MHz data. Here we can verify the layers at 0.5 and 2.3 feet with slightly better accuracy on the depth. However, we also can map layers at depths of 1 and 3.4 feet. It also appears that the 4.2-foot layer cannot be resolved adequately with 500 MHz. The 1000 MHz (Figure 16) is shown to 2 feet with a very near surface reflection at 1.4 inches, a second reflection around 5 to 6 inches that is likely the base of the concrete floor, and a third layer at the 1 foot depth.

Figure 17 shows the color contours of raw amplitude with Section 1. All three frequencies are presented in one plot along with the five soil vapor measurements along this section. As a reminder, amplitude attributes are used only to help with identifying LNAPL anomalies and not used for mapping depths to strata. The radargrams presented in Figures 14 through 16 are for mapping depths to layers. Section 1 includes the release location and a significant portion upgradient of the release to observe subsurface conditions unaffected by the current release. Within the 250 MHz data, we see generally flat or constant arrival depths and consistent amplitudes upgradient, a large perturbance at the release due to metal rails and transitions between the doors, returning to a relatively flat and consistent condition downgradient of the release. For all of the data collected between the isolation doors where the release occurred, the GPR data is likely corrupted by subsurface metal preventing any meaningful interpretation. We do not believe the early, high amplitude reflections are due to the release because, as Cassidy (2007) showed, LNAPL would depress the trace amplitudes. Downgradient of the release, where soil vapor is between 78 to 91 ppb (a decrease by a factor of 4 compared to the January 2022 readings), we see a slight broadening of the positive reflection between two and four feet below ground surface on the [redacted] line and a slight increase in reflection amplitude for the first arrival in the [redacted] line. At the same location within the 500 MHz section, we observe a slightly early arrival and some strong amplitude variations in the 1000 MHz. However, some of these observations are also noted in the upgradient portion of the lines, making their uniqueness to increased soil vapor suspect.

Figure 18 shows the filtered amplitude for Section 1, where filtered amplitude refers to taking the absolute value of each amplitude trace and applying a low pass filter akin to that conducted in the study by Cassidy (2007). This is the same filtering procedure described for Figure 10. Starting with the assumption that soil vapor and hence fuel present in the subsurface is extremely low beyond 00+400, we see each frequency's response to background conditions. The 500 MHz and 1000 MHz data show high amplitude in the very near surface with a yellow band nearly constant across the tunnel. The exception is 500 MHz in the center of the tunnel between the rails. The center line in many of the sections are noisy due to high metal content. The 250 MHz shows slightly different results with the amplitude more varied and the solid contour line at 10,000 mV

(or log value of 4) appearing stippled. The patterns in the 250 MHz downgradient of the release are different than upgradient, suggesting a potential differentiator for identifying fuel.

In Figure 19 we show the frequency content for each of the three antennae along all three lines ([redacted]). The 250 MHz data shows a slight change in the power spectrum downgradient relative to upgradient. Specifically, we see higher power around 170 MHz that correlates with the higher soil vapor values. For the downgradient data at 500 MHz, the power spectra is high along three bands for the [redacted] and [redacted] lines: 220, 470, and 680 MHz. This is slightly different than upgradient of the leak where two bands are observed and the third band is intermittent. At 1000 MHz, there does not appear to be a differentiator up or downgradient. Areas upgradient and downgradient show discretely located high power values nearly that are nearly saturated.

Within this section, we do not see any specific anomalies that should be followed up on with targeted drilling. These data are providing a baseline for correlations that will be carried through to the rest of the sections.

Figure 14. Section 1 radargram for 250 MHz: North, central, south sections

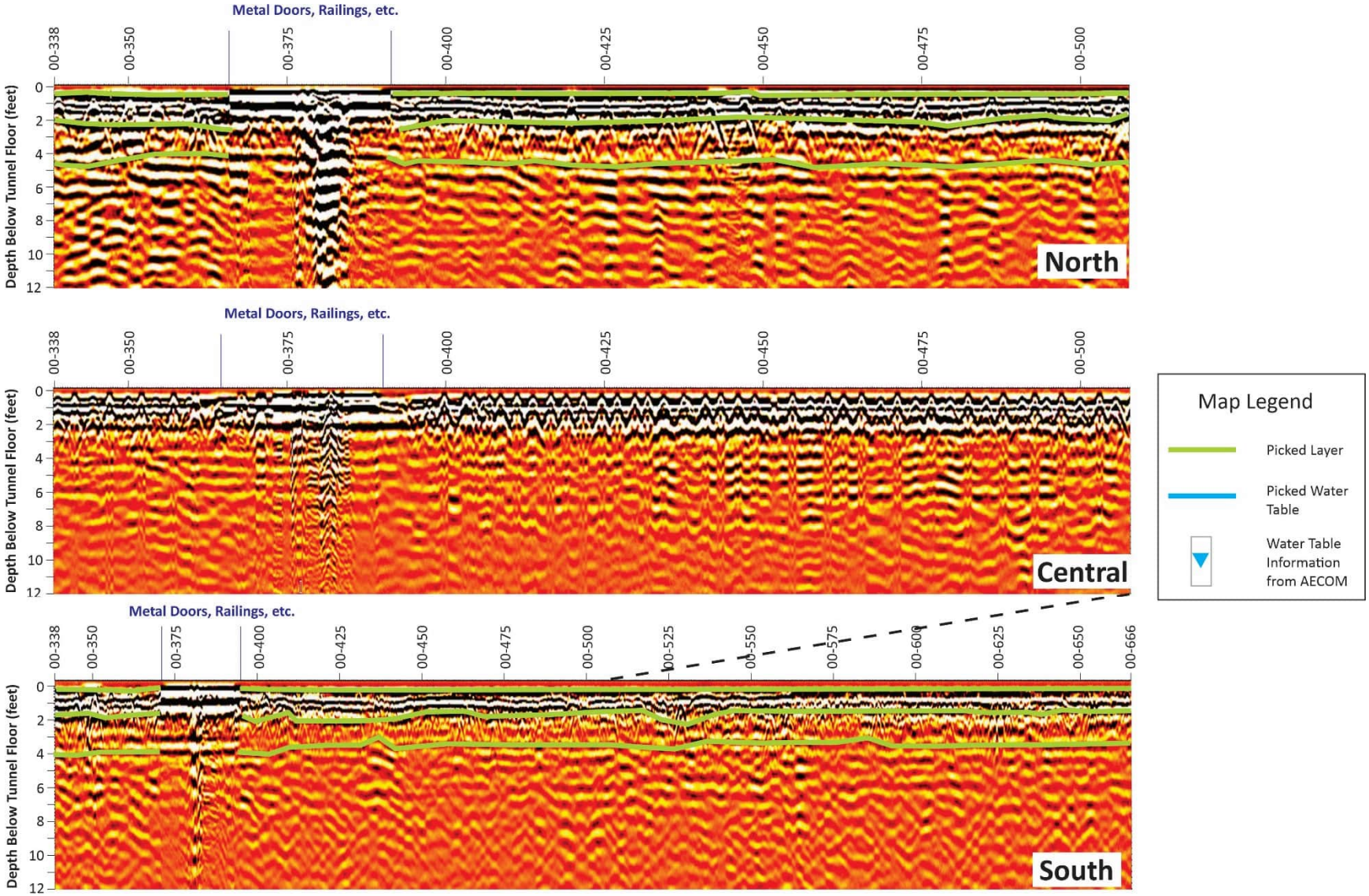


Figure 15. Section 1 radargram for 500 MHz: North, central, south sections

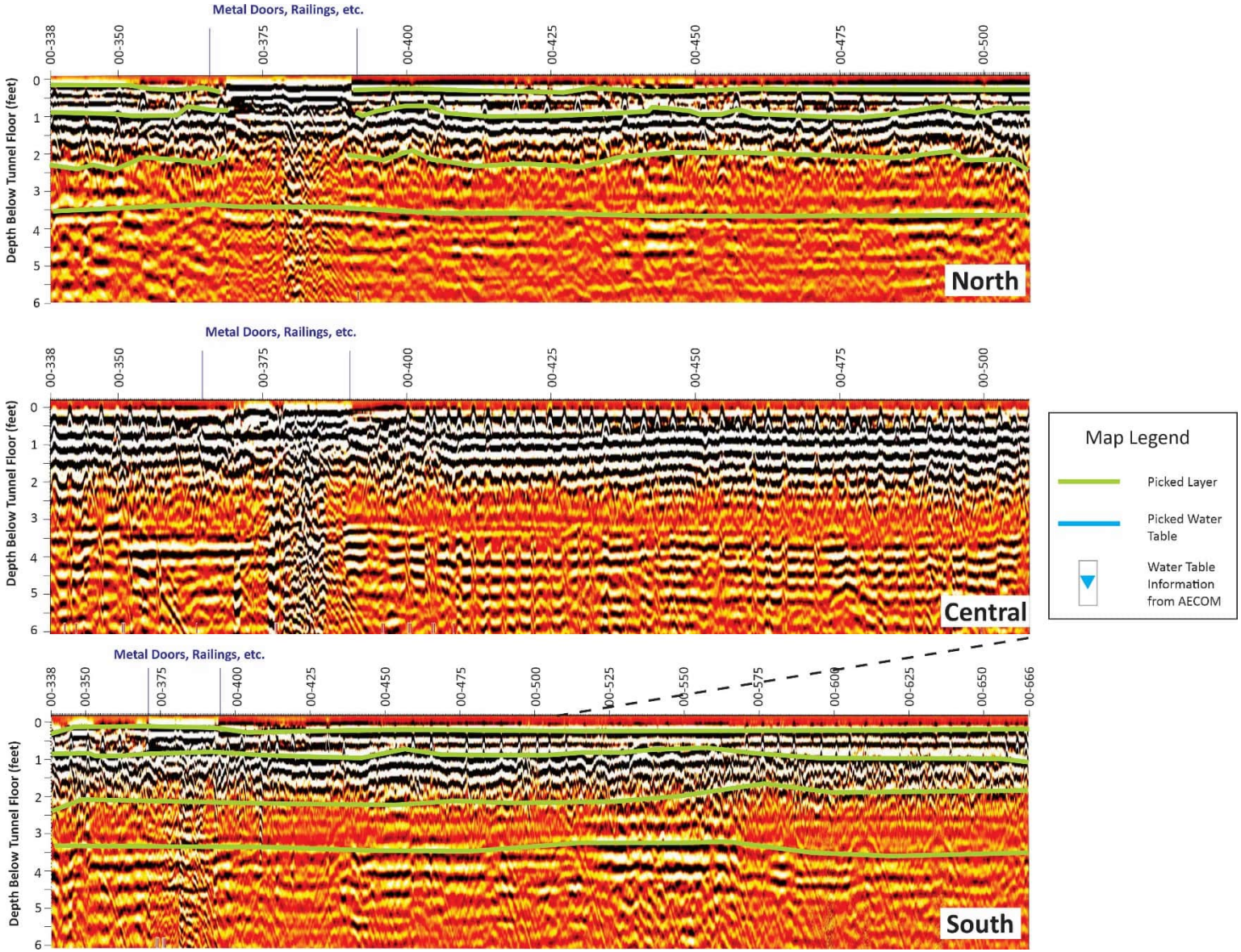


Figure 16. Section 1 radargram for 1000 MHz: North, central, south sections

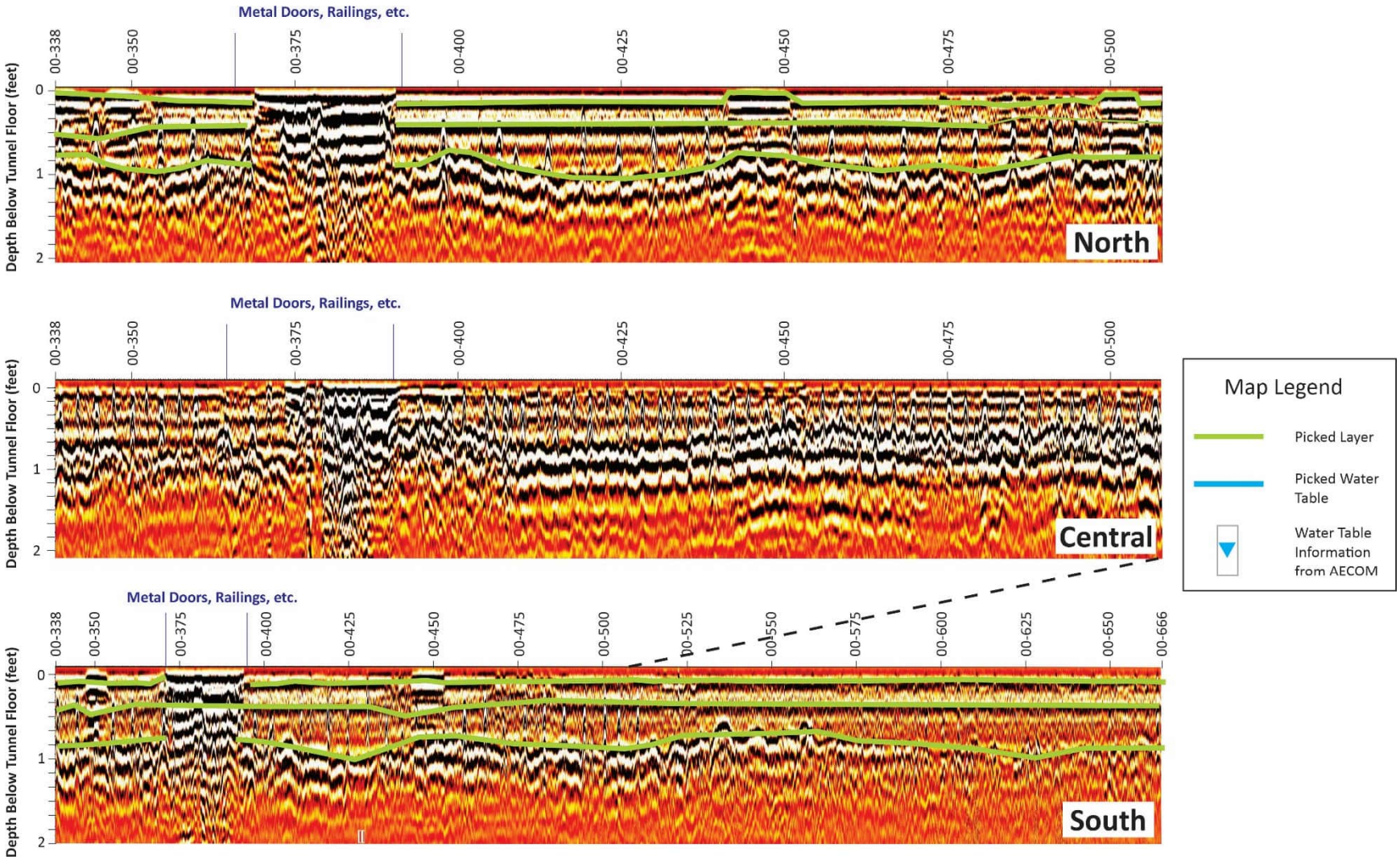


Figure 17. Section 1 raw amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data

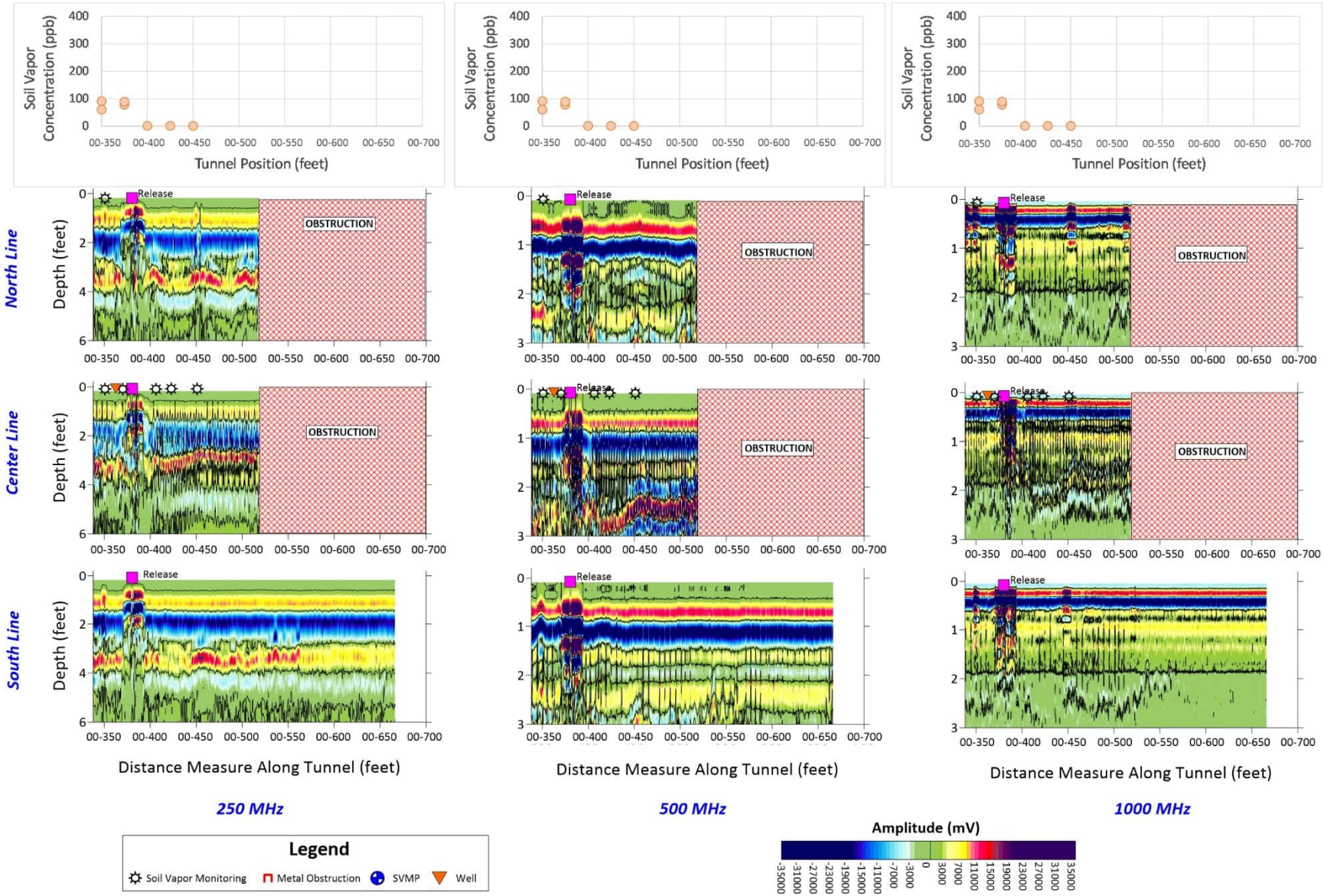


Figure 18. Section 1 filtered amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data.

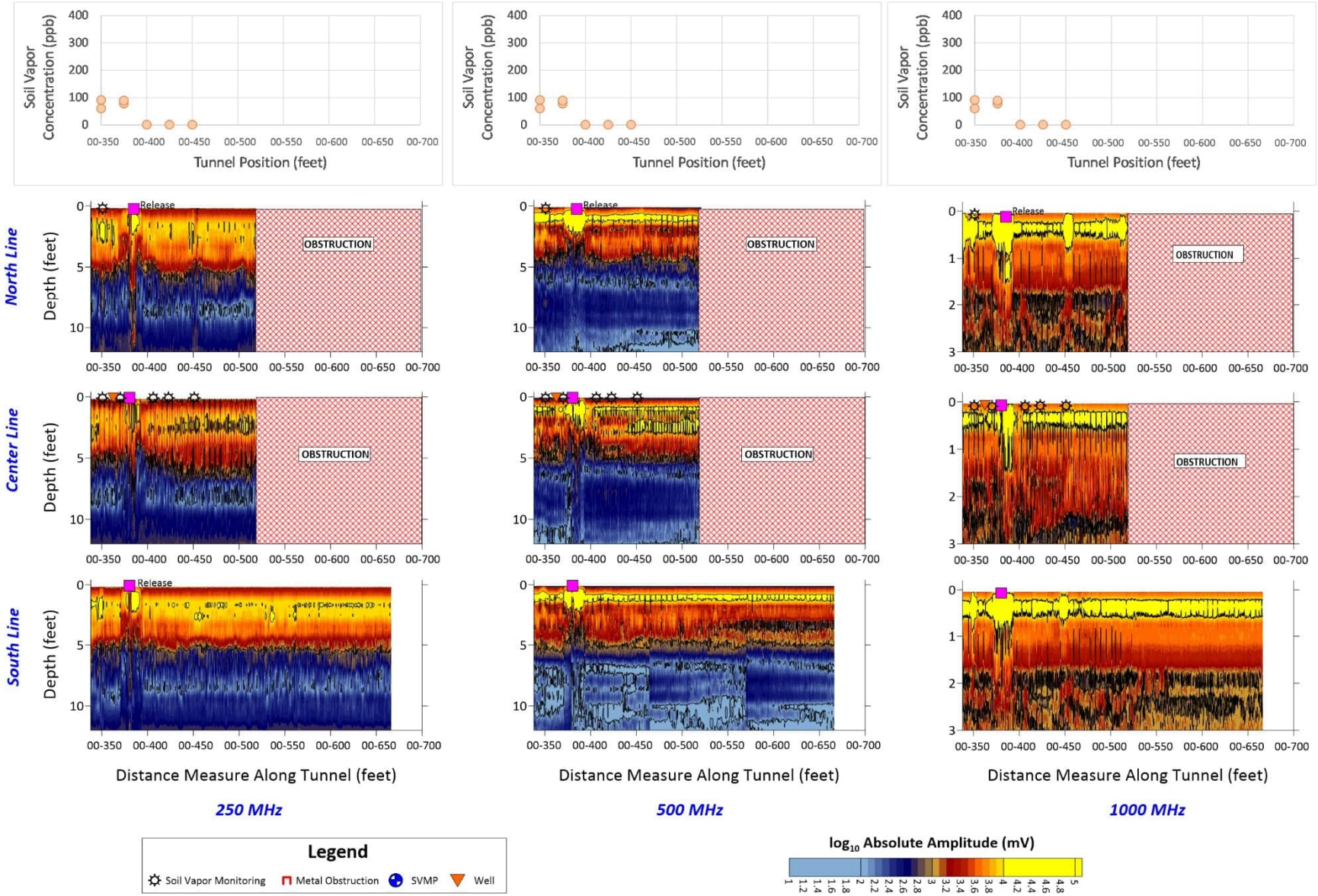
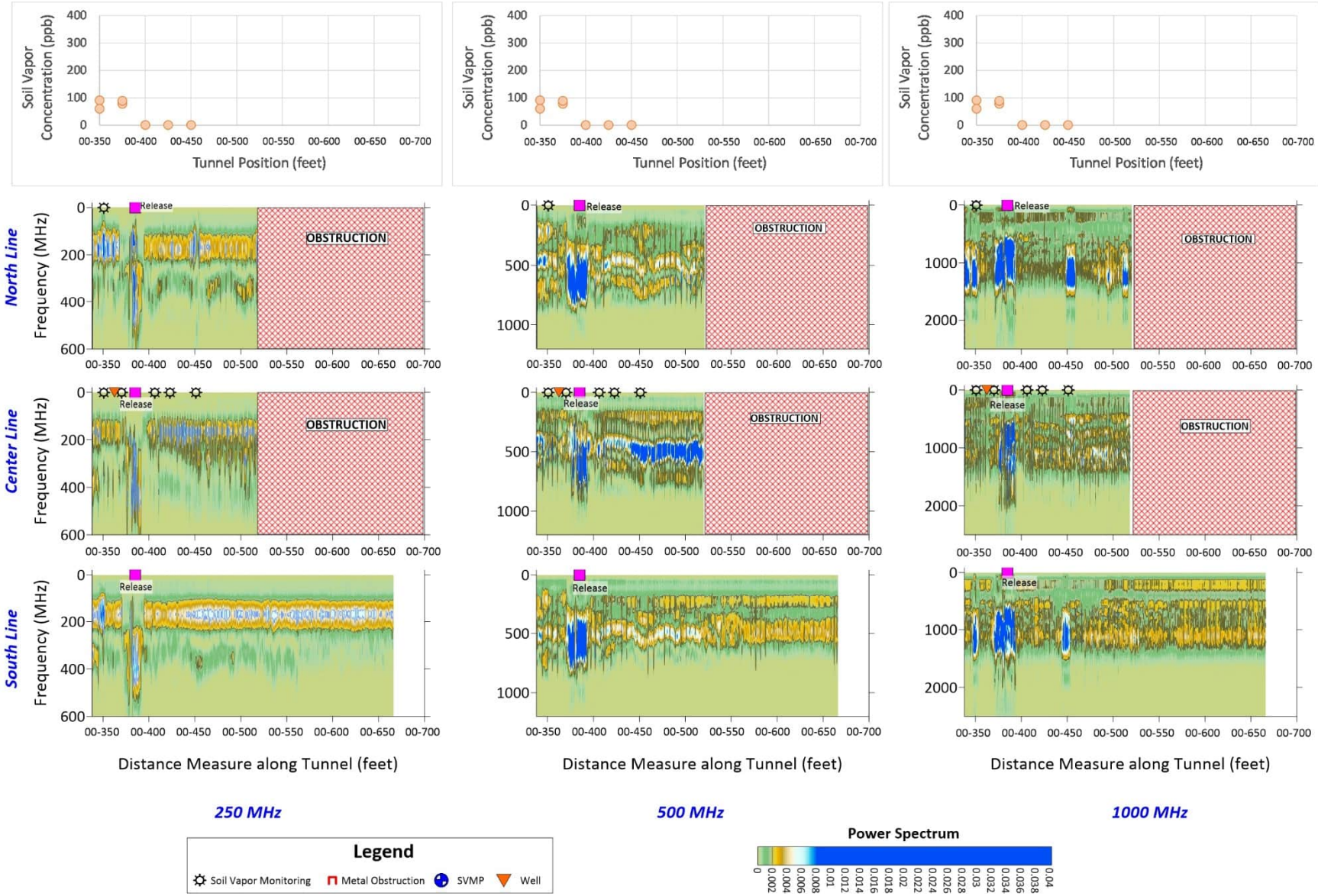


Figure 19. Section 1 power spectra for frequencies 250, 500, and 1,000 MHz and soil vapor data.



4.2 SECTION 2

Section 2 is immediately downgradient of the release spanning from stations 00-93 to 00-338. The measured soil vapor in this section is highly varied with two measurements near or above 200 ppb, one just below 100 ppb, and the remaining near zero. This is a significant decrease from January 2022, where the reading at 00-100 dropped from 624 to 176 ppb, a factor of 3.5.

Figures 20 through 22 show the three sets of radargrams for each frequency. These radargrams are used to map layered horizons below the tunnel floor. Figure 20 shows the depths of three reflections for 250 MHz at similar depths as that in Figure 14. The layering is mostly flat lying. A fourth reflection has been added in blue to highlight the most likely position of the water table based on piezometer data that coincides with Section 3 (Figure 26). For Figure 20, we simply carried that through (b) (3) (A) to the adjacent section. Figure 21 shows the same four reflections at roughly the same depth as Figure 15. The water table is too deep to be picked up by the 500 MHz antenna. For the 100 MHz, the attenuation was not as severe and we were more confident in collecting data to a depth of 3 feet. As shown in Figure 16, Figure 22 reveals a similar three-reflection layered system.

Figure 23 shows the raw amplitude for Section 2. The amplitude attributes and frequency data presented in figures 23 through 25 are used for helping to determine the lateral locations of elevated hydrocarbons and not necessarily the depth or vertical limits. Also, the 250 MHz (b) (3) (A) line is of little value along this section due to the metal cross ties buried beneath the rails causing diffraction hyperbolas to obscure meaningful information – they are a source of noise. The (b) (3) (A) line covers up to the approximate position of 00-225 and shows that the elevated soil vapor reading at 00-100 corresponds to an earlier positive arrival that is not observed at locations with lower soil vapor readings. We observe something similar in Section 1 for both 250 and 1000 MHz. This could be a reflection from very near surface, i.e., just below the concrete floor. At position 00-275 and 00-325, where elevated soil vapor was measured, the same reflection pattern is not observed. However, at 00-316 we see an interesting reflection pattern at a depth of about 2.5 feet in both 250 and 500 MHz in the (b) (3) (A) and (b) (3) (A) lines that is not tied to a specific soil vapor measurement. We marked this as S2-pt1. The radargram (Figure 20) reveals a dampened reflection at the location as well. We also see an interesting feature in the (b) (3) (A) line of 500 MHz, marked as S2-pt2, at 00-171. Both of these locations should be investigated.

Figure 24 shows the filtered amplitude for Section 2. In the 250 MHz data, the amplitude on the (b) (3) (A) line is dampened at 00-100 location, but the other frequencies do not have the same response. Further, we see a dampened response at 00-175 without an accompanying increase in soil vapor concentration. As a reminder, we are simply looking for changes in the patterns of amplitude attributes and whether those changes correlate to high or low soil vapor readings. On the (b) (3) (A) line, a dampened response is observed at elevated soil vapor at 00-275 and 00-325. Within the 500 MHz data, all amplitudes are fairly consistent across the entire line. Within the 1000 MHz

data, the high vapor reading at 00-100 has a slightly dampened amplitude in the (b) (3) (A) line but not the (b) (3) (A) or (b) (3) (A) line. The elevated soil vapor readings at 00-275 and 00-325 show nothing of significance in the 1000 MHz data.

The power spectrum for each of the three antenna frequencies is shown in Figure 25. The power spectra and amplitude attributes have different but complementary information that can be used to either validate potential anomalies or find new anomalies that should be investigated. In the (b) (3) (A) line at 250 MHz, we see low power at 00-100, coincident with higher soil vapor data, with much higher power elsewhere along the line. At a couple of sections, a secondary power band is seen at 340 to 350 MHz at 135 feet and 197 to 216 feet along the tunnel. The vapor data suggests that the response is not related to fuel, but a secondary band was shown to correlate in Section 1 with high vapor in the (b) (3) (A) line at 250 MHz at the 00-350 measurement. Similar to the tank experiment of Figure 8, where the power spectra shifted to higher frequencies at the ethanol release, the secondary banding at higher frequencies could be related to elevated LNAPL. The (b) (3) (A) line shows mixed results with the second band. For the 500 MHz data, two and three bands are fairly common at high frequencies. However, whether one, two, or three bands are present with low or high power, there does not appear to be a strong correlation with high or low soil vapor data. The 1000 MHz data show generally lower power data throughout the sections with slightly elevated power values coincident with the location of surficial metal. The location S2-pt1 identified in the raw amplitude at 250 MHz is also seen as an interesting anomaly in the 500 and 1000 MHz frequency data.

Figure 20. Section 2 radargram for 250 MHz: North, central, south sections

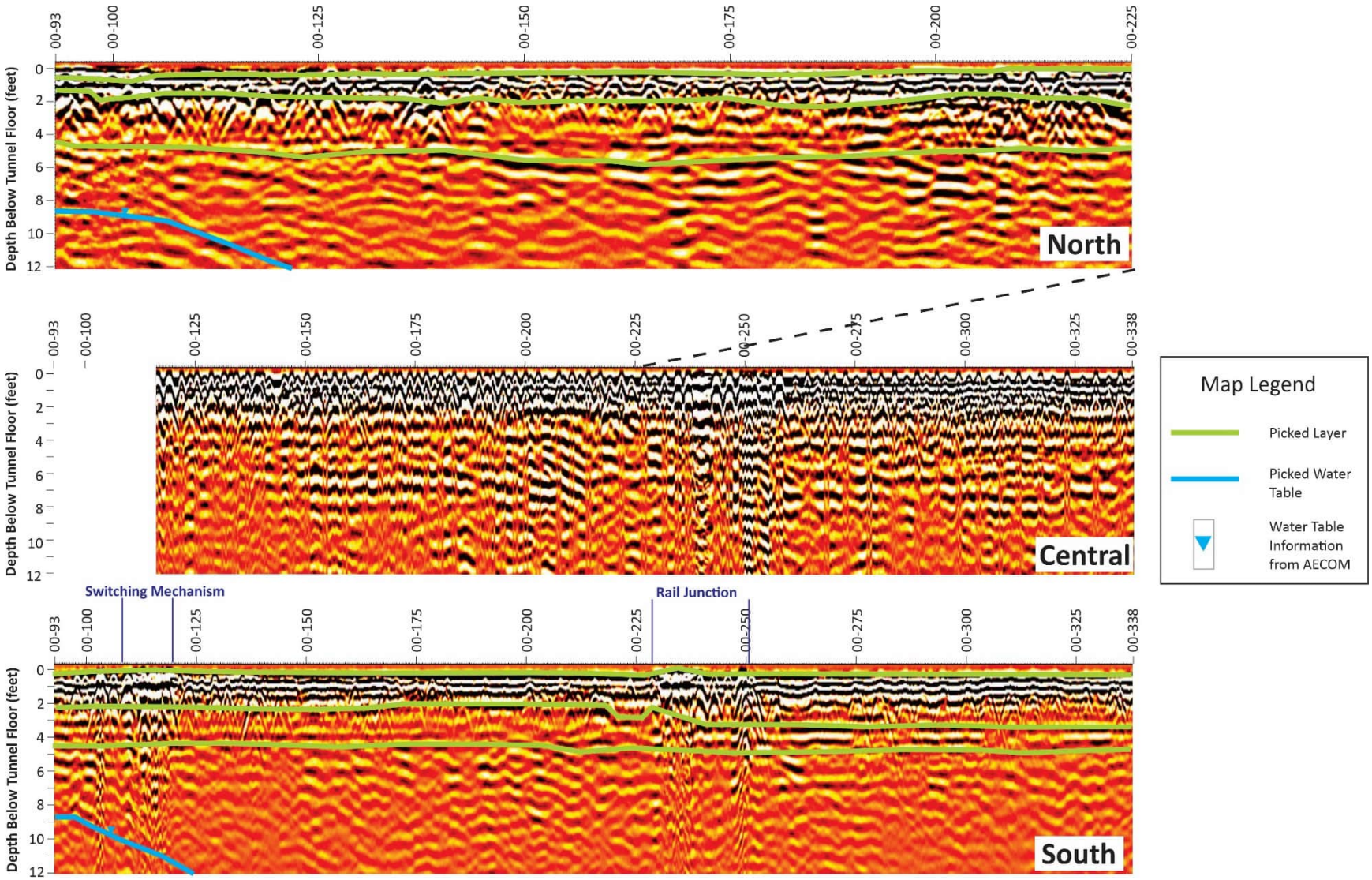


Figure 21. Section 2 radargram for 500 MHz: North, central, south sections

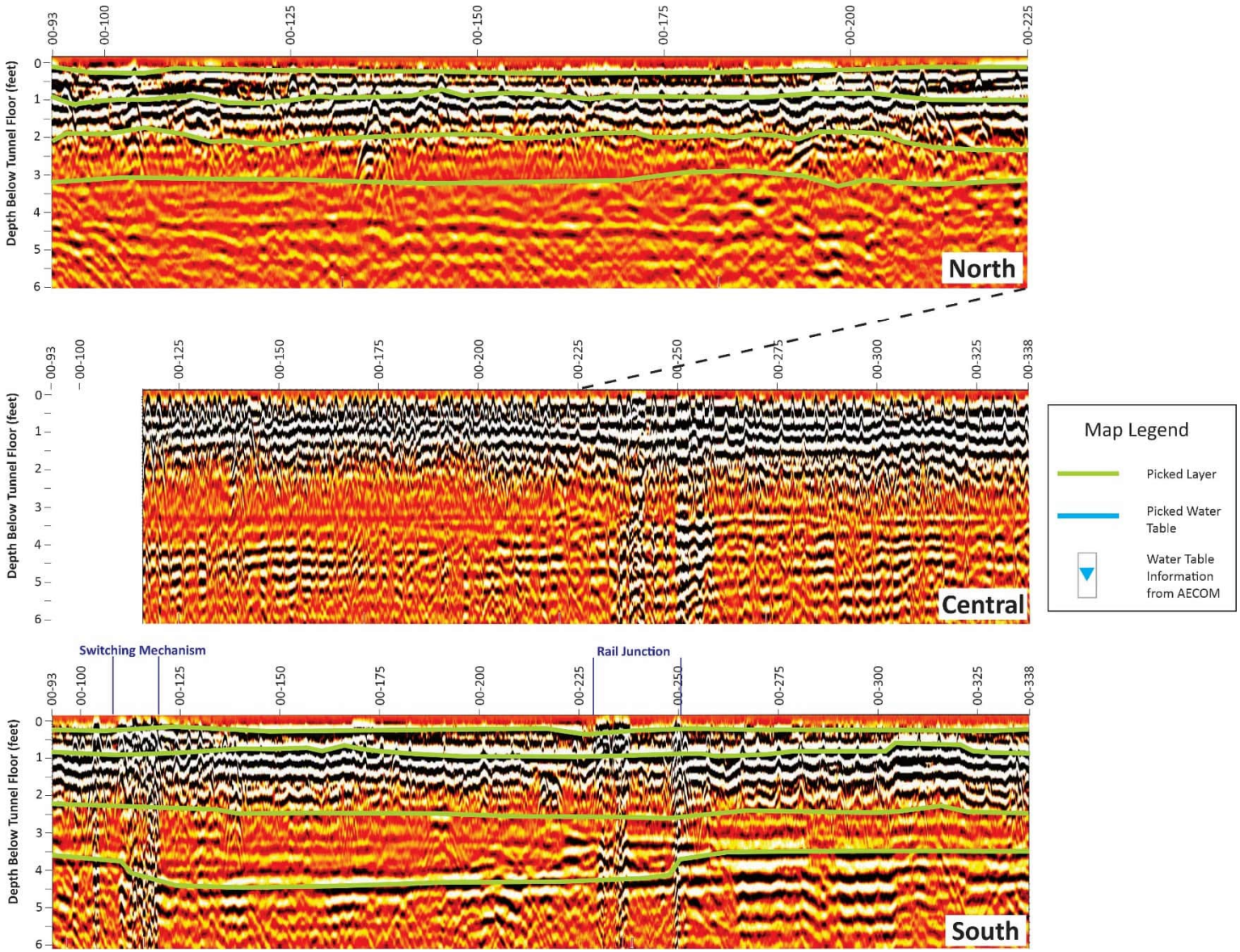


Figure 22. Section 2 radargram for 1000 MHz: North, central, south sections

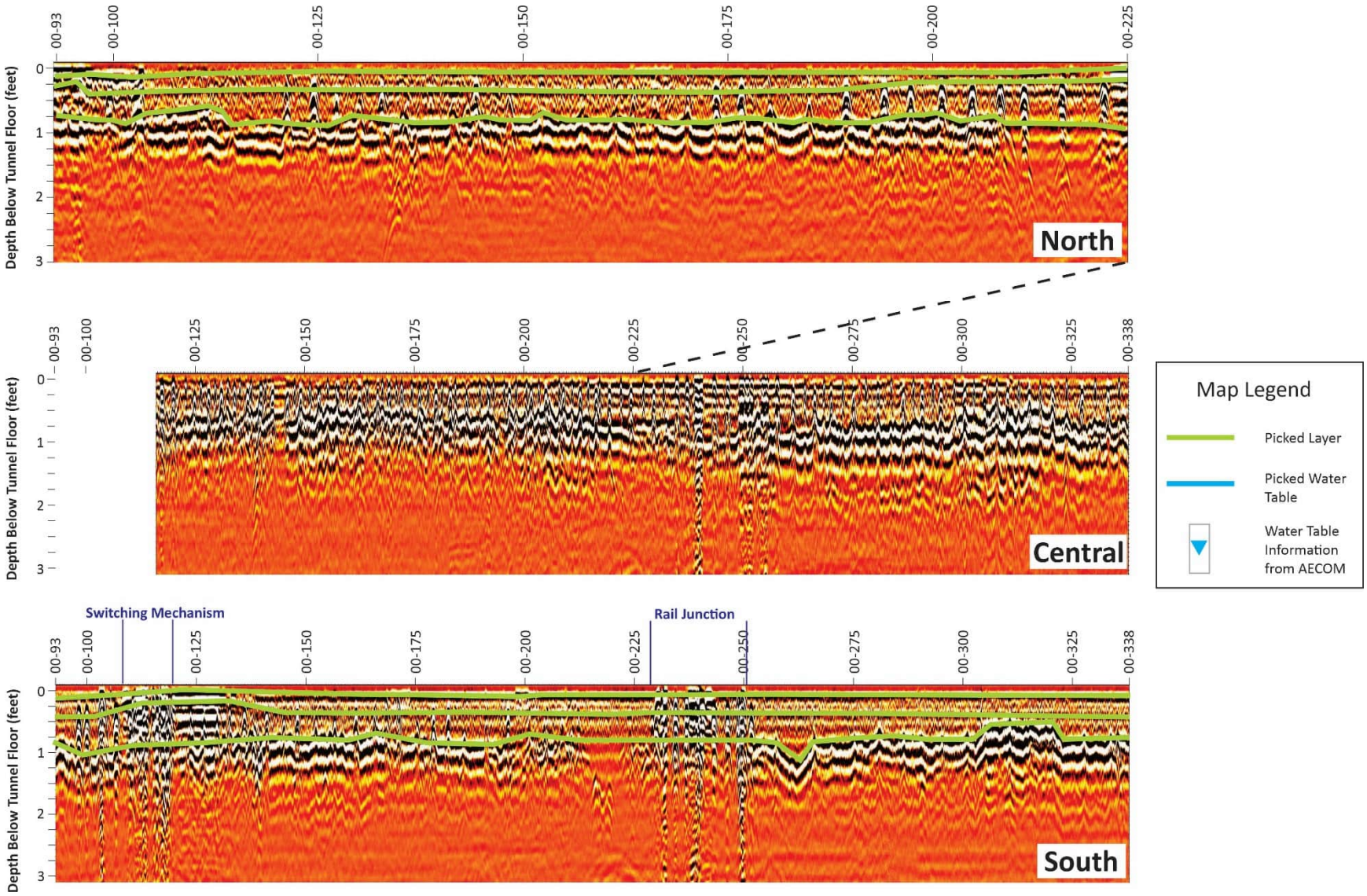


Figure 23. Section 2 raw amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data

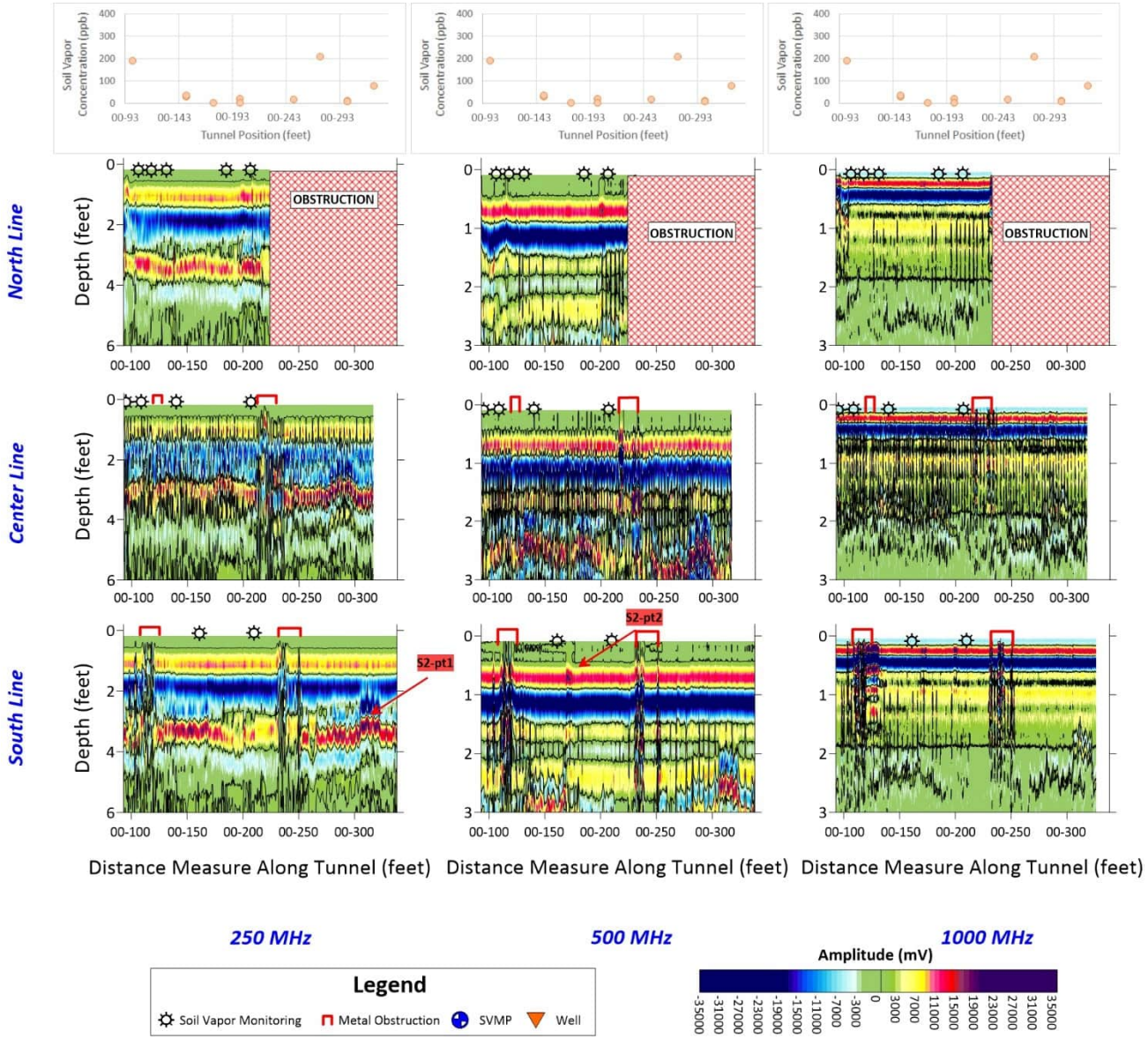


Figure 24. Section 2 filtered amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data.

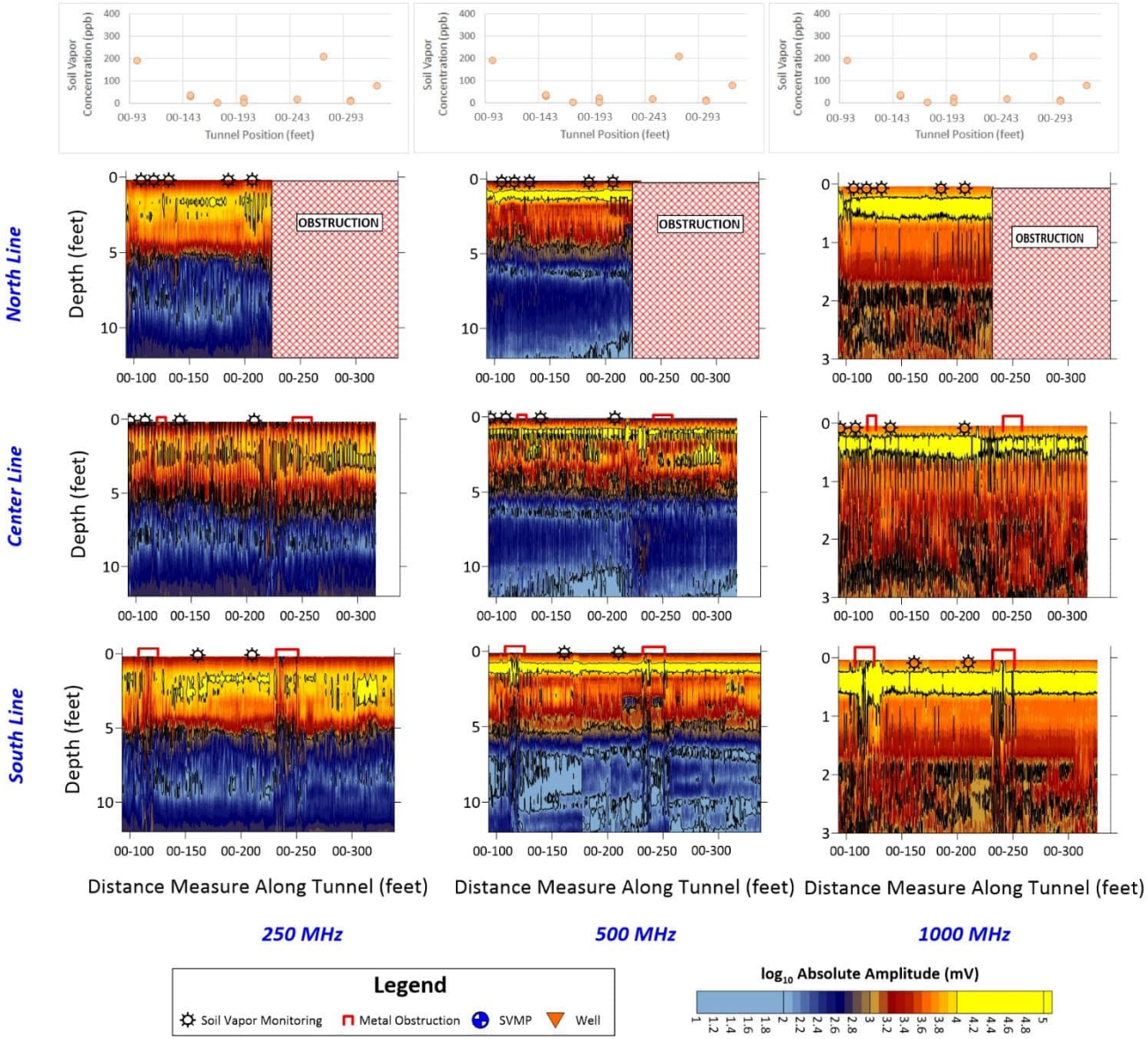
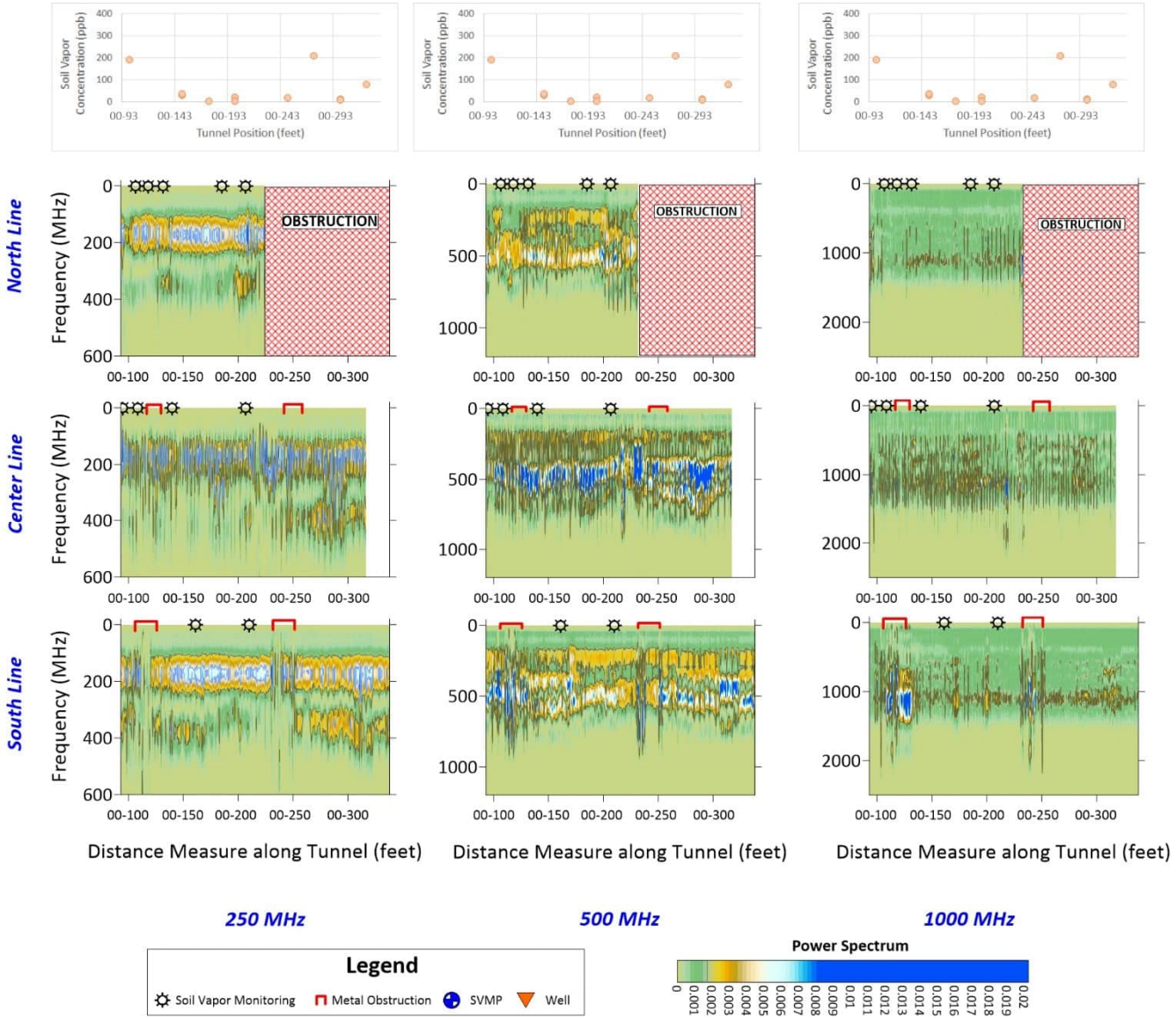


Figure 25. Section 2 power spectra for frequencies 250, 500, and 1,000 MHz and soil vapor data.



4.3 SECTION 3

Section 3 is the shortest section and in the middle of the survey area spanning from 00+07 to 00-93 feet along the tunnel. There are only a few soil vapor measurements within this section and most are at or near 0 ppb. One reading at 00+00 is 350 ppb near the center GPR line. Figures 26 through 28 show the radargrams of the three frequencies along this section. The centerline between the rails is noisy due to the regularly spaced metal cross-pieces beneath the rails. These data are difficult to interpret for anything meaningful related to mapping stratigraphic layers or the fuel spill.

At 00-10 and 00-40, two piezometers indicate water levels at 5.08 and 6.08 feet, respectively. Based on the water level depths, we calibrated the reflections at these depths to map the location of the water table across the entire line. The water table is easily observed in the 250 MHz data, partially in the 500 MHz (b) (3) (A) line data, and not at all in the 1000 MHz. The water table appears as shallow as 4 feet at 00+06. Other strata mapped through the sections correspond those mapped in preceding sections, providing a high level of continuity beneath the tunnel.

Figure 29 shows the raw amplitude data for all three lines and all three frequencies. Within these data, along with all others when presenting raw amplitude plots, we have added a solid contour line at a value of 0 mV. This line helps to distinguish when the amplitude changes from positive to negative, especially in very low amplitude and late time arrivals. We did not find them to be very useful at late time, however, for identifying unique structure or hydrocarbon information.

Along the (b) (3) (A) line of Figure 29, the 500 MHz data shows reflections closer to the surface from 00+07 to 00-05 feet along the tunnel and an uncharacteristic blip in the amplitude of the 250 MHz data at 00+02 feet along the tunnel. The soil vapor reads 0 ppb here, but the reflections are suggesting a feature of interest. At 00-75 feet along the tunnel, another interesting blip is observed in the 500 MHz data and we have labeled this as S3-pt1 as a potential exploration anomaly (at 00+75). The features at 00+02 and 00-75 feet are confirmed in the 1000 MHz data. Along the (b) (3) (A) line, the amplitude data show an intense reflection in the 250 MHz data at 00-43 to 00-46 feet along the tunnel and at a depth of around 2.5 feet. We have labeled this as S3-pt2 (at 00-46) for a potential anomaly of exploration. The intensity simply refers to the increased amplitude values relative to adjacent data. In the 500 and 1000 MHz data, we see two features with a similar response at the same position as the (b) (3) (A) line. We have labeled these as S3-pt3 and S3-pt4 and they do not appear to be diffraction hyperbola when referring back to Figure 27.

Figure 30 shows the absolute value of the amplitude that has been filtered. The data appear ambiguous without much telling information for obvious anomalies. In the (b) (3) (A) 250 MHz line, the first seven feet up to station 0 feet shows high amplitude (above a log value of 4 indicated by the black contour line) and stippled or absent for the rest of the line. In the 500 MHz (b) (3) (A) line, the amplitude is high at the suggested exploration point S3-pt1 (at 00-75). Along the (b) (3) (A) line, the 250 MHz data is similar to the (b) (3) (A) line and the suggested exploration point S3-pt2 at

00+46 feet appear unremarkable. We do see, however, in the 500 MHz and 1000 MHz that the exploration points S3-pt3 and S3-pt4 is causing a confirmatory perturbance in the signal. These points are located at 00-68 and 00-75, respectively.

Figure 31 shows the power spectra for all three frequencies. In the (b) (3) (A) line for 250 MHz we observe the highest power values between 00+07 and 00+02 feet indicating stronger than normal reflections of the EM waves. The (b) (3) (A) line also shows higher power at around 00+02 feet along the tunnel. The 250 MHz data also shows a faint second band of higher power at 350 MHz with higher power values in the (b) (3) (A) line at 00-45, 00-70, and 00-76 to 00-93 feet along the tunnel. The 500 MHz data also shows multiple bands of higher power particularly at the end of the (b) (3) (A) line at 550 MHz. The 1000 MHz data does not have the high power observed in other sections of the tunnel.

Figure 26. Section 3 radargram for 250 MHz: North, central, south sections

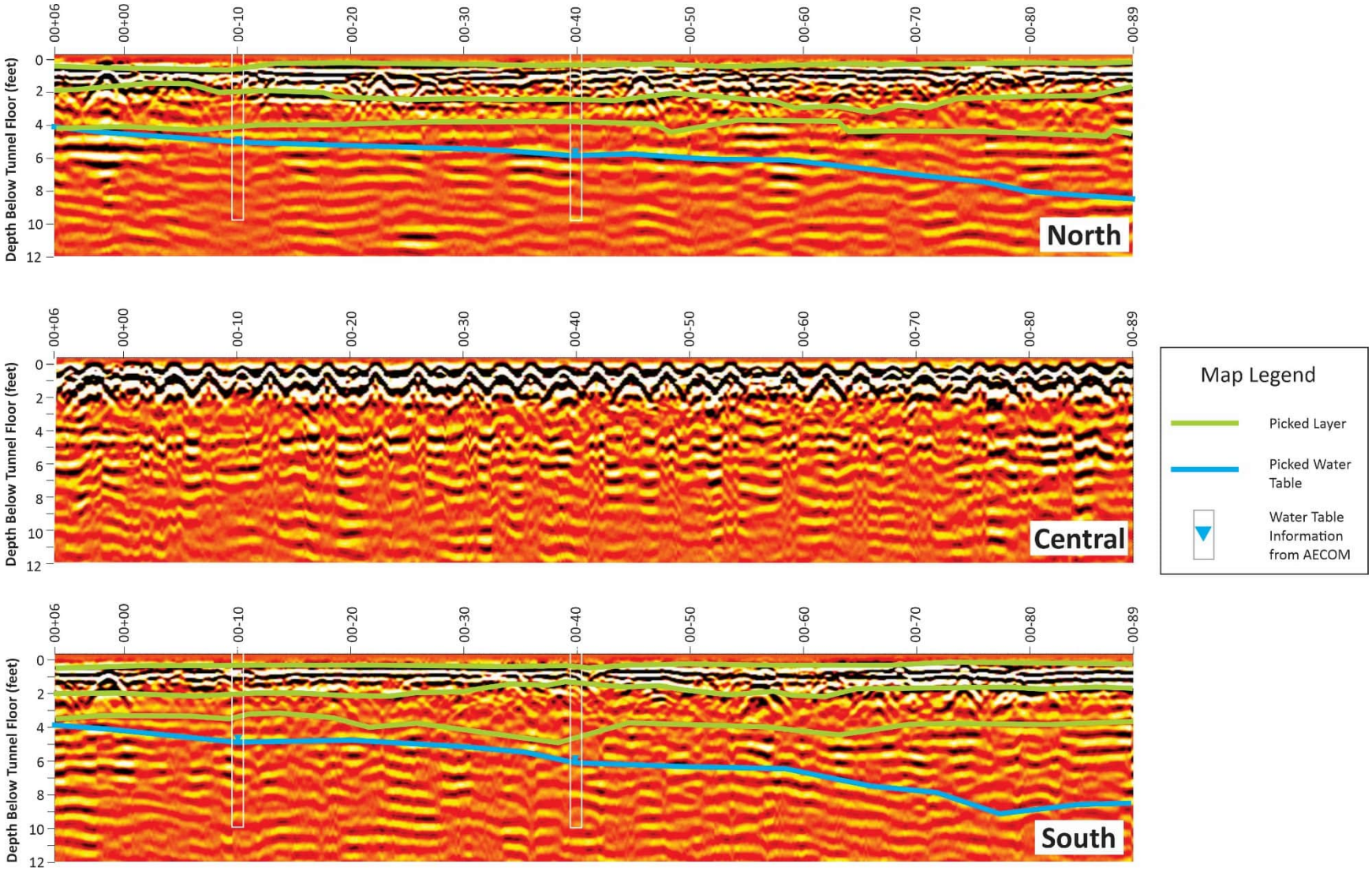


Figure 27. Section 3 radargram for 500 MHz: North, central, south sections

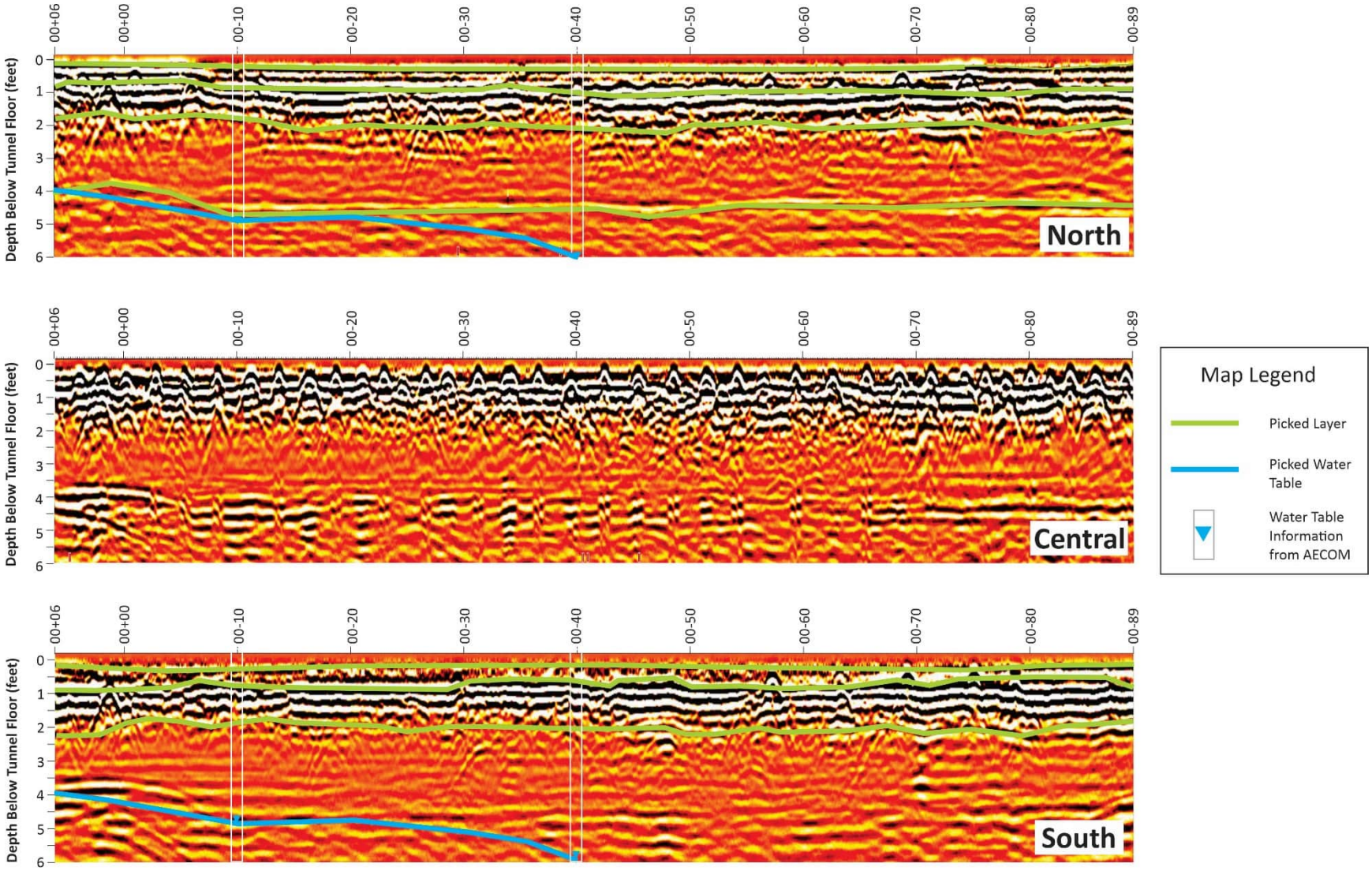


Figure 28. Section 3 radargram for 1000 MHz: North, central, south sections

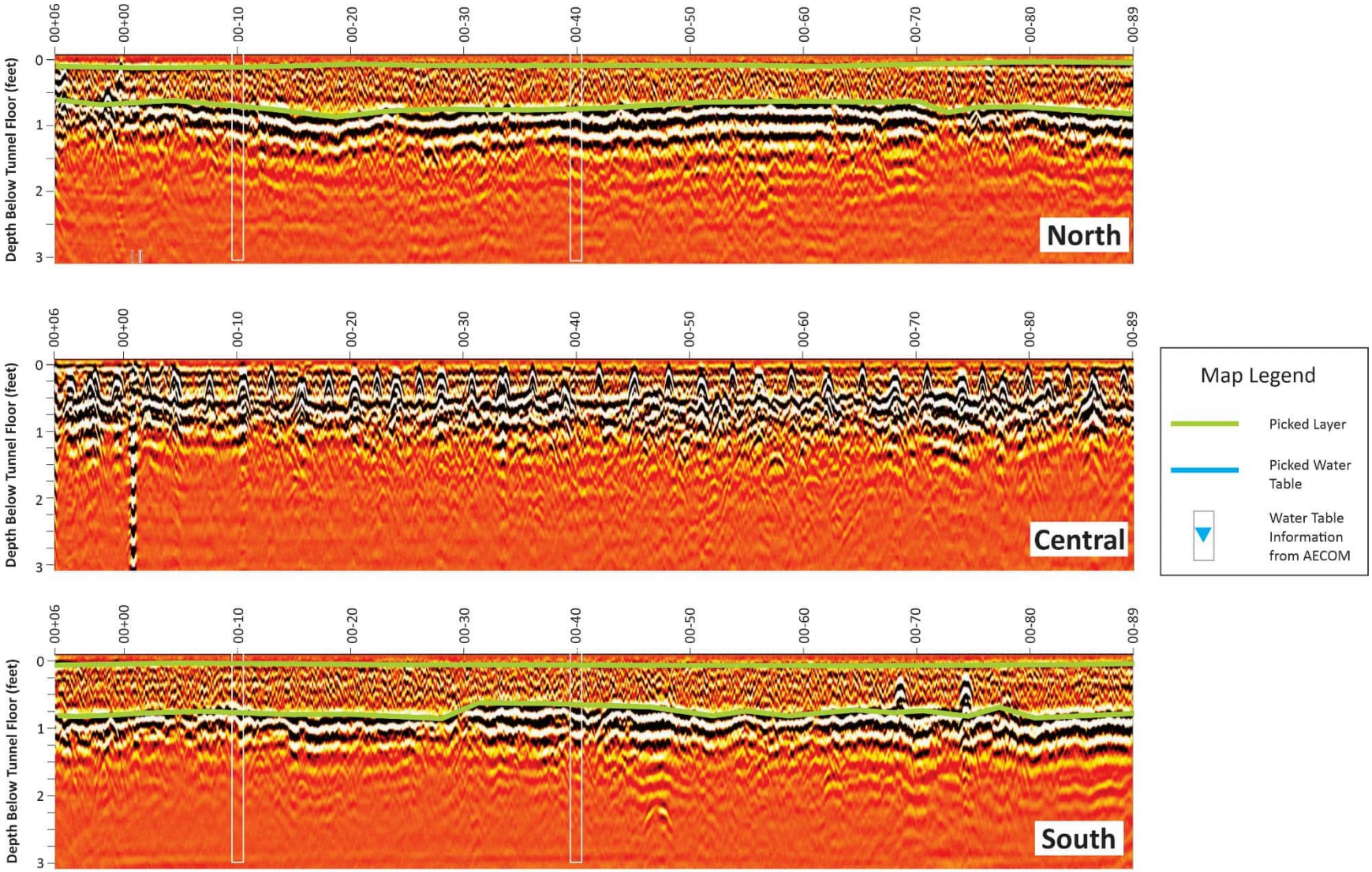


Figure 29. Section 3 raw amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data

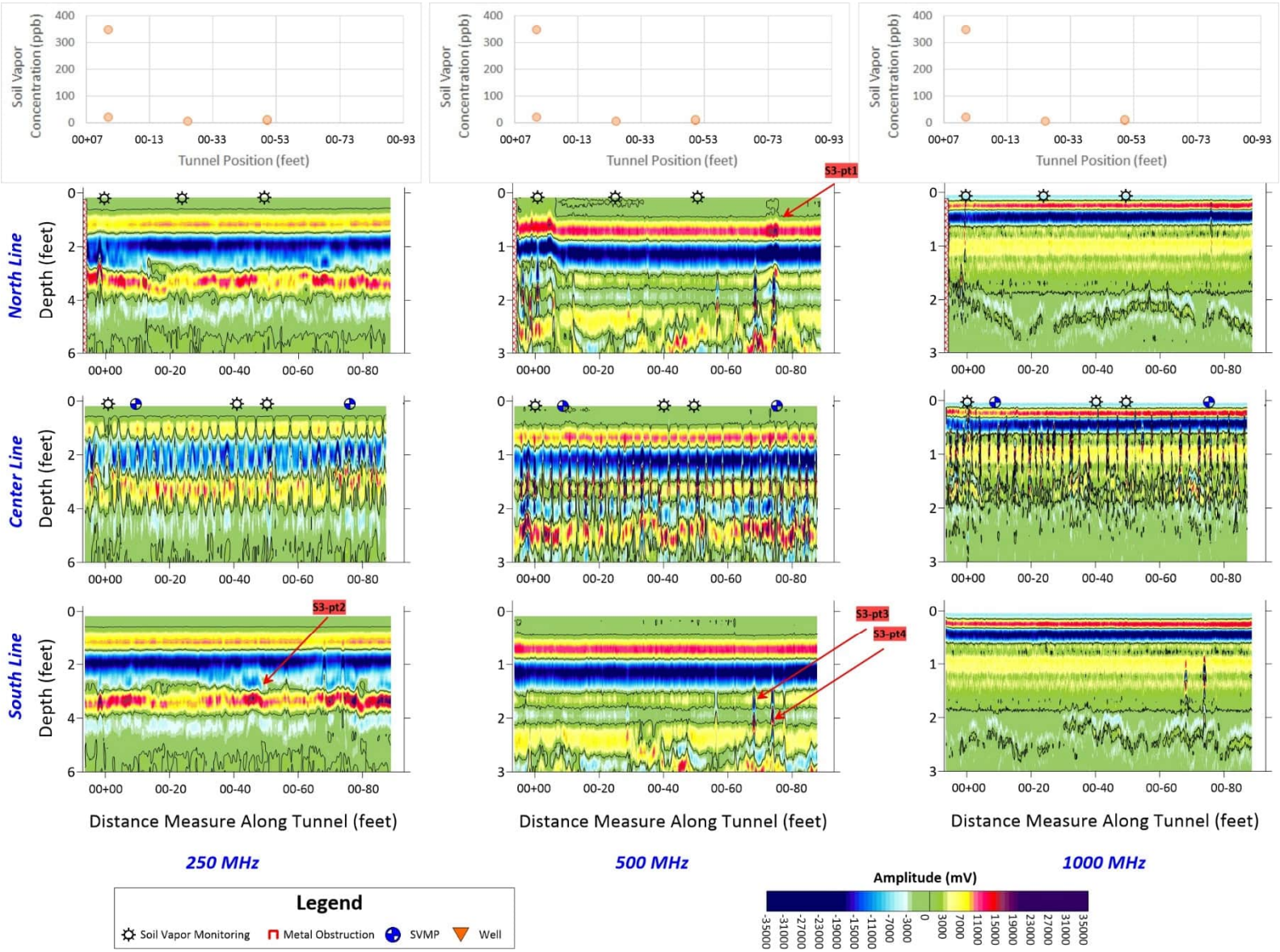


Figure 30. Section 3 filtered amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data.

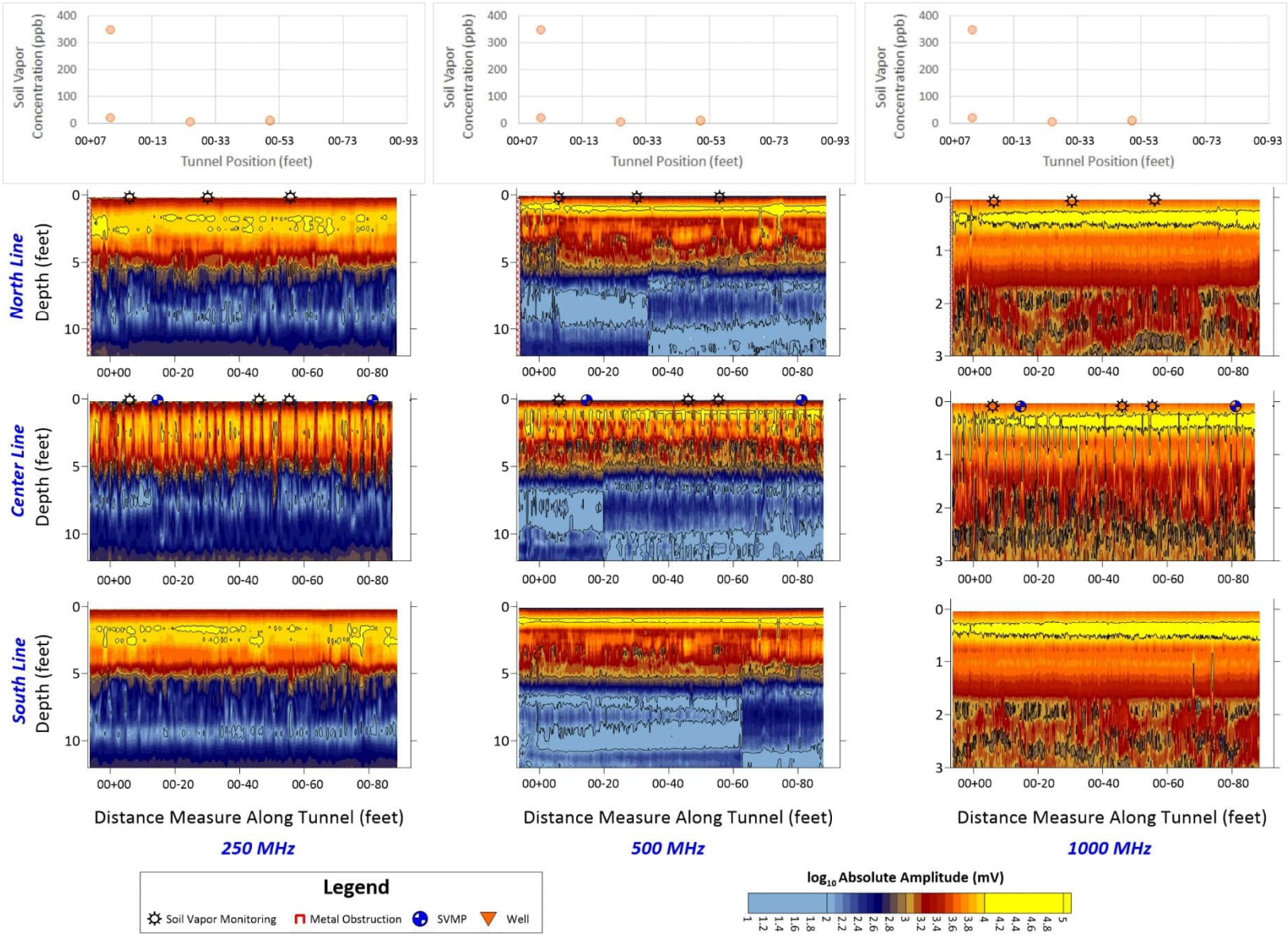
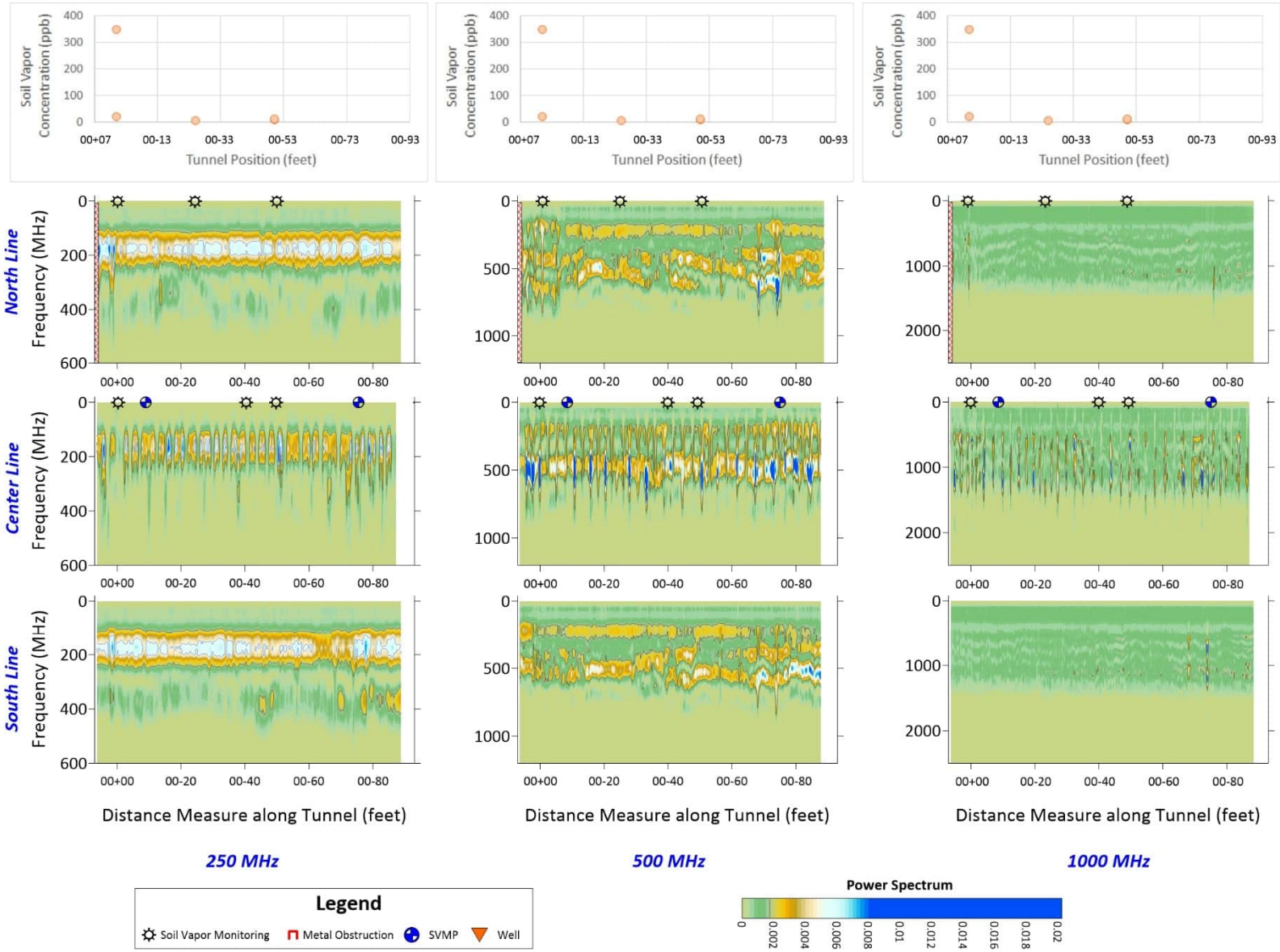


Figure 31. Section 3 power spectra for frequencies 250, 500, and 1,000 MHz and soil vapor data.



4.4 SECTION 4

Section 4 covers a long 300-foot portion of the tunnel from the wooden stairs to the thrust block that protects the bend in the large HDPE pipe. The pipe runs along the (b) (3) (A) side of the tunnel making access with GPR impossible. Soil vapor monitoring stations are located approximately every 50 feet along this section and the data show a couple of values near 100 ppb (at 00+300 and 00+150) with the rest of the values nearer 10 ppb. Two piezometer that provided water level depths were at positions 00+210 and 00+50 feet; the water levels were at 3.05 and 3.63 feet depth, respectively.

For this section, like other sections before it, the data within the (b) (3) (A) line is difficult to interpret due to buried metal cross bars beneath the rails. We will limit our discussion to the (b) (3) (A) line.

Figures 32 through 34 show the radargrams for the three frequencies of 250, 500, and 1000 MHz, respectively. The radargrams were used for mapping the layers by drawing lines across unique reflected horizons that were not caused by multiples. In the 250 MHz radargram of Figure 32, we mapped three distinct geological horizons that are familiar from the three sections before it. A fourth reflected layer is also observed that coincides with the perched water table. Within this section, the water table, calibrated from the piezometers, is flay lying and varying from 2.8 to 3.6 feet. The 500 MHz data of Figure 33 shows two mapped reflected layers above the water table and one below. The one below the water table appears to dip sharply around 00+210. We cannot confirm the layer dipping in the 250 MHz, data, however. Between 00+210 and 00+150, several faint reflections may indicate more distinct layering and at 00+150, a clear layer emerges in the data. For the 1000 MHz data (Figure 34), we can confidentially map one layer associated with the concrete and a second, deeper layer within the top foot. Collection for this particular section was limited to 2 feet based on the limited value of data below 2 feet.

Figure 35 shows the raw amplitude data for Section 4. The 250 MHz data reveal two spots of enhanced reflected amplitudes at positions 00+229 to 00+192 along the tunnel, at depths around 2.5 feet and again between 00+127 and 00+107 feet at the same depth. We have marked these as exploration anomalies S4-pt1 and S4-pt2 (at 00+206 and 00+117, respectively). Interestingly, the other two frequencies that were independently collected show unexpected behaviors at the same location and depth, particularly at 500 MHz. A third location of interest is located at 00+41 feet along the tunnel (marked as S4-pt3) and actually shows up as a bright spot on the 500 MHz data in the shallower reflections. We define a bright spot as an isolated increase in amplitude.

Figure 36 highlights the filtered, absolute value of the amplitude. Again focusing exclusively on the (b) (3) (A) line, we observe in the 250 MHz data a more consistent and higher amplitude data than previous sections. The high amplitude contour, identified by the solid black line (at log value of 4), are closed to form several discrete regions. The areas we have identified for exploration tend to be in these closed contour regions, but others also exist that were not identified for exploration. Our exploration anomalies are more readily seen in the 500 MHz data. Here, secondary amplitudes

are seen for S4-pt1 and S4-pt2 and the bright spot is more obvious in the primary amplitude. The strong secondary amplitudes in the 500 MHz data are rare in other sections. There doesn't appear to be anything remarkable in the 1000 MHz data.

Figure 37 highlights the power spectrum from each antenna. For the 250 MHz data, the power is much higher in Section 4 than past sections with a second band at 380 MHz quite prevalent across a majority of the section. An interesting area without a second band would be worth exploring and we have marked this area as S4-pt4, ranging from 00+279 to 00+259 feet along the tunnel. At 00+300 feet, the soil vapor was measured to be relatively high and the proximity of S4-pt4 may indicate subsurface hydrocarbons. In the 500 MHz data, three bands are common unlike before with high power coincident with previously identified exploration anomalies. For the 1000 MHz, there are four separate bands with high power with the first one at around 250 MHz having the highest. When considering all of the attributes together, there is a strong possibility that attributes of the concrete or the underlying basalt differ from surrounding areas in Section 4, perhaps indicating thicker lithologic material (considered A'a clinker in logs of the area).

Figure 32. Section 4 radargram for 250 MHz: Central, south sections

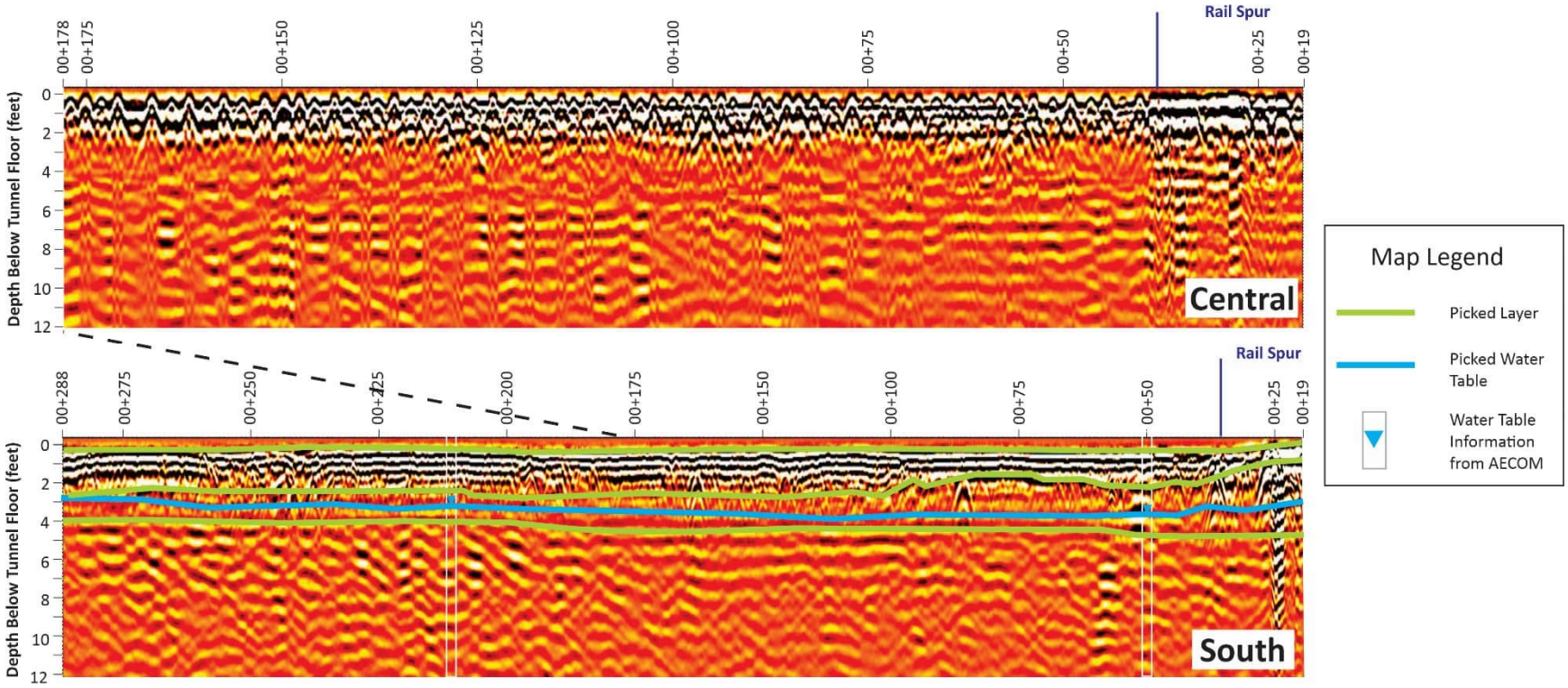


Figure 33. Section 4 radargram for 500 MHz: Central, south sections

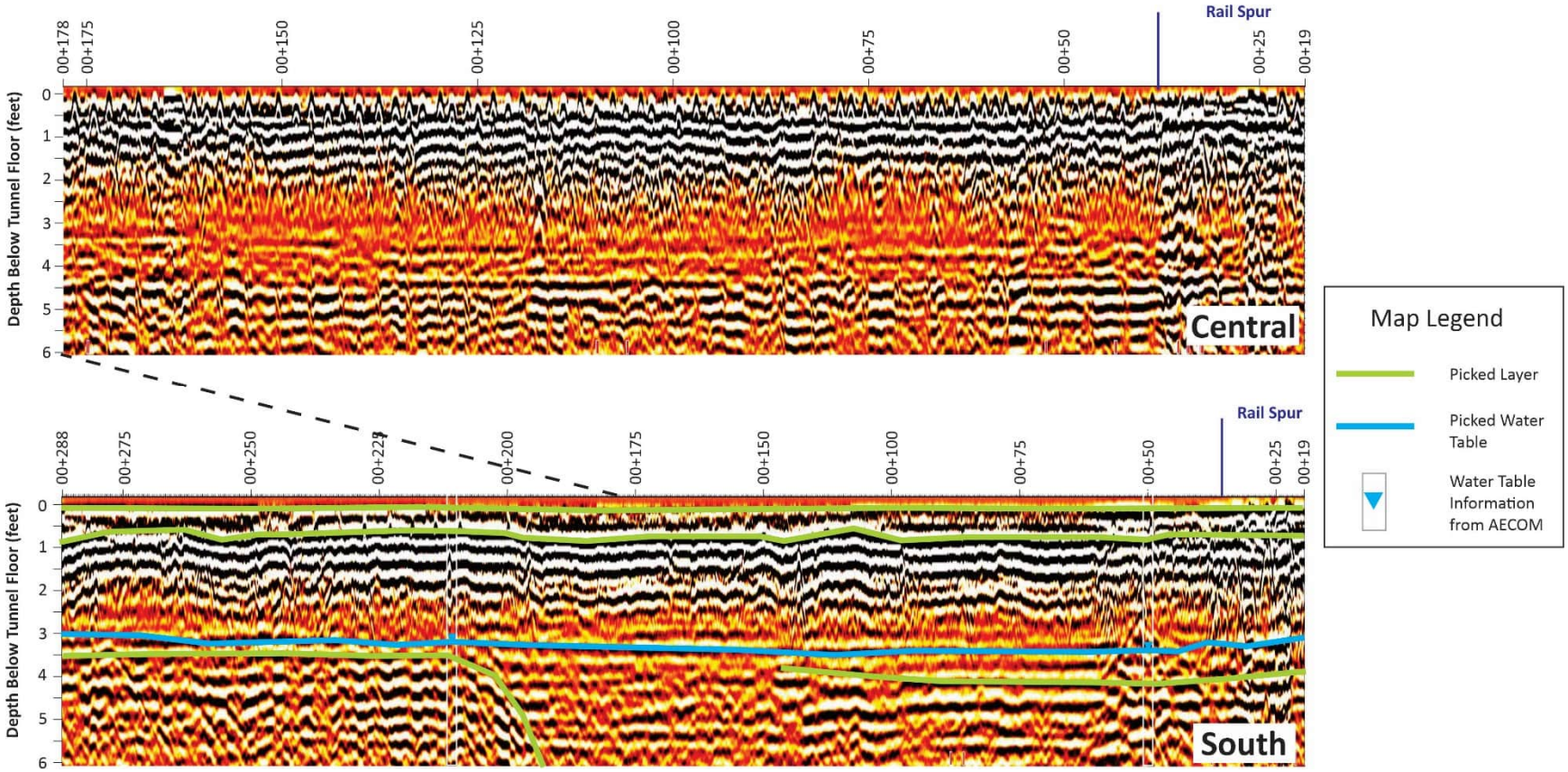


Figure 34. Section 4 radargram for 1000 MHz: Central, south sections

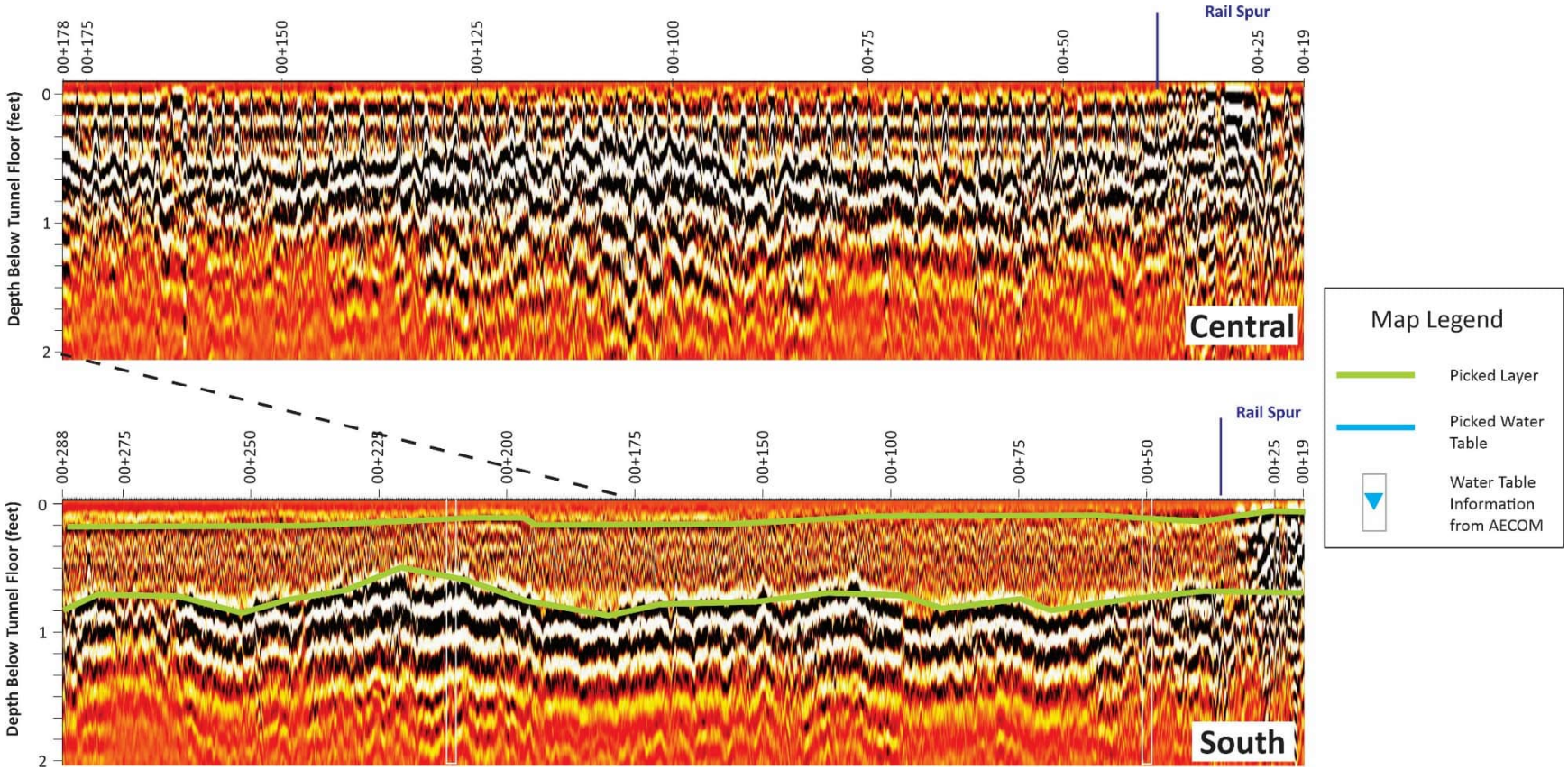


Figure 35. Section 4 raw amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data

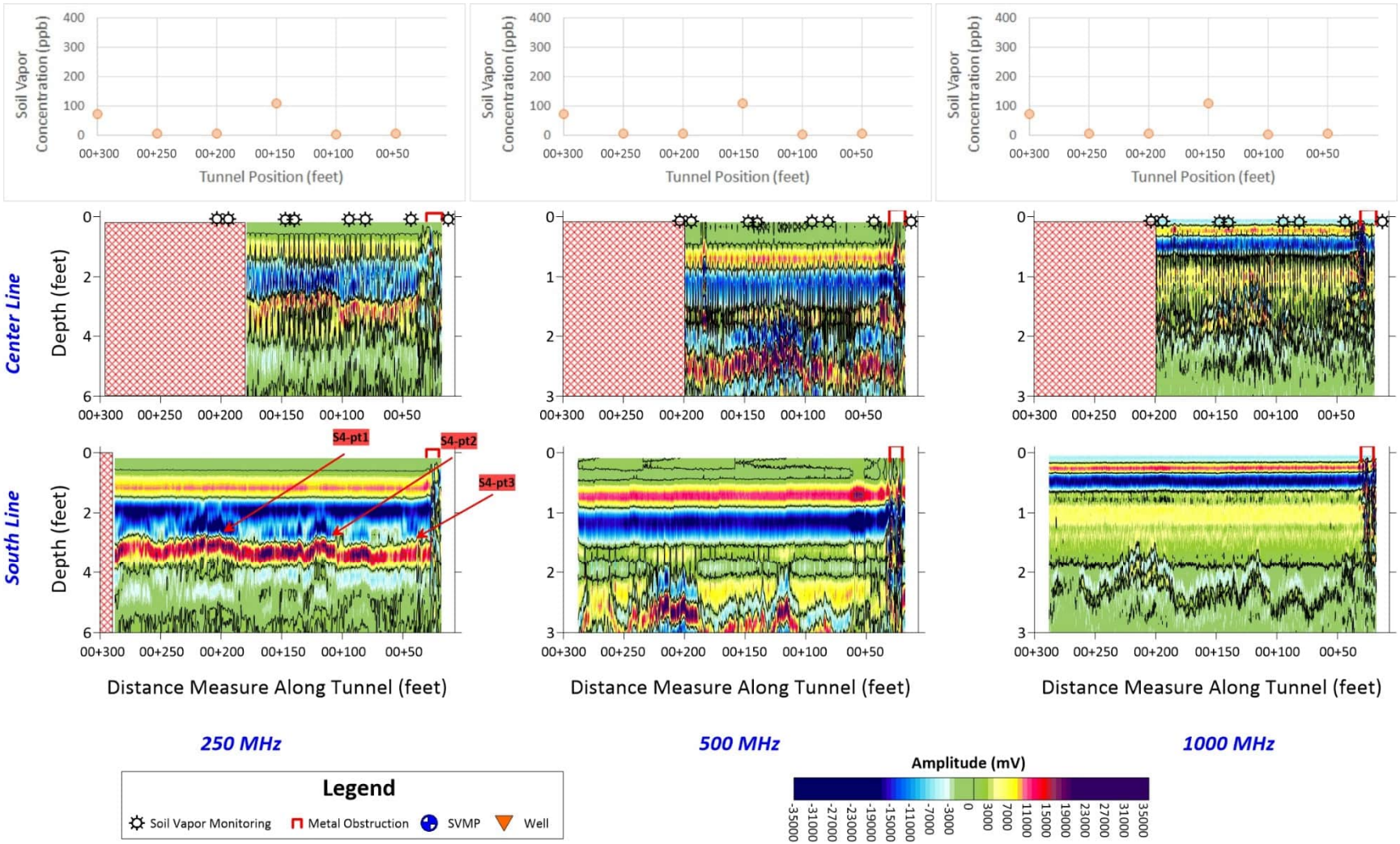


Figure 36. Section 4 filtered amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data.

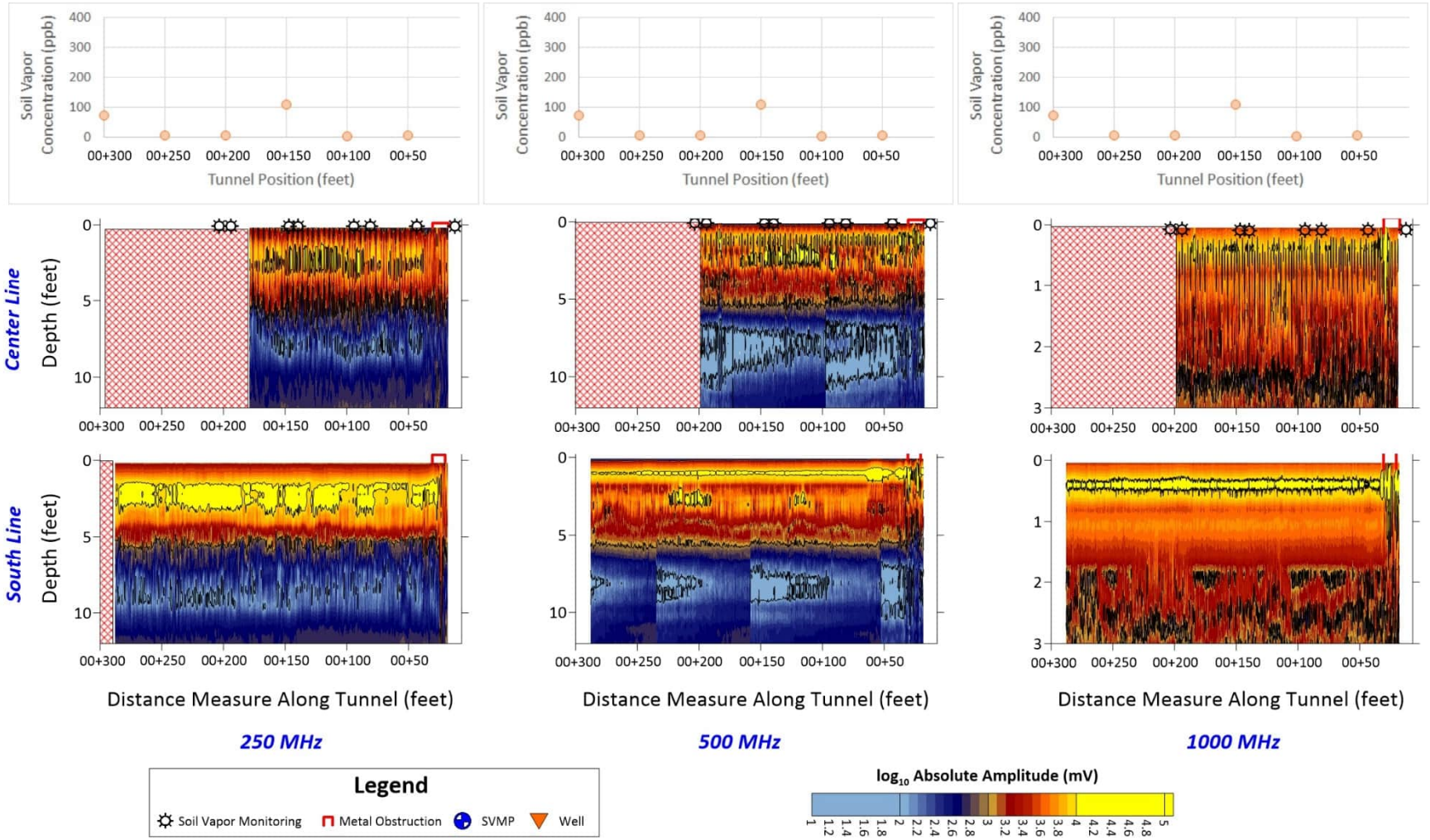
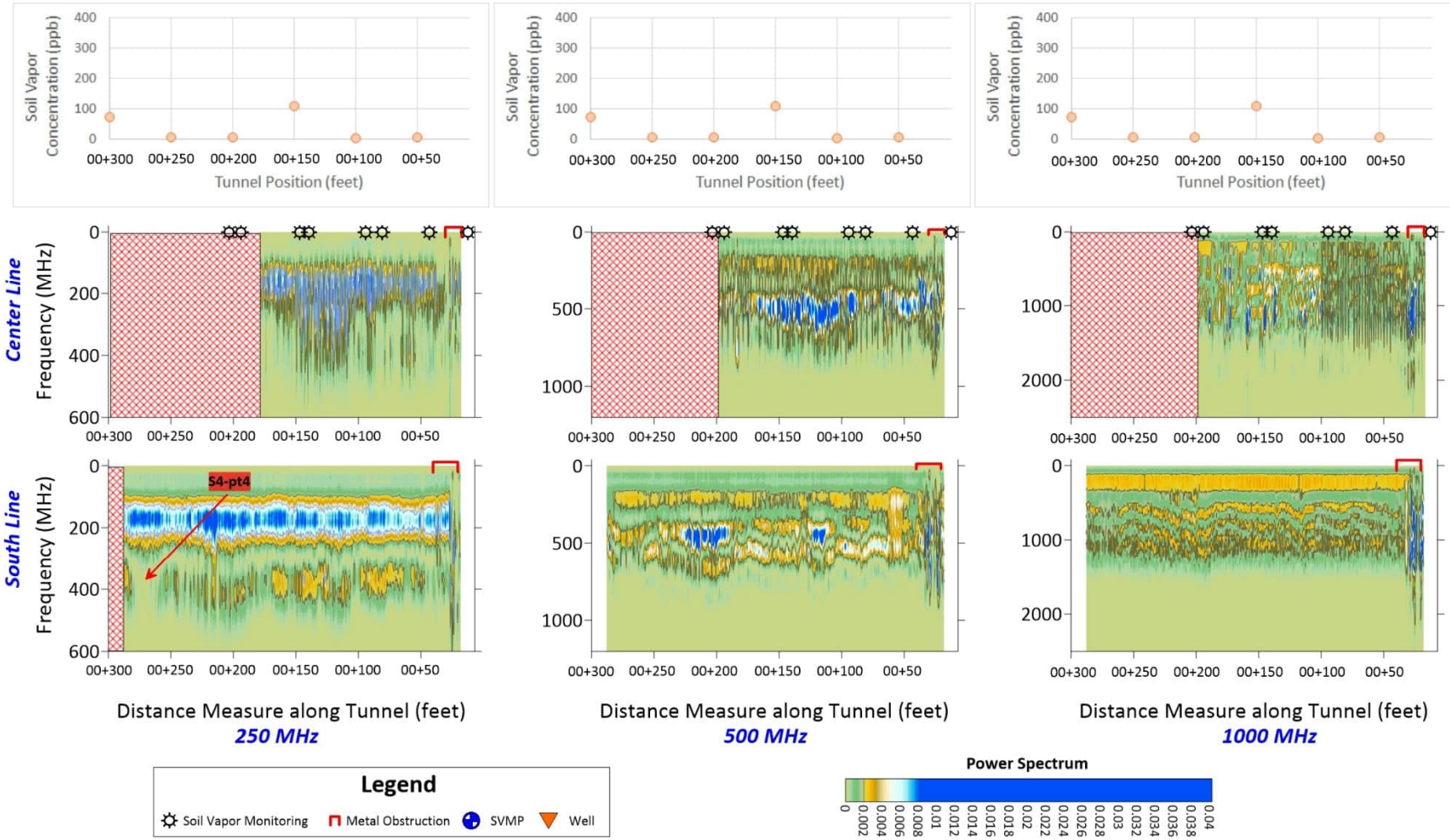


Figure 37. Section 4 power spectra for frequencies 250, 500, and 1,000 MHz and soil vapor data.



4.5 SECTION 5

Section 5 is the last section to be acquired and is located closest to the Adit 3 entrance. It spans the last 200 feet from the entrance at 00+500 feet to the wooden staircase at 00+300 feet. Based on the pipe location, the (b) (3) (A) line could not be acquired. In the (b) (3) (A) line, acquisition was also interrupted by the sump location at around 00+350 feet. Soil vapor monitoring points are located approximately every 50 feet and decreases from nearly 100 ppb to near 0 ppb at 00+500 feet.

Figures 38 through 40 show the radargrams for the three frequencies. Based on the two piezometers at 00+375 and 00+325, we calibrated the water table to a depth of around 2 feet. Above the water table, the reflection at the base of the concrete floor was easily determined for the 250 MHz antenna. The reflections from the water table, however, appear to comingle with multiples which obscure its exact location. Below the water table, we could map one more reflected layer at a depth of around 3 feet. Below this depth, the EM waves were attenuated making picking of strata tenuous. For the 500 MHz radargram in Figure 39, we see similar patterns of reflections. Below the table, the reflections appear rather strong, however, they are more than likely multiples from the water table. For the 1000 MHz, we could not distinguish the water table, but there were a couple of reflected horizons in the upper two feet.

Figure 41 shows the raw amplitude data for all three frequencies of 250, 500, and 1000 MHz. In the 250 MHz (b) (3) (A) data we observe a broad negative reflection (blue contour) from depths of 1.5 to 3 feet below surface (assuming a velocity of 0.13 m/ns). In the left side of the plot, the arrival pattern appears to be two reflections arriving nearly the same time and changes to a single arrival at the right side of the plot. Within this depth, there are a couple of subtle changes in the second arrival that we have highlighted as anomalies of potential interest, named S5-pt1 and S5-pt2. These two points are located, respectively, at 00+493 to 00+486 and at 00+412 to 00+402 and the anomalies are 00+488 and 00+404. In the 250 MHz (b) (3) (A) line, similar perturbances in the negative reflection are observed at the same location. Moving to the right, we have identified a third location that looks like a potential anomaly at 00+362 feet along the tunnel; we have identified this location as S5-pt3 (00+362). In the 500 MHz data, S5-pt1 is more subtle and S5-pt2 is not readily seen. Point S5-pt3 is observable and confirms the 250 MHz data.

Figure 42 shows the filtered amplitude data for Section 5. The 250 MHz data shows a wide swath of high amplitude across this section of the tunnel except at locations identified in the raw amplitude sections as exploration anomalies. In these data, S5-pt3 looks similar to the surficial metal identified elsewhere on the line, but nothing was clearly obvious on the ground. The 500 MHz data look like that of Section 4 with a narrow amplitude high fairly consistent across the section and secondary amplitudes occasionally present. The difference here, however, is that the pattern in Section 4 is different than Section 5, where the presence of the second high amplitude was coincident with anomalies of potential interest.

Figure 43 shows the power spectrum for Section 5. For the (b)(3)(A) and (b)(3)(A) line, the 250 MHz data show two bands from 00+500 to 00+400 feet, with these bands at 170 and 380 MHz. From 00+400 to 00+300 feet along the tunnel, the power is concentrated in a single band at 170 MHz. At the three points for exploration, there are subtle changes in the power. For the 500 MHz data, there are two obvious bands with a third band periodically present. High values of power are observed in the middle band near 450 MHz, but not necessarily coincident with anomalies of potential interest. The 1000 MHz data look similar to that of Section 4 with four individual bands at 200, 600, 900, and 1150 MHz. Spatially, nothing obvious within the power spectra can be attributed to previously chosen exploration points.

Figure 38. Section 5 radargram for 250 MHz: North, south sections

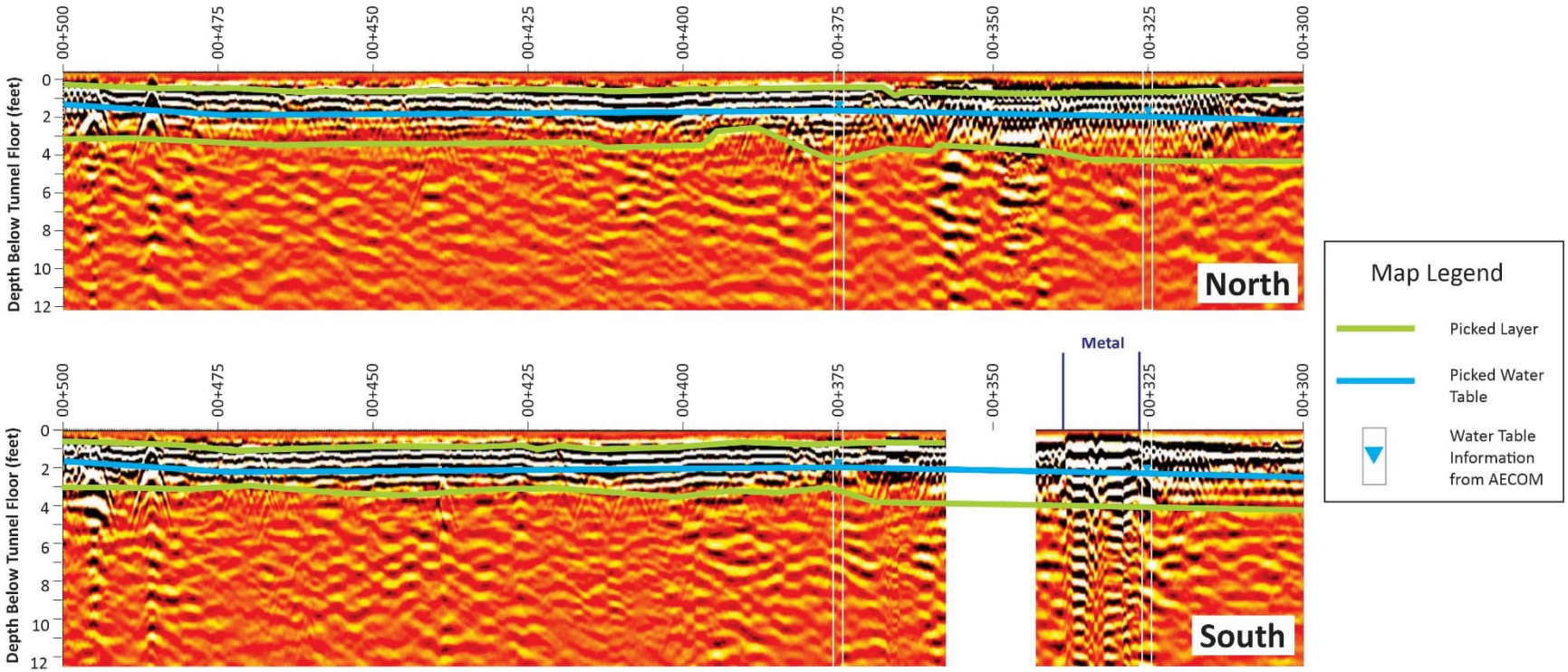


Figure 39. Section 5 radargram for 500 MHz: North, south sections

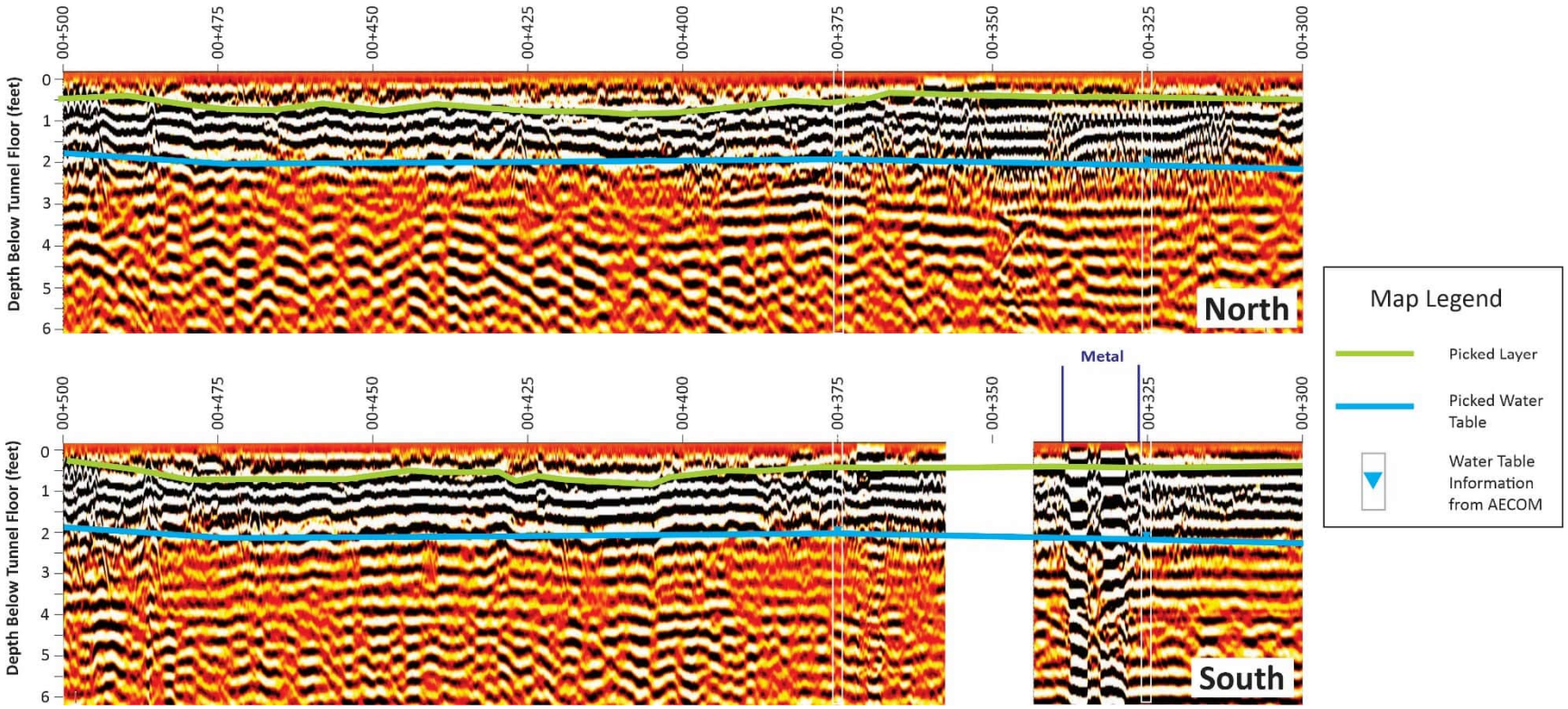


Figure 40. Section 5 radargram for 1000 MHz: North, south sections

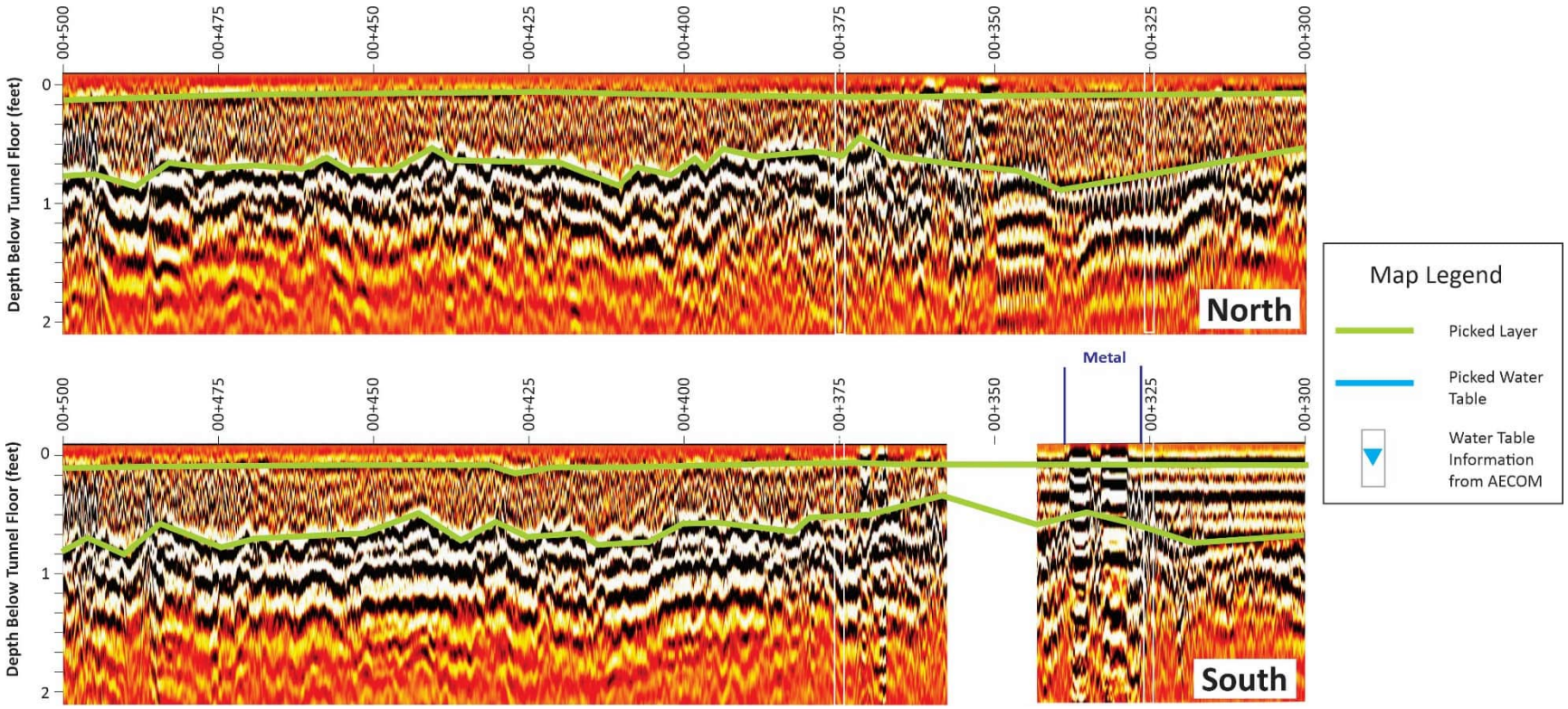


Figure 41. Section 5 raw amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data

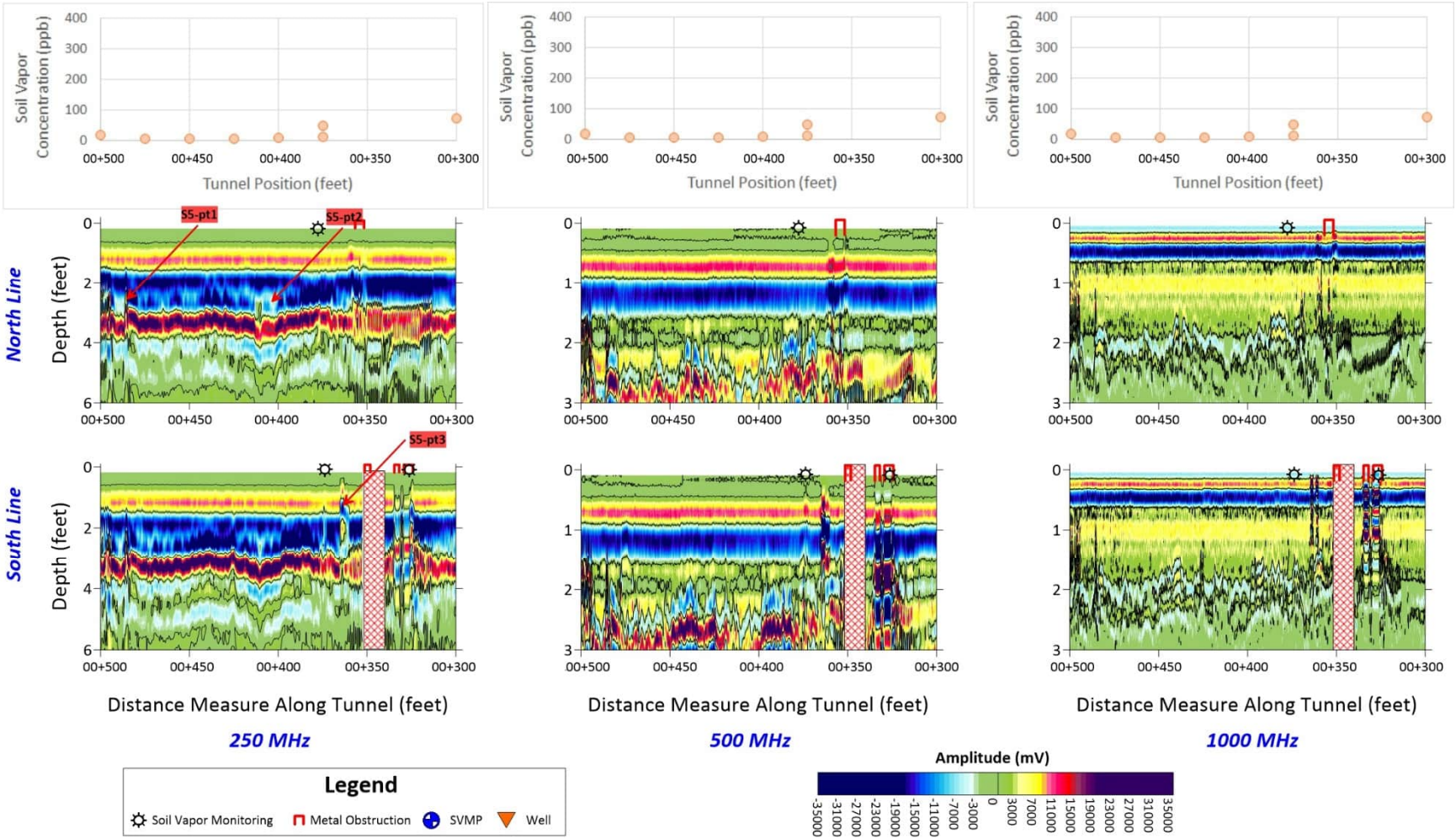


Figure 42. Section 5 filtered amplitude for frequencies 250, 500, and 1,000 MHz and soil vapor data.

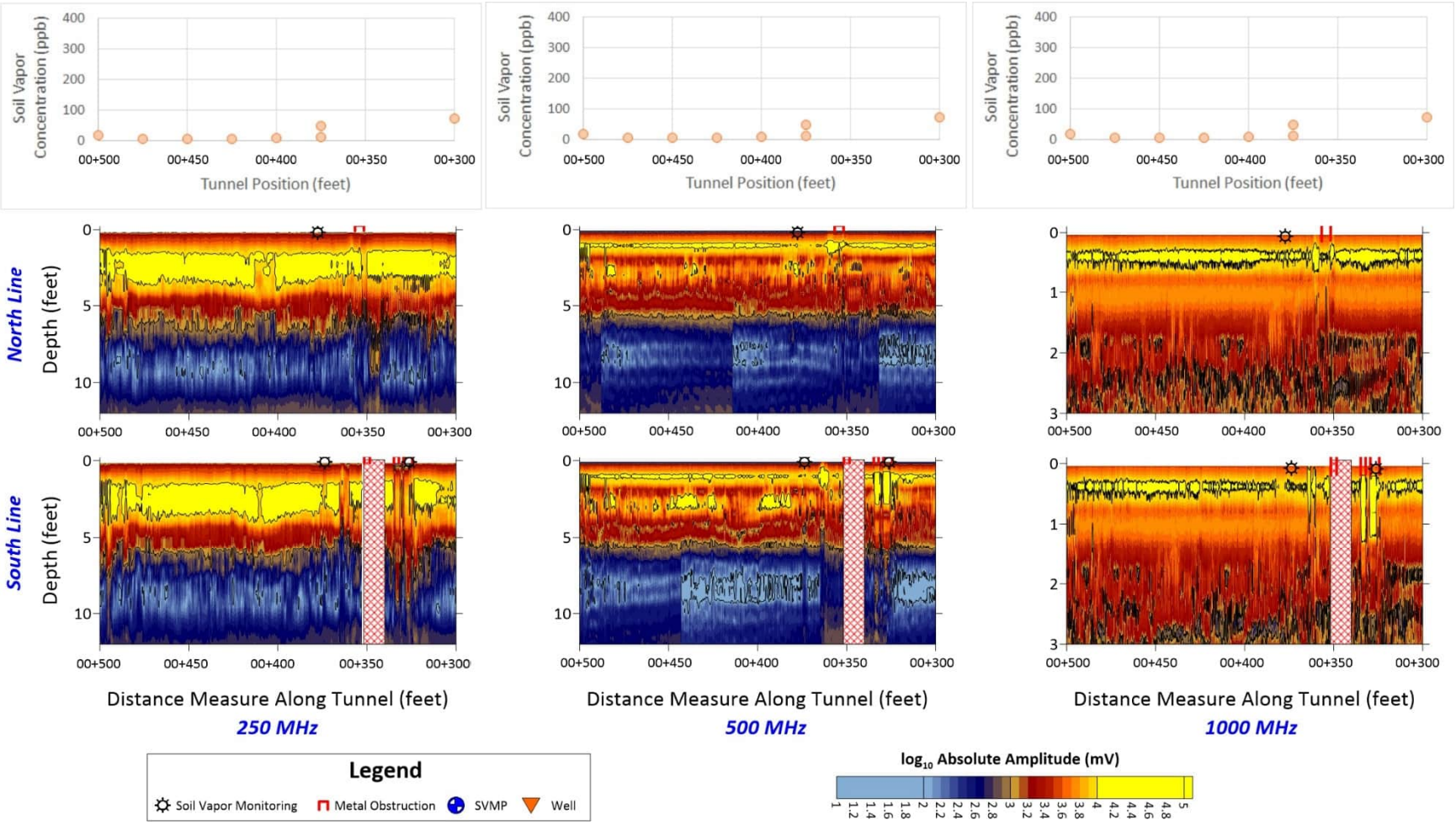
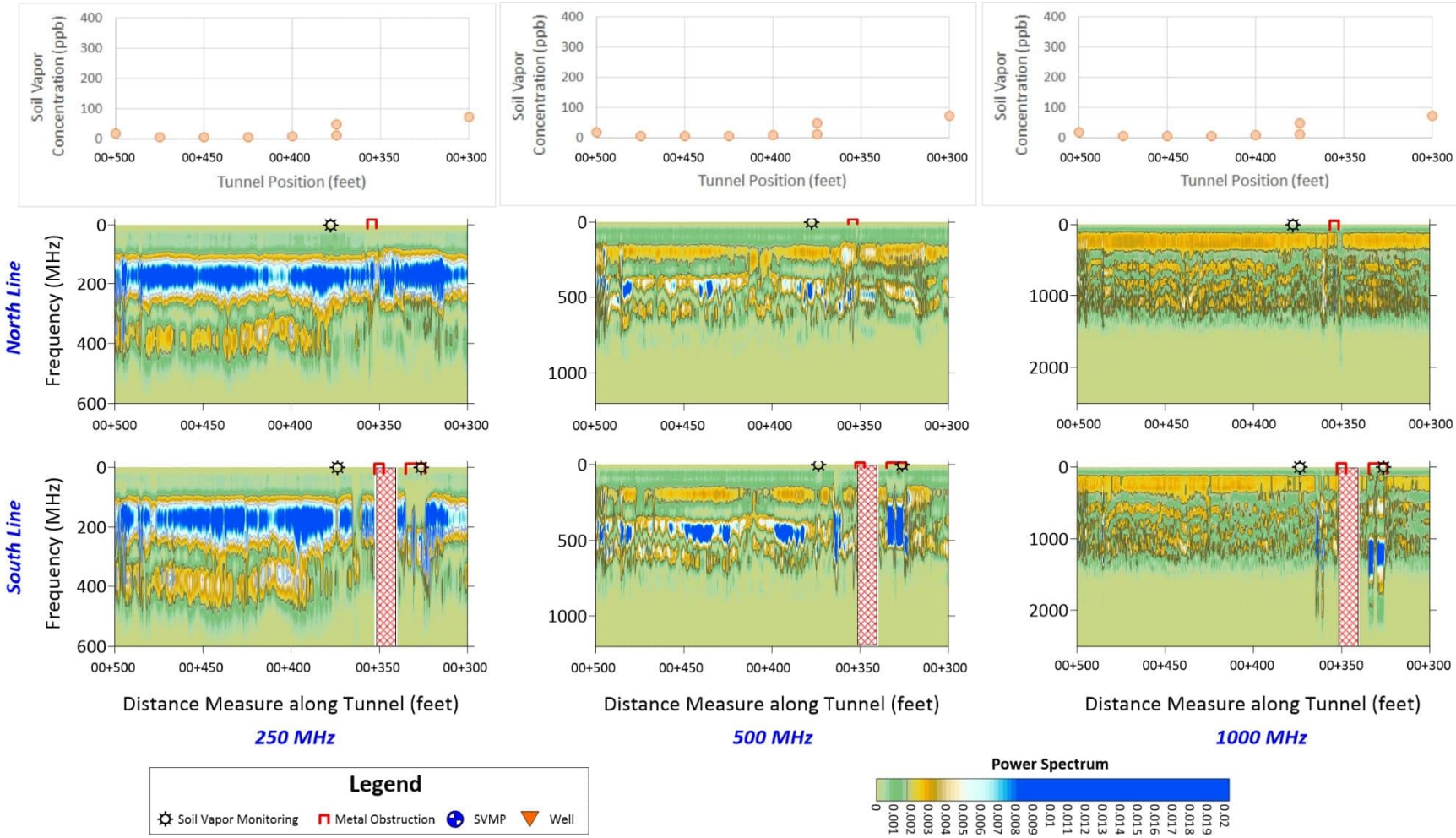


Figure 43. Section 5 power spectra for frequencies 250, 500, and 1,000 MHz and soil vapor data.



5.0 SUMMARY

A multi-frequency GPR geophysical investigation, including the use of shielded 250, 500, and 1000 MHz antennae, was conducted between November 10th and 12th, 2022. The GPR method was applied to investigate sections of the Lower Access Tunnel at the U.S. Navy Red Hill Bulk Fuel Storage Facility following a leak from an overhead pipe on or about November 20, 2021. Three coincident lines of GPR were collected in the sections of the lower access in proximity to the fuel leak, including (b) (3) (A), and (b) (3) (A) lines placed on the tunnel floor. For reference, the (b) (3) (A) line was collected between parallel metal train rails.

Minimal subsurface information was available in the lower access tunnel to ground truth the geophysical model results, although VOC concentrations from soil vapor measurements used to correlate to the GPR responses. The soil vapor values were very low throughout most of the tunnel sections we investigated and was a significant decrease compared to the Phase I investigation conducted in January 2022. To tease out subtleties within the GPR data, we relied on attributes within the amplitudes of reflected electromagnetic waves and on the information in the frequency spectrum such as the power.

A summary of the interpretations are provided below:

- The radargrams provide detailed information on the depths of several layers of geological layers beneath the tunnel floor, including the water table when it was within the imaging depth of each frequency.

- The raw amplitudes, color contoured to show differences between positive and negative reflected arrivals were fairly uniform across the tunnel. For example, the peak of the first arrival for the 250 MHz data occurred from 1 to 1.2 feet below surface. The difference, however, was in the amplitude of the peak, which was higher in the portions of the tunnel closer to Adit 3 in Sections 4 and 5. Other exceptions were observed when there was noted metal on the ground, mostly due to rails or switches. The release point also showed an intense earlier arrival, seemingly above the bottom of the concrete floor, likely due to the metal.

- For all of the frequencies and methods of processing and investigation, the middle line between the rails were unusable. This is due to periodically placed metal cross beams below the rails.

- The 250 MHz antenna showed impressive imaging depths, well beyond what would be useful for imaging near surface spills. However, the radargrams showed high attenuation at depths beyond 6 feet, obscuring geological details.

- The 500 MHz was very useful for verifying subtle variations in the subsurface below the concrete tunnel. The frequency was a good trade-off in signal attenuation, detail, and depth of investigation.
- The data obtained using the 1000 MHz antenna had limited visibility and depth penetration, making the data of less value than the 250 and 500 MHz antenna.
- Within the 250 and 500 MHz data, we identified regions that may warrant additional characterization. We called these locations exploration anomalies in the text and have summarized their locations in Table 3.

Table 3. Summary of anomalies of potential interest

Exploration Anomalies	Tunnel Side	Start Station (feet)
S2-pt1	(b) (3) (A) [redacted]	00-316
S2-pt2		00-171
S3-pt1		00-75
S3-pt2		00-46
S3-pt3		00-68
S3-pt4		00-75
S4-pt1		00+206
S4-pt2		00+117
S4-pt3		00+56
S5-pt1		00+488
S5-pt2		00+404
S5-pt3		00+362

Two of the exploration anomalies listed in Table 3 were also recommended in the Phase I survey, namely the positions at 00-316 and 00+488. They were listed in the Phase I report as 00+315 and 00-490.

6.0 REFERENCES

Cassidy, N.J., 2007. Evaluating LNAPL contamination using GPR signal attenuation analysis and dielectric property measurements: Practical implications for hydrological studies. Journal of Contaminant Hydrology, 94(1-2), pp.49-75.

Glaser, D.R., Werkema, D.D., Versteeg, R.J., Henderson, R.D. and Rucker, D.F., 2012. Temporal GPR imaging of an ethanol release within a laboratory-scaled sand tank. Journal of Applied Geophysics, 86, pp.133-145.

7.0 APPENDIX A – DRAWINGS

(b) (3) (A)

[redacted]

(b) (3) (A)

[redacted]

(b) (3) (A)

[redacted]

(b) (3) (A)

[redacted]

(b) (3) (A)

[redacted]

(b) (3) (A)

[redacted]

(b) (3) (A)

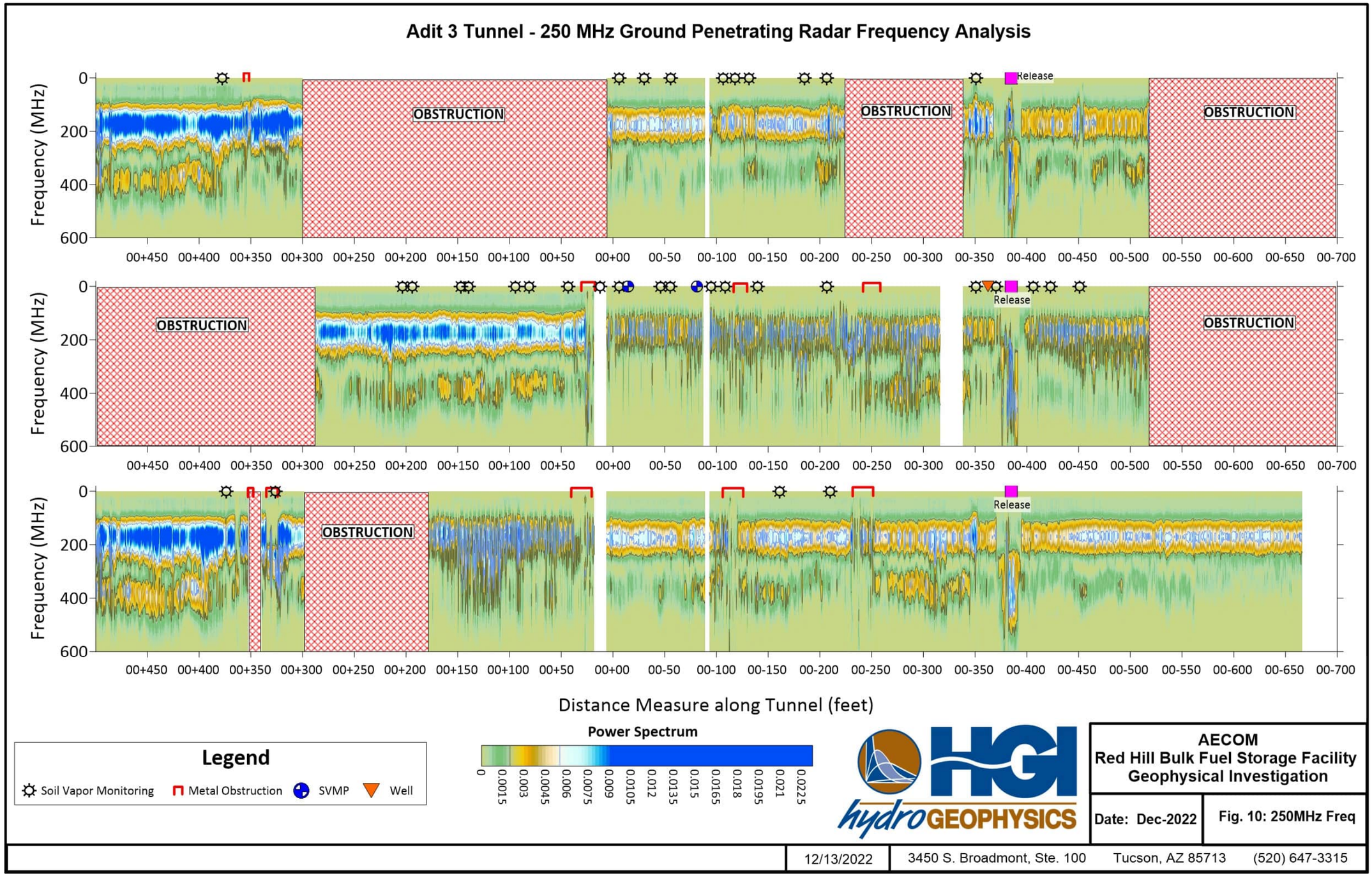
[redacted]

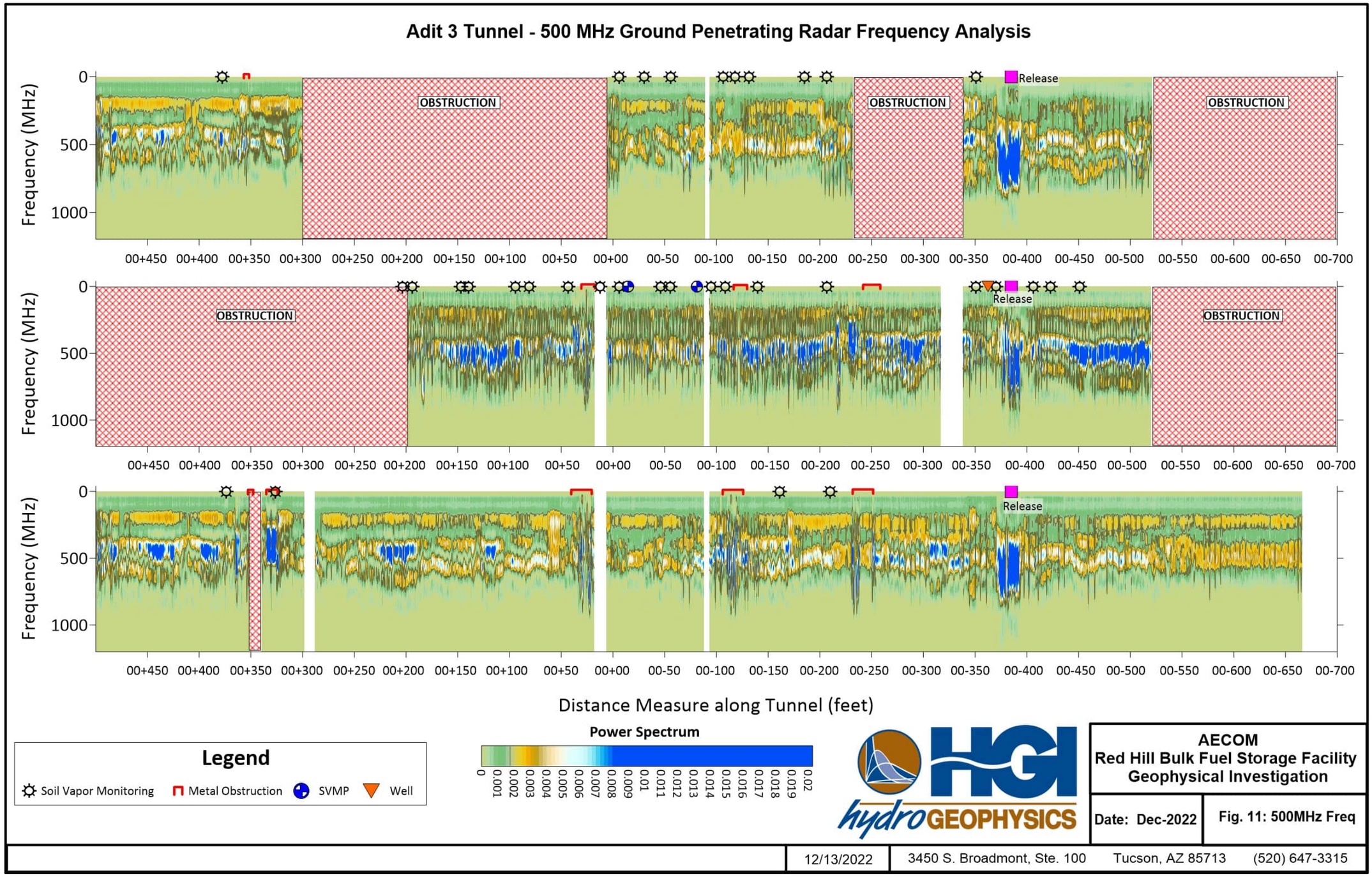
(b) (3) (A)

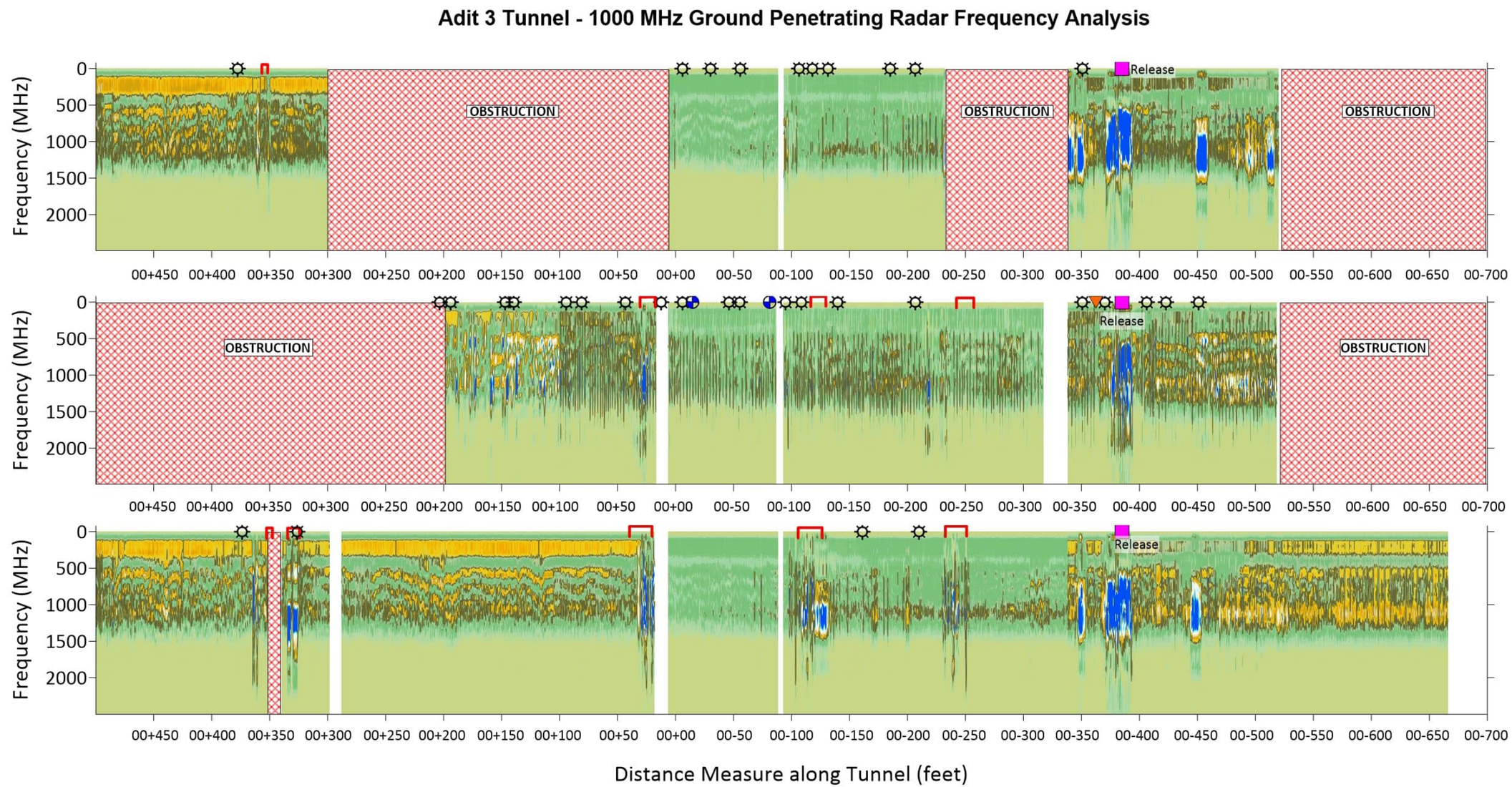
[redacted]

(b) (3) (A)

[redacted]


Adit 3 Tunnel - 250 MHz Ground Penetrating Radar Frequency Analysis
Frequency (MHz)
0
200
400
600
OBSTRUCTION
Release
00+450 00+400 00+350 00+300 00+250 00+200 00+150 00+100 00+50 00+00 00-50 00-100 00-150 00-200 00-250 00-300 00-350 00-400 00-450 00-500 00-550 00-600 00-650 00-700
Distance Measure along Tunnel (feet)
Legend
Soil Vapor Monitoring
Metal Obstruction
SVMP
Well
Power Spectrum
0 0.0015 0.003 0.0045 0.006 0.0075 0.009 0.0105 0.012 0.0135 0.015 0.0165 0.018 0.0195 0.021 0.0225
AECOM
Red Hill Bulk Fuel Storage Facility
Geophysical Investigation
Date: Dec-2022
Fig. 10: 250MHz Freq
12/13/2022
3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315


Adit 3 Tunnel - 500 MHz Ground Penetrating Radar Frequency Analysis
Frequency (MHz)
0
500
1000
OBSTRUCTION
Release
00+450 00+400 00+350 00+300 00+250 00+200 00+150 00+100 00+50 00+00 00-50 00-100 00-150 00-200 00-250 00-300 00-350 00-400 00-450 00-500 00-550 00-600 00-650 00-700
Distance Measure along Tunnel (feet)
Legend
Soil Vapor Monitoring
Metal Obstruction
SVMP
Well
Power Spectrum
0 0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.01 0.011 0.012 0.013 0.014 0.015 0.016 0.017 0.018 0.019 0.02
hydroGEOPHYSICS
AECOM
Red Hill Bulk Fuel Storage Facility
Geophysical Investigation
Date: Dec-2022
Fig. 11: 500MHz Freq
12/13/2022
3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315



Legend

Soil Vapor Monitoring | Metal Obstruction | SVMP | Well

Power Spectrum

0 0.002 0.004 0.006 0.008 0.01 0.012 0.014 0.016 0.018 0.02 0.022 0.024 0.026 0.028 0.03 0.032 0.034 0.036 0.038 0.04

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Date: Dec-2022 | **Fig. 12: 1000MHz Freq**

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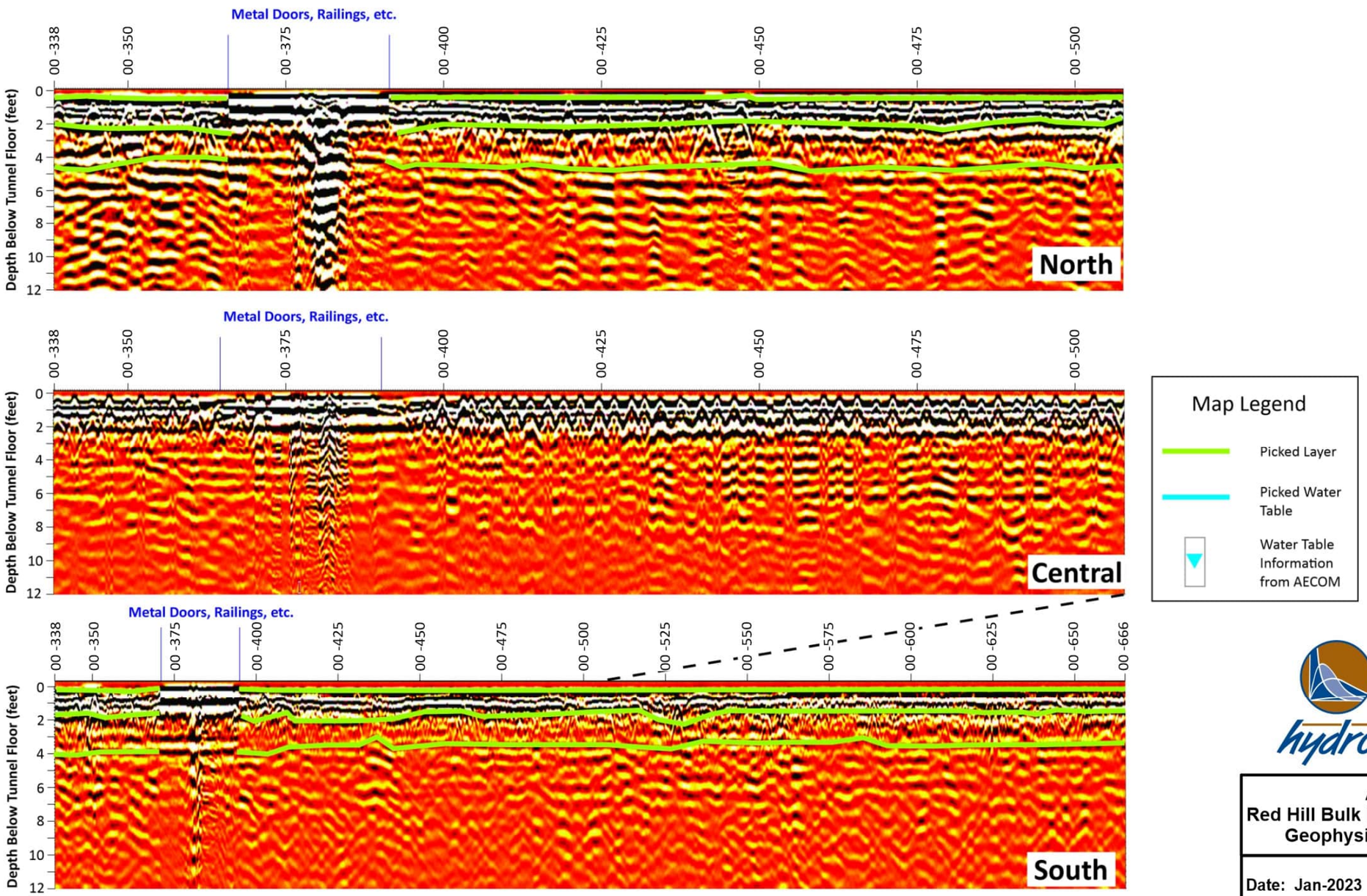
Adit 3 Tunnel - 250 MHz Ground Penetrating Radargram - Section 1



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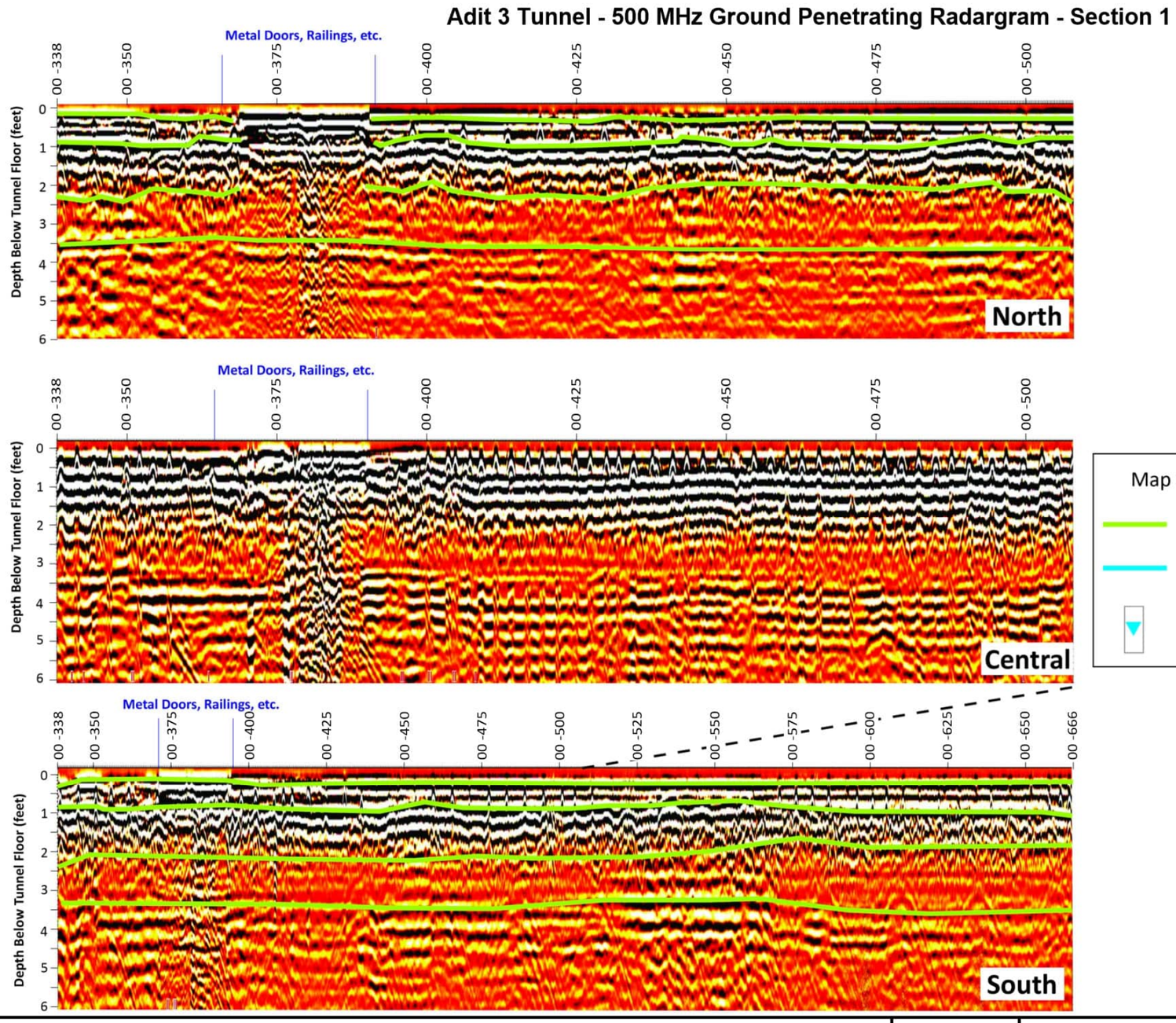
Geophysical Investigation

Date: Jan-2023 | **Fig. 13: 250MHz Radar**

01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315



Map Legend

- Picked Layer
- Picked Water Table
- Water Table Information from AECOM

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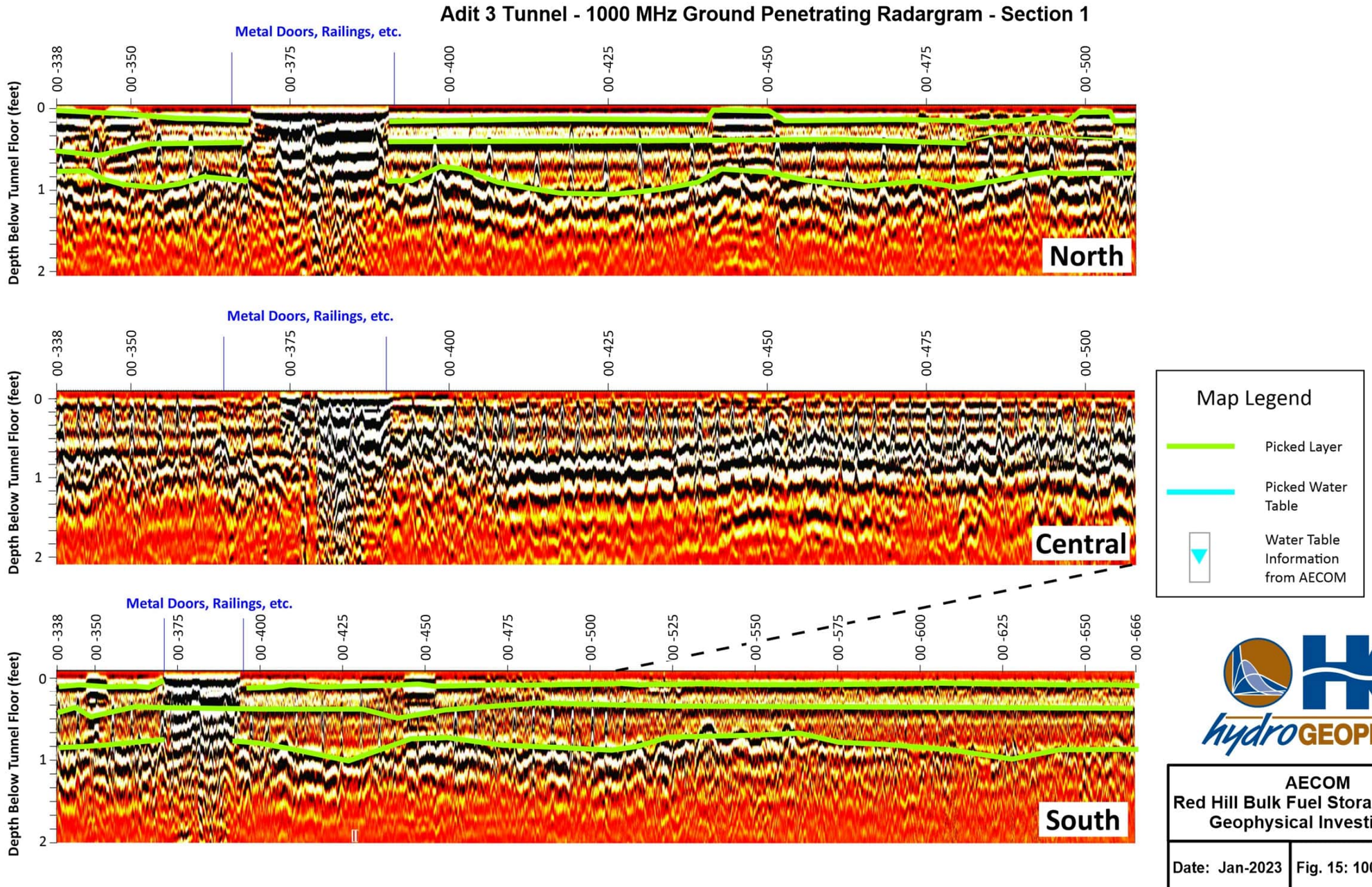
Date: Jan-2023 | **Fig. 14: 500MHz Radar**

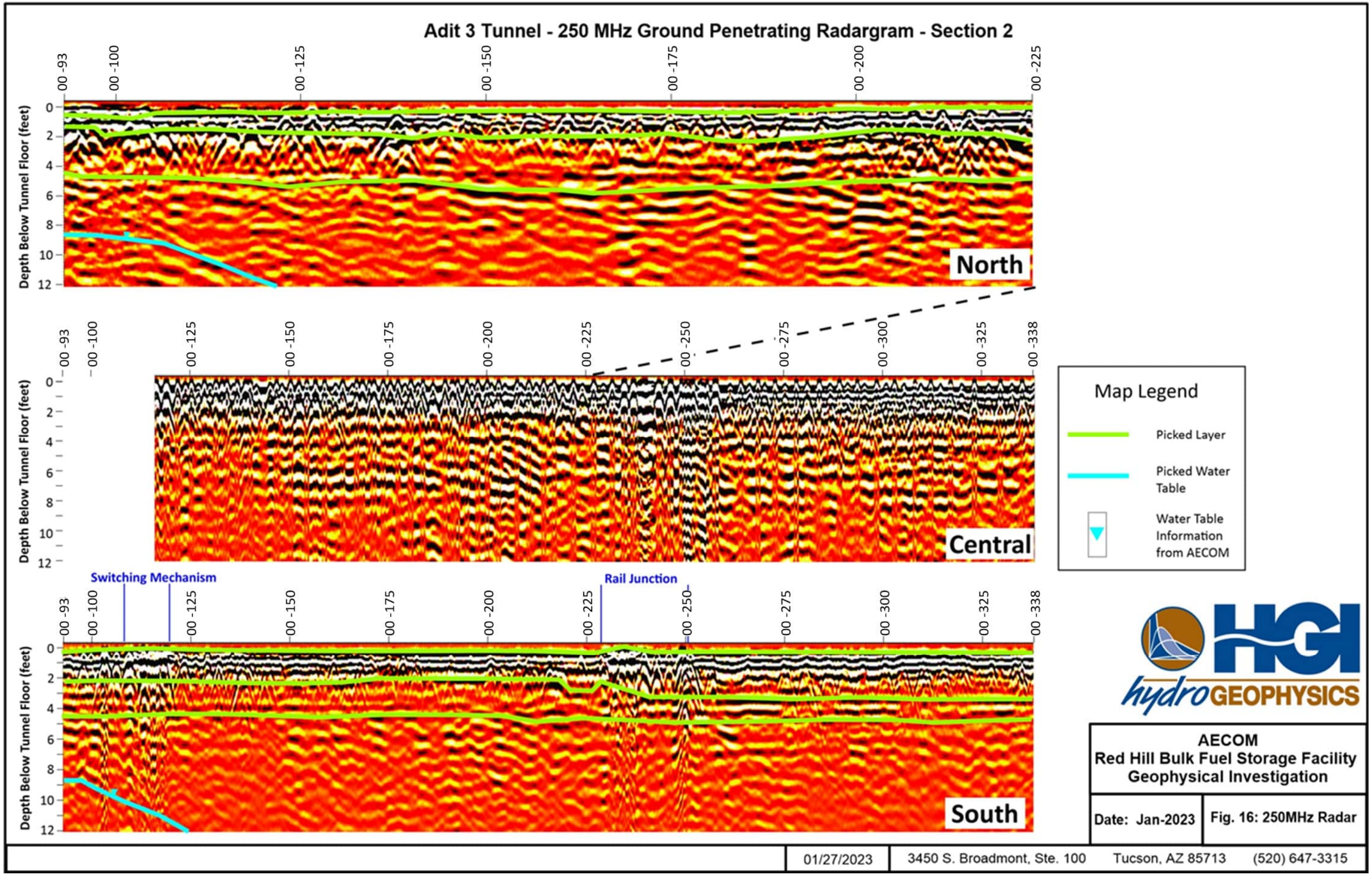
01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315

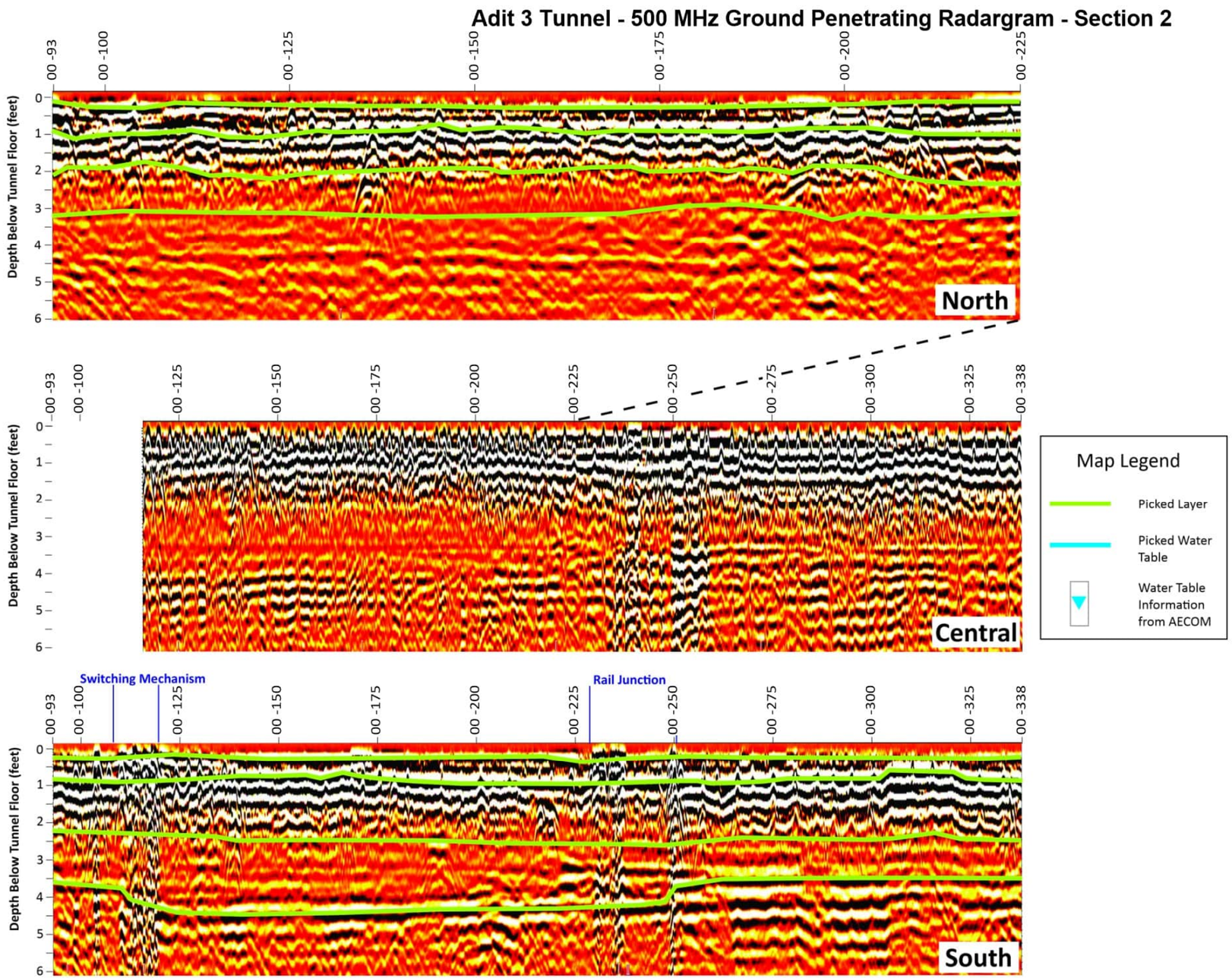


AECOM
Red Hill Bulk Fuel Storage Facility
Geophysical Investigation

Date: Jan-2023 | **Fig. 15: 1000MHz Radar**

01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315


Adit 3 Tunnel - 250 MHz Ground Penetrating Radargram - Section 2
Depth Below Tunnel Floor (feet)
North
Central
South
Switching Mechanism
Rail Junction
Map Legend
Picked Layer
Picked Water Table
Water Table Information from AECOM
AECOM
Red Hill Bulk Fuel Storage Facility
Geophysical Investigation
Date: Jan-2023
Fig. 16: 250MHz Radar
01/27/2023
3450 S. Broadmont, Ste. 100
Tucson, AZ 85713
(520) 647-3315



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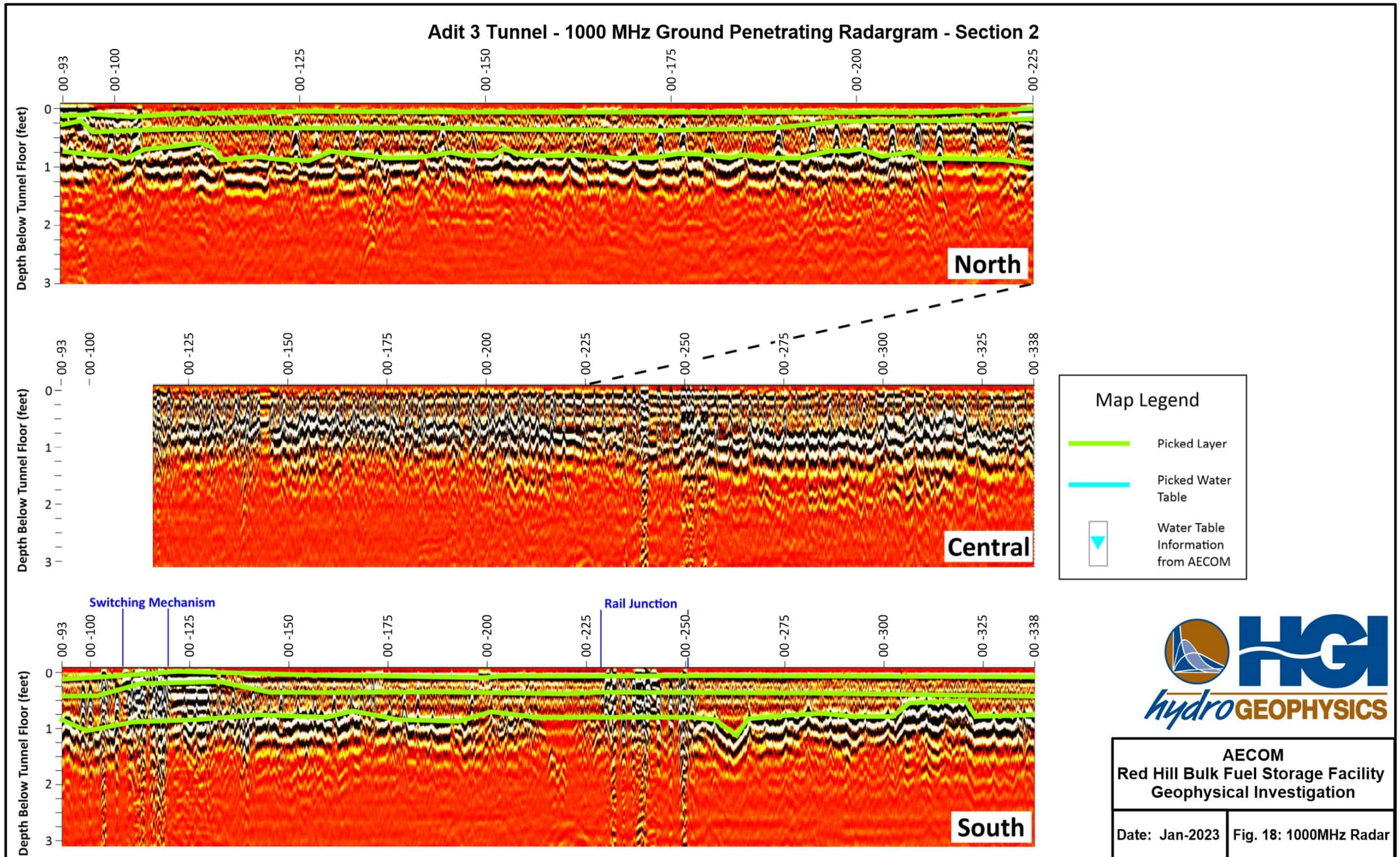
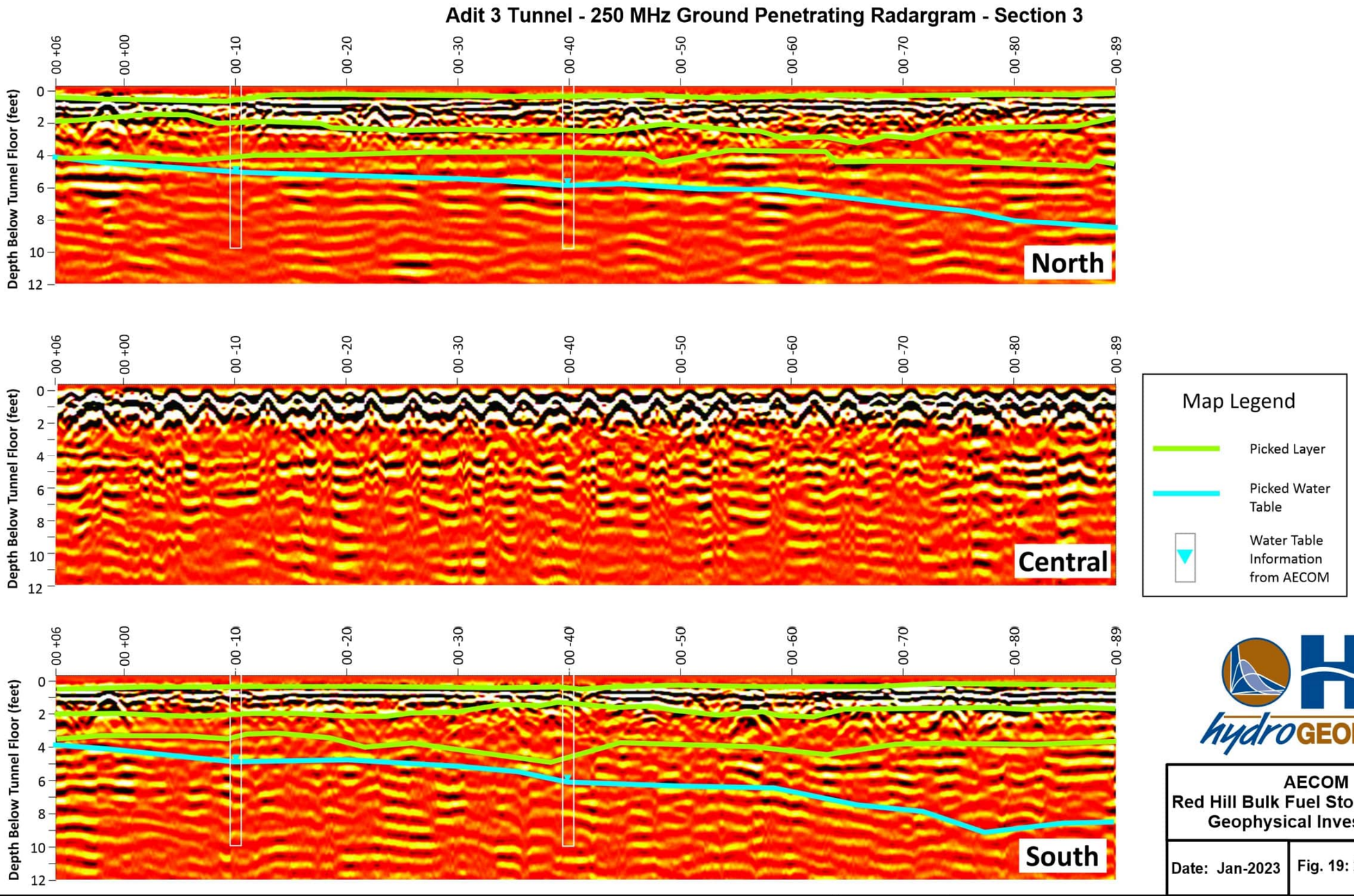
Geophysical Investigation

Date: Jan-2023 | **Fig. 17: 500MHz Radar**

01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315


Adit 3 Tunnel - 1000 MHz Ground Penetrating Radargram - Section 2
Depth Below Tunnel Floor (feet)
North
Central
South
Switching Mechanism
Rail Junction
Map Legend
Picked Layer
Picked Water Table
Water Table Information from AECOM
AECOM
Red Hill Bulk Fuel Storage Facility
Geophysical Investigation
Date: Jan-2023
Fig. 18: 1000MHz Radar
01/27/2023
3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315



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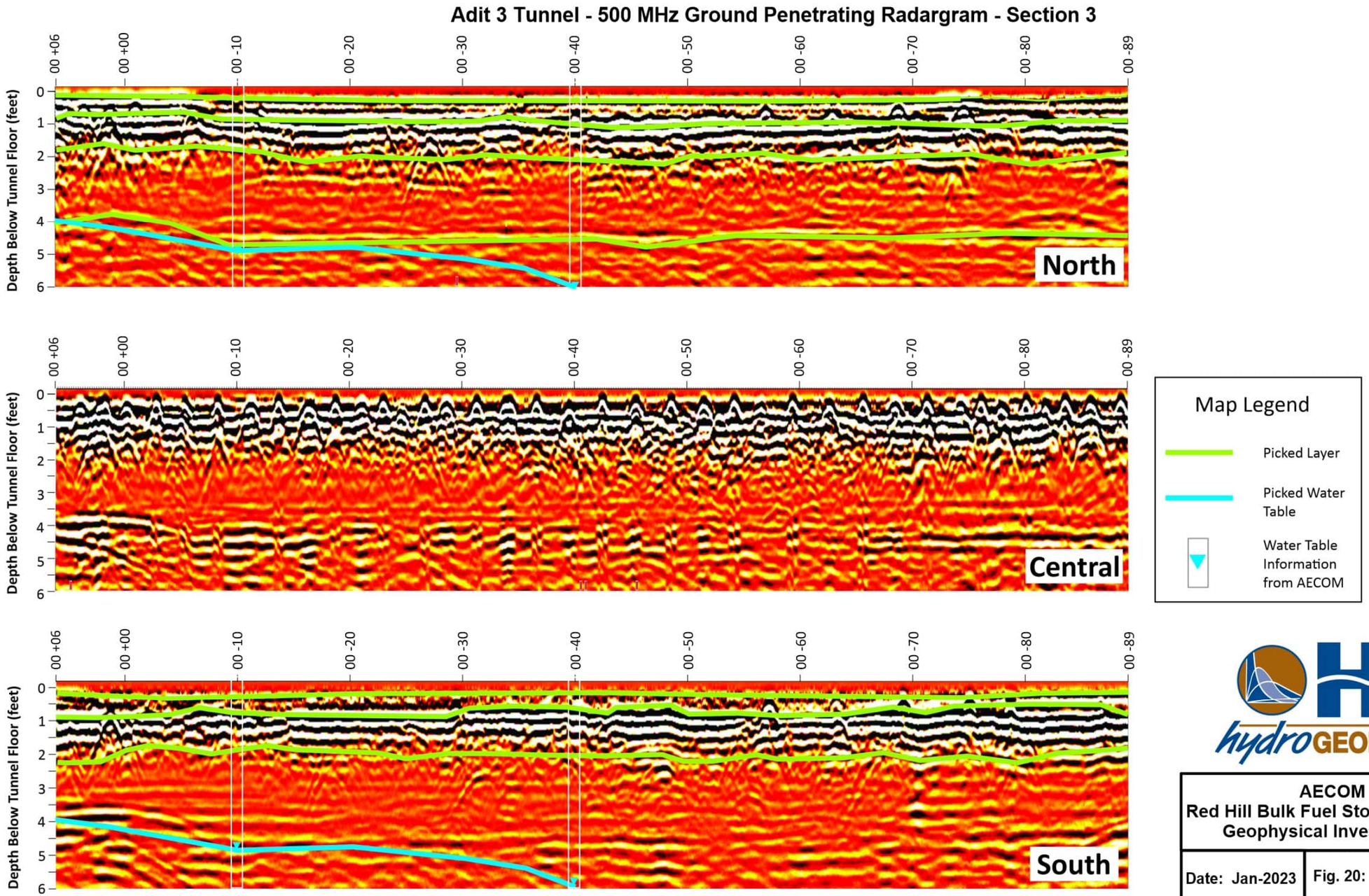
Date: Jan-2023 | **Fig. 19: 250MHz Radar**

01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315



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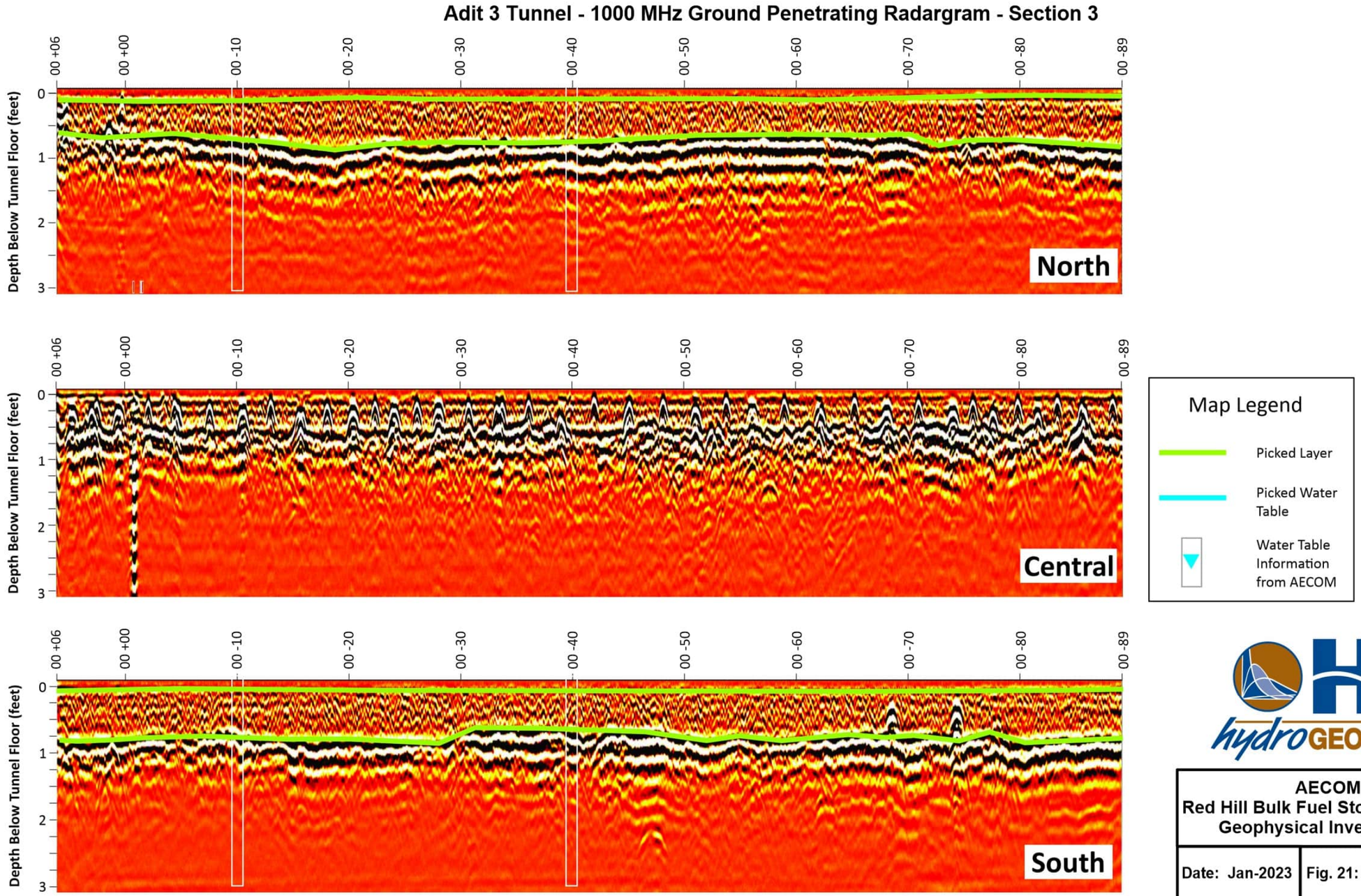
Geophysical Investigation

Date: Jan-2023 | **Fig. 20: 500MHz Radar**

01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315



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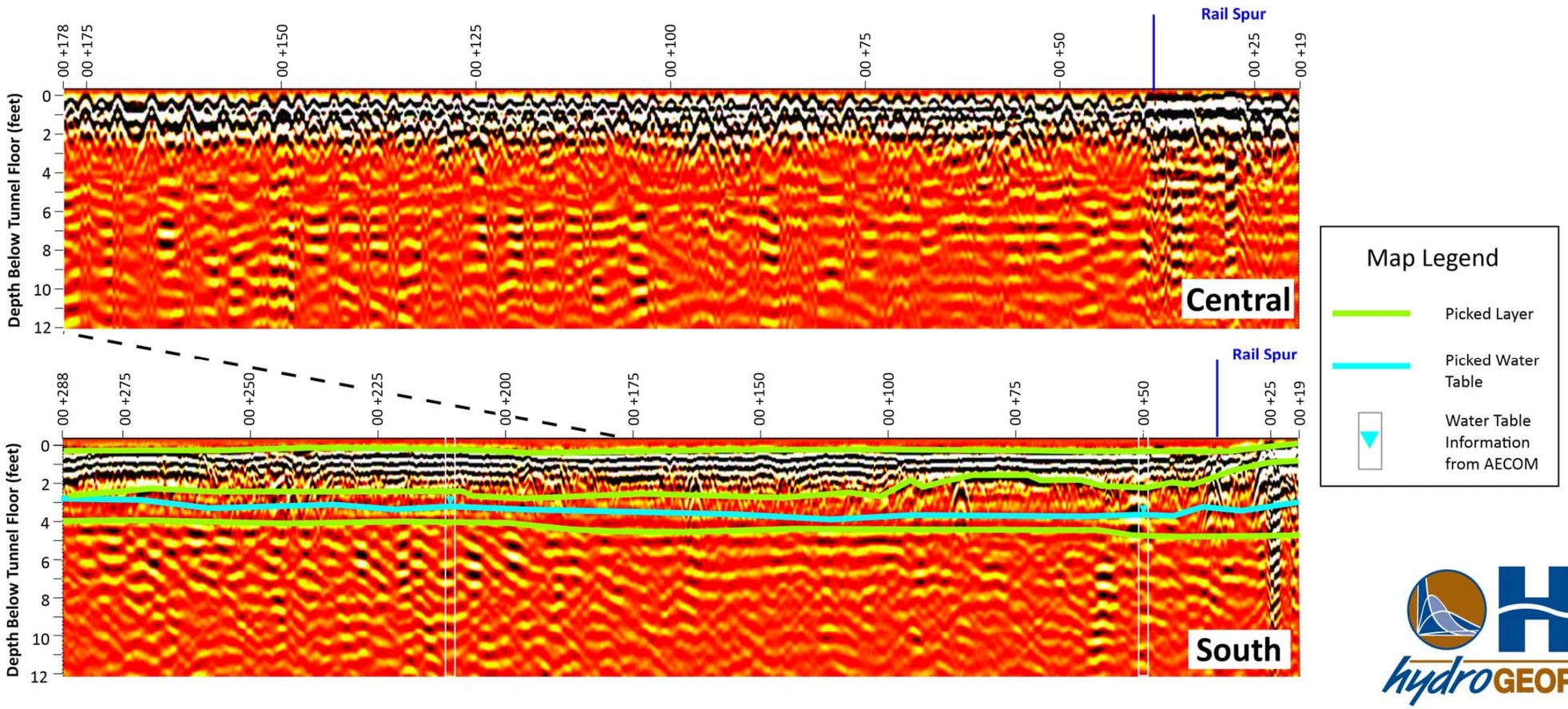
Geophysical Investigation

Date: Jan-2023 | **Fig. 21: 1000MHz Radar**

01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315

Adit 3 Tunnel - 250 MHz Ground Penetrating Radargram - Section 4



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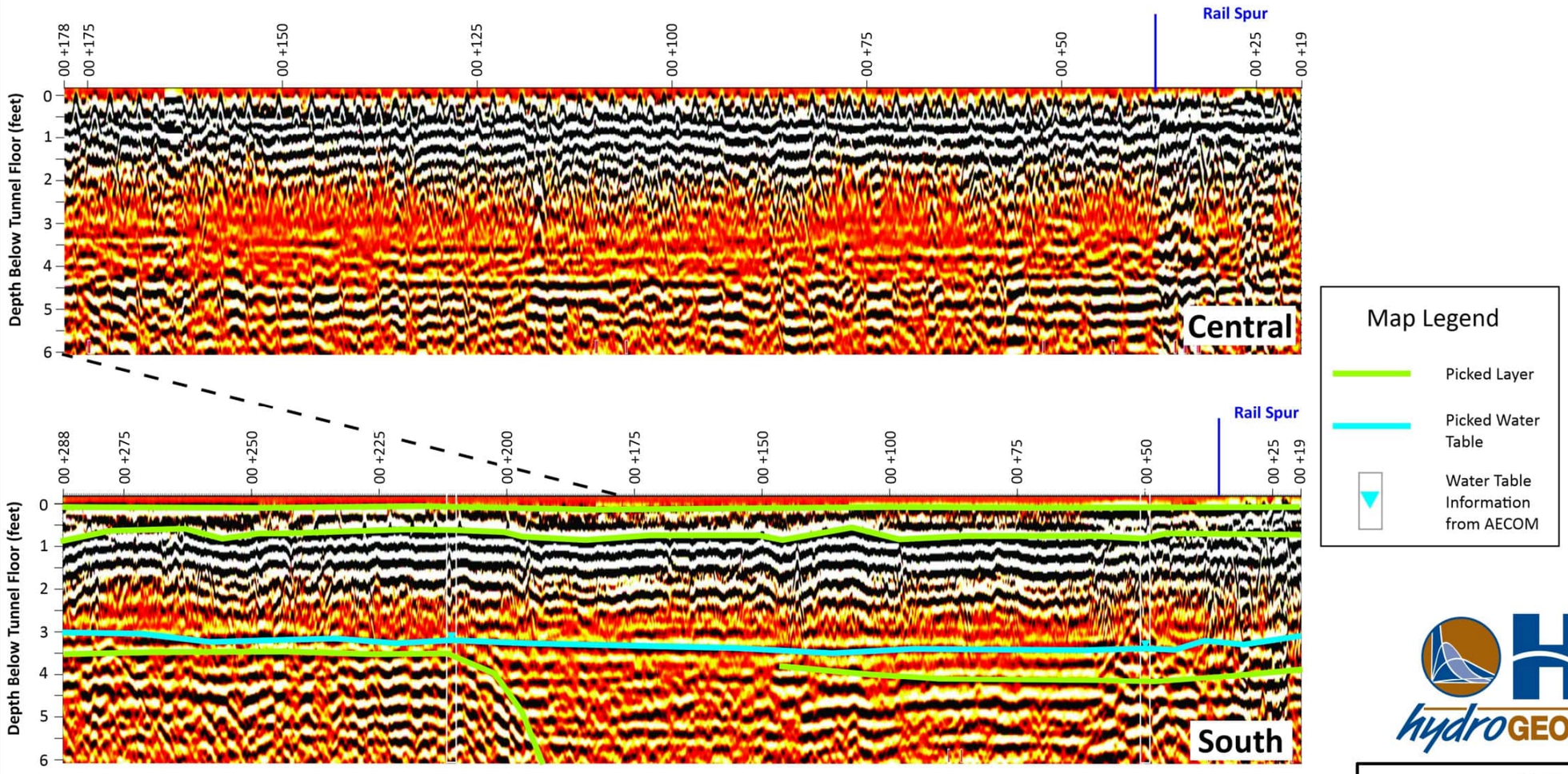
Red Hill Bulk Fuel Storage Facility
Geophysical Investigation

Date: Jan-2023	Fig. 22: 250MHz Radar

01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315

Adit 3 Tunnel - 500 MHz Ground Penetrating Radargram - Section 4



AECOM
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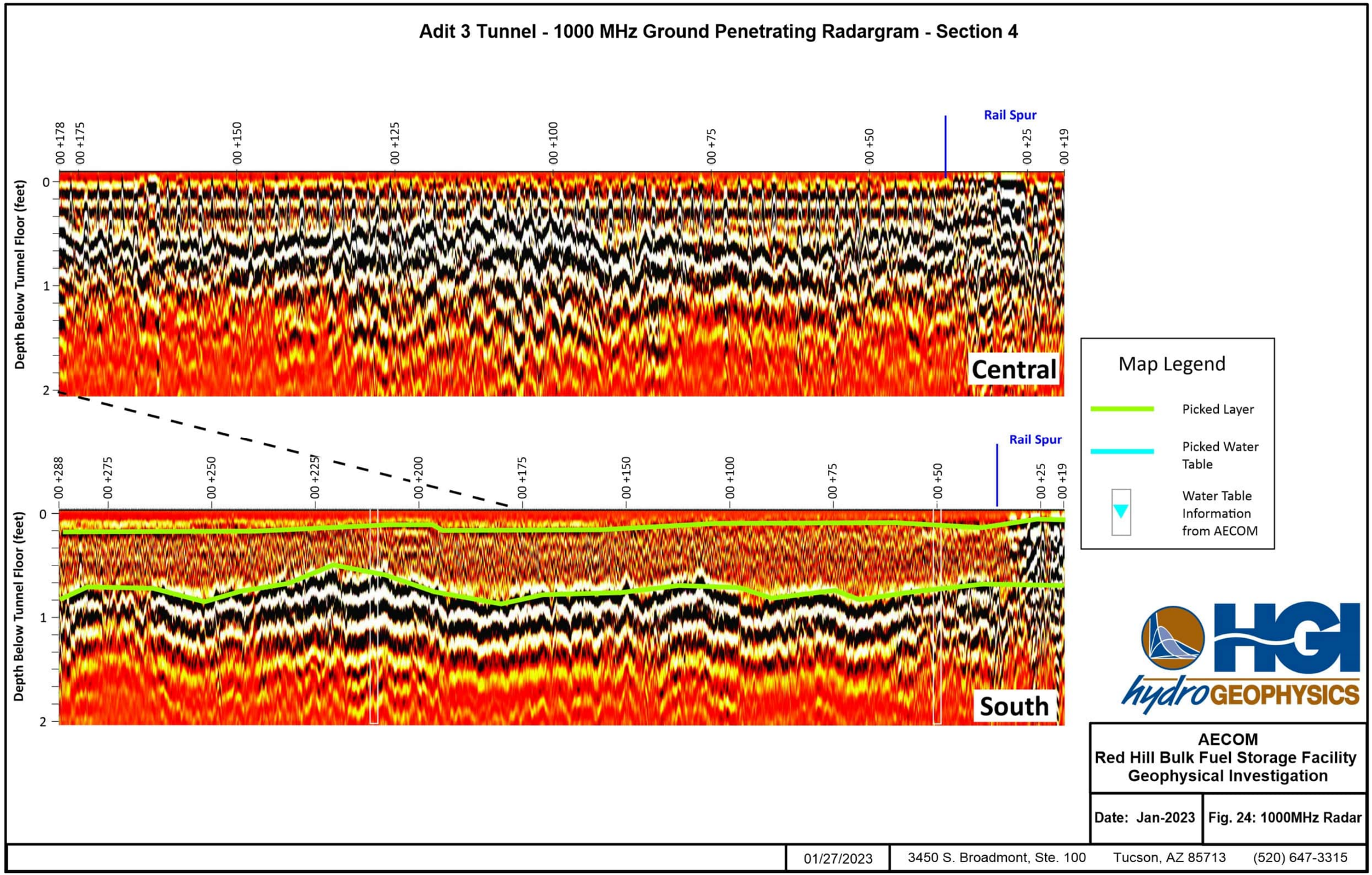
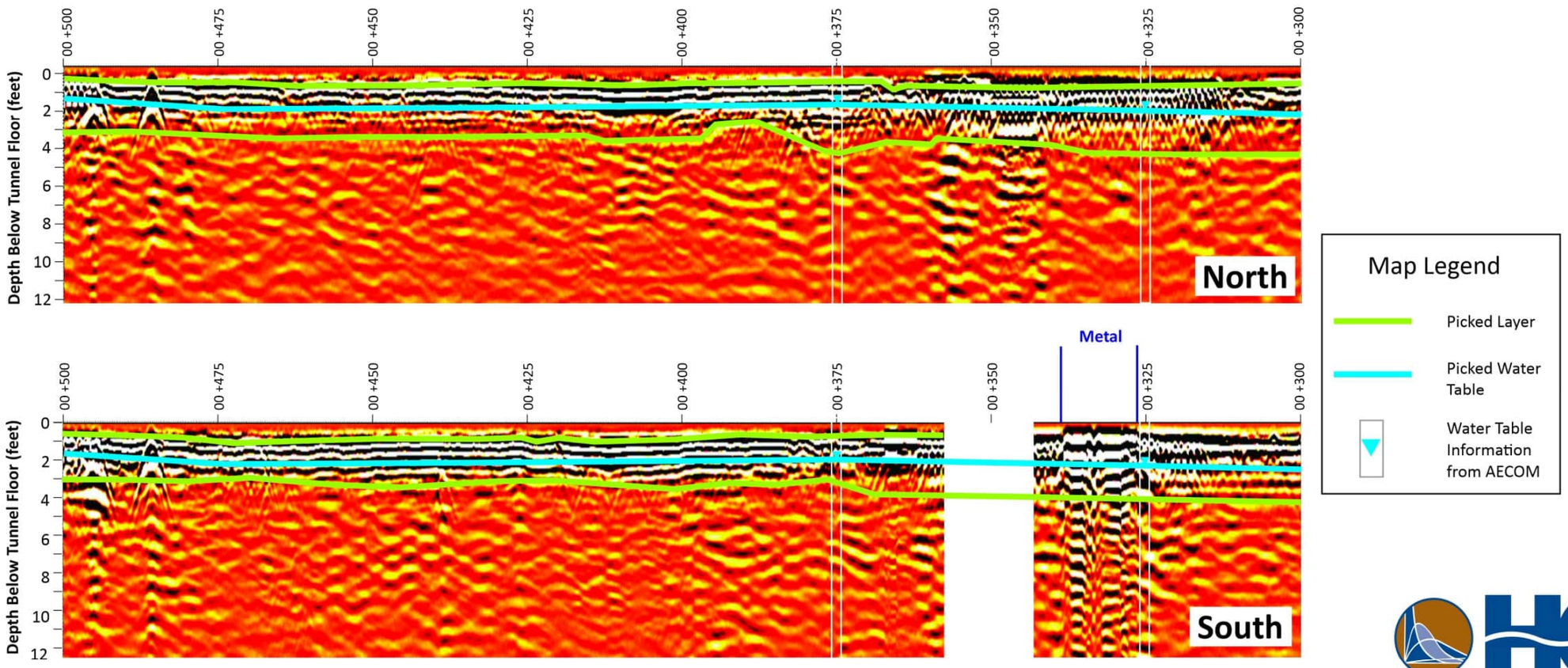
Geophysical Investigation

Date: Jan-2023 | **Fig. 23: 500MHz Radar**

01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315


Adit 3 Tunnel - 1000 MHz Ground Penetrating Radargram - Section 4
Rail Spur
00 +178
00 +175
00 +150
00 +125
00 +100
00 +75
00 +50
00 +25
00 +19
Depth Below Tunnel Floor (feet)
0
1
2
Central
Rail Spur
00 +288
00 +275
00 +250
00 +225
00 +200
00 +175
00 +150
00 +100
00 +75
00 +50
00 +25
00 +19
Depth Below Tunnel Floor (feet)
0
1
2
South
Map Legend
Picked Layer
Picked Water Table
Water Table Information from AECOM
hydroGEOPHYSICS
AECOM
Red Hill Bulk Fuel Storage Facility
Geophysical Investigation
Date: Jan-2023
Fig. 24: 1000MHz Radar
01/27/2023
3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315

Adit 3 Tunnel - 250 MHz Ground Penetrating Radargram - Section 5

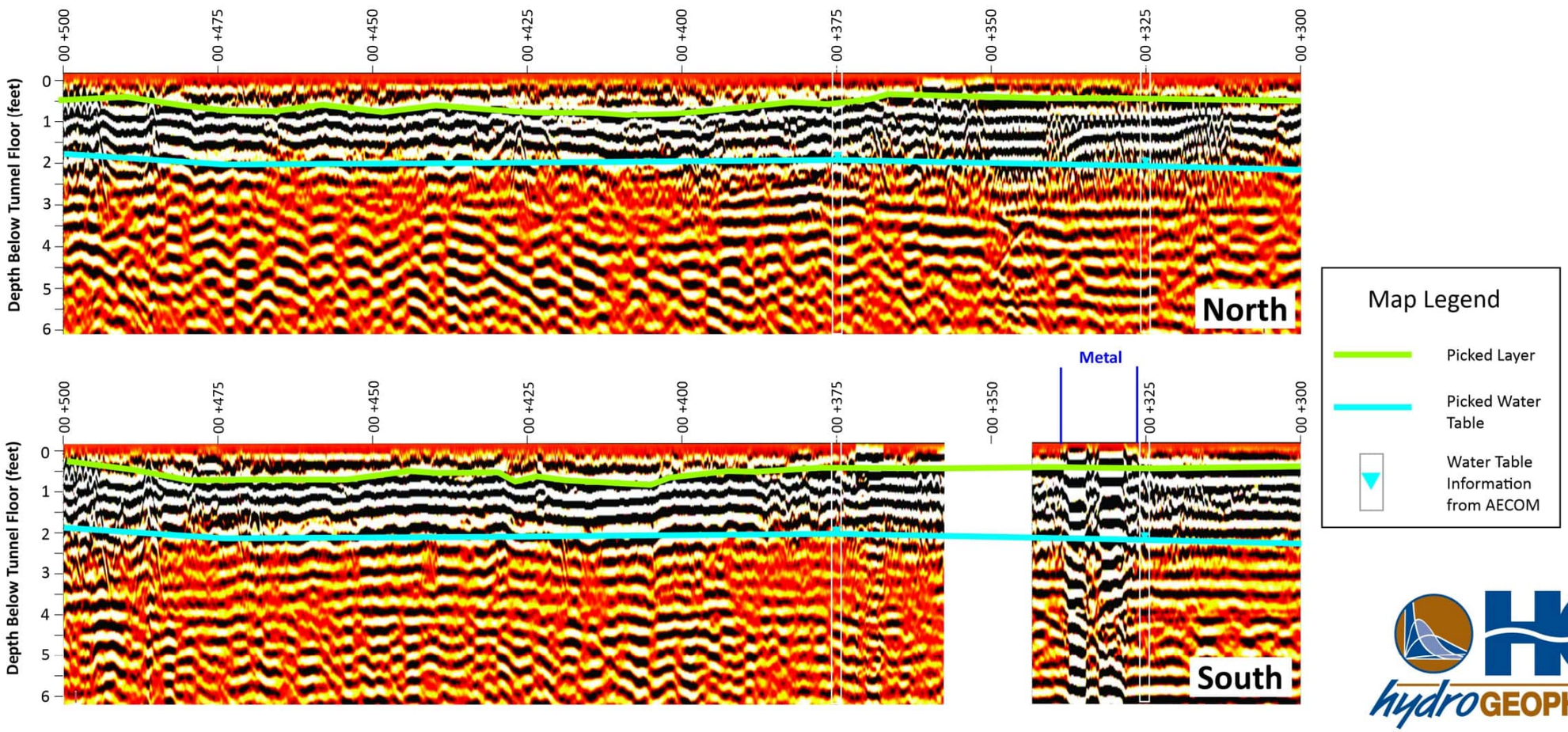


AECOM
Red Hill Bulk Fuel Storage Facility
Geophysical Investigation

Date: Jan-2023	Fig. 25: 250MHz Radar

01/27/2023 | 3450 S. Broadmont, Ste. 100 Tucson, AZ 85713 (520) 647-3315

Adit 3 Tunnel - 500 MHz Ground Penetrating Radargram - Section 5



AECOM
Red Hill Bulk Fuel Storage Facility
Geophysical Investigation

Date: Jan-2023 | **Fig. 26: 500MHz Radar**

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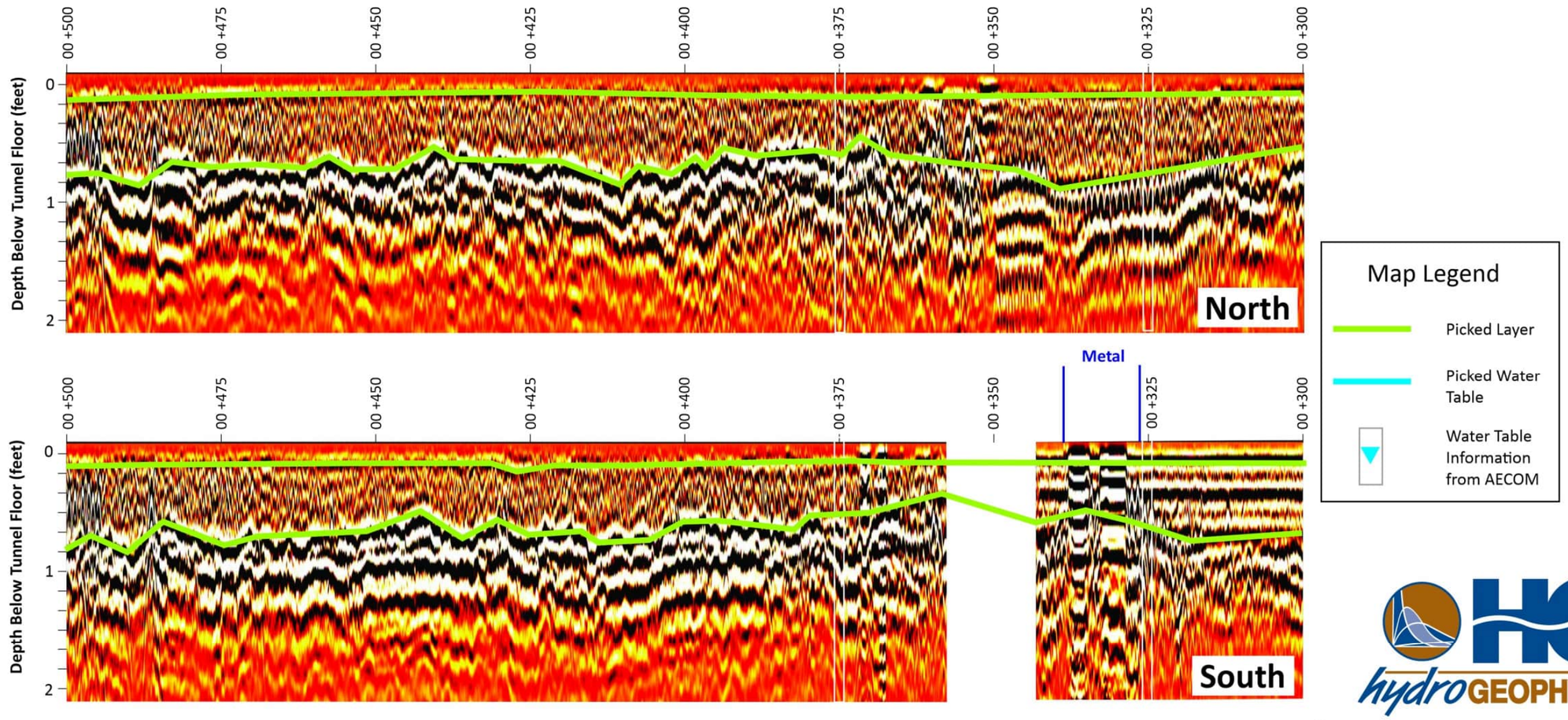

AECOM
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Geophysical Investigation

Date: Jan-2023 | **Fig. 27: 1000MHz Radar**

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Appendix B – SVMP PID Natural Gas Data

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
1S+025-SVMP	Inside	12/22/2021	11:32	20.3	20.9	0.0	NM
1S+025-SVMP	Inside	12/23/2021	12:03	81.4	20.9	0.0	3.0
1S+025-SVMP	Inside	12/24/2021	10:15	57.6	20.9	0.0	5.0
1S+025-SVMP	Inside	12/27/2021	11:44	42.8	20.9	0.0	3.0
1S+025-SVMP	Inside	12/29/2021	8:23	5.8	20.9	0.0	4.0
1S+025-SVMP	Inside	12/30/2021	8:29	6.0	20.9	0.0	0.0
1S+025-SVMP	Inside	12/31/2021	NR	NM	NM	NM	NM
1S+025-SVMP	Inside	1/6/2022	9:51	487.9	20.9	0.0	0.0
1S+025-SVMP	Inside	1/12/2022	9:43	376.3	20.9	0.0	0.0
1S+025-SVMP	Inside	1/19/2022	10:33	401.9	20.9	0.0	0.0
1S+025-SVMP	Inside	1/26/2022	9:35	354.0	20.9	0.0	0.0
1S+025-SVMP	Inside	2/2/2022	9:54	56.0	20.9	0.0	0.0
1S+025-SVMP	Inside	2/9/2022	9:20	309.0	20.9	0.0	0.0
1S+025-SVMP	Inside	2/18/2022	9:50	84.0	20.9	0.0	0.0
1S+025-SVMP	Inside	2/23/2022	9:43	121.0	20.9	0.0	0.0
1S+025-SVMP	Inside	3/2/2022	9:14	217.0	20.9	0.0	0.0
1S+025-SVMP	Inside	3/16/2022	9:40	126.0	20.9	0.0	0.0
1S+025-SVMP	Inside	3/23/2022	9:27	86.0	20.9	0.0	0.0
1S+025-SVMP	Inside	3/30/2022	9:58	100.0	20.9	0.0	0.0
1S+025-SVMP	Inside	4/6/2022	9:43	96.0	20.9	0.0	0.0
1S+025-SVMP	Inside	4/13/2022	9:16	90.0	20.9	0.0	0.0
1S+025-SVMP	Inside	4/20/2022	9:12	74.0	20.9	0.0	0.0
1S+025-SVMP	Inside	4/27/2022	8:59	73.0	20.9	0.0	0.0
1S+025-SVMP	Inside	5/4/2022	12:40	68.0	20.9	0.0	0.0
1S+025-SVMP	Inside	5/9/2022	9:02	116.0	20.9	0.0	0.0
1S+025-SVMP	Inside	5/16/2022	9:09	53.0	20.9	0.0	0.0
1S+025-SVMP	Inside	5/23/2022	9:34	56.0	20.9	0.0	0.0
1S+025-SVMP	Inside	5/31/2022	10:58	48.0	20.9	0.0	0.0
1S+025-SVMP	Inside	6/6/2022	9:04	63.0	20.9	0.0	0.0
1S+025-SVMP	Inside	6/13/2022	9:26	57.0	20.9	0.0	0.0
1S+025-SVMP	Inside	6/20/2022	9:08	38.0	20.9	0.0	0.0
1S+025-SVMP	Inside	7/11/2022	9:15	68.0	20.9	0.0	0.0
1S+025-SVMP	Inside	8/8/2022	NR	90.0	NR	NR	NR
1S+025-SVMP	Inside	9/12/2022	9:30	36.0	20.9	0.0	0.0
1S+025-SVMP	Inside	11/7/2022	13:30	29.0	20.9	0.0	0.0
1S+025-SVMP	Inside	11/14/2022	10:45	25.5	20.9	0.0	0.0
1S+025-SVMP	Inside	11/21/2022	12:36	17.0	20.9	0.0	0.0
1S+025-SVMP	Inside	11/28/2022	10:46	10.7	20.9	0.0	0.0
1S+025-SVMP	Inside	12/27/2022	13:22	11.1	20.9	0.0	0.0
1S+025-SVMP	Inside	1/9/2023	9:42	8.2	20.9	0.0	0.0
1S+038-SVMP	Inside	12/31/2021	9:17	65.4	20.9	0.0	0.0
1S+038-SVMP	Inside	1/6/2022	9:57	65.4	20.9	0.0	0.0
1S+038-SVMP	Inside	1/12/2022	10:29	17.2	21.2	0.0	0.0
1S+038-SVMP	Inside	1/19/2022	11:57	28.9	20.9	0.0	2.0
1S+038-SVMP	Inside	1/26/2022	10:13	22.0	20.9	0.0	0.0
1S+038-SVMP	Inside	2/2/2022	10:35	8.0	20.9	0.0	0.0
1S+038-SVMP	Inside	2/9/2022	9:53	15.0	20.9	0.0	0.0
1S+038-SVMP	Inside	2/18/2022	10:17	9.0	20.9	0.0	0.0
1S+038-SVMP	Inside	2/23/2022	10:20	11.0	20.9	0.0	0.0
1S+038-SVMP	Inside	3/2/2022	8:40	16.0	20.9	0.0	0.0
1S+038-SVMP	Inside	3/16/2022	10:34	5.0	20.9	0.0	0.0
1S+038-SVMP	Inside	3/23/2022	10:14	7.0	20.9	0.0	0.0
1S+038-SVMP	Inside	3/30/2022	10:50	5.0	20.9	0.0	0.0
1S+038-SVMP	Inside	4/6/2022	10:19	5.0	20.9	0.0	0.0
1S+038-SVMP	Inside	4/13/2022	9:53	5.0	20.9	0.0	0.0
1S+038-SVMP	Inside	4/20/2022	9:47	6.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
1S+038-SVMP	Inside	4/27/2022	9:37	6.0	20.9	0.0	0.0
1S+038-SVMP	Inside	5/4/2022	13:13	5.0	20.9	0.0	0.0
1S+038-SVMP	Inside	5/9/2022	9:37	8.0	20.9	0.0	0.0
1S+038-SVMP	Inside	5/16/2022	10:04	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	5/23/2022	10:13	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	5/31/2022	NR	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	6/6/2022	9:53	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	6/13/2022	10:29	3.0	20.9	0.0	0.0
1S+038-SVMP	Inside	6/20/2022	9:54	4.0	20.9	0.0	0.0
1S+038-SVMP	Inside	7/11/2022	10:02	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	8/8/2022	9:49	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	9/12/2022	10:13	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	11/7/2022	14:11	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	11/14/2022	11:39	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	11/21/2022	13:17	3.9	20.9	0.0	0.0
1S+038-SVMP	Inside	11/28/2022	11:38	0.0	20.9	0.0	0.0
1S+038-SVMP	Inside	12/19/2022	11:23	1.6	20.9	0.0	0.0
1S+038-SVMP	Inside	12/27/2022	13:58	2.5	20.9	0.0	0.0
1S+038-SVMP	Inside	1/9/2023	10:19	0.0	20.9	0.0	0.0
1S+050-SVMP	Inside	12/22/2021	11:24	28.2	20.9	0.0	NM
1S+050-SVMP	Inside	12/23/2021	11:36	92.4	20.9	0.0	3.0
1S+050-SVMP	Inside	12/24/2021	10:13	26.2	20.9	0.0	5.0
1S+050-SVMP	Inside	12/27/2021	11:39	42.3	20.9	0.0	4.0
1S+050-SVMP	Inside	12/29/2021	8:24	6.9	20.9	0.0	0.0
1S+050-SVMP	Inside	12/30/2021	8:28	6.9	20.9	0.0	0.0
1S+068-SVMP	Inside	12/31/2021	9:15	95.1	20.9	0.0	0.0
1S+068-SVMP	Inside	1/6/2022	9:55	92.0	20.9	0.0	0.0
1S+068-SVMP	Inside	1/12/2022	10:26	19.0	21.2	0.0	0.0
1S+068-SVMP	Inside	1/19/2022	11:53	103.4	21.2	0.0	2.0
1S+068-SVMP	Inside	1/26/2022	10:11	22.0	20.9	0.0	0.0
1S+068-SVMP	Inside	2/2/2022	10:32	9.0	20.9	0.0	0.0
1S+068-SVMP	Inside	2/9/2022	9:55	15.0	20.9	0.0	0.0
1S+068-SVMP	Inside	2/18/2022	10:16	9.0	20.9	0.0	0.0
1S+068-SVMP	Inside	2/23/2022	10:26	11.0	20.9	0.0	0.0
1S+068-SVMP	Inside	3/2/2022	9:45	16.0	20.9	0.0	0.0
1S+068-SVMP	Inside	3/16/2022	10:31	7.0	20.9	0.0	0.0
1S+068-SVMP	Inside	3/23/2022	10:07	7.0	20.9	0.0	0.0
1S+068-SVMP	Inside	3/30/2022	10:40	6.0	20.9	0.0	0.0
1S+068-SVMP	Inside	4/6/2022	10:14	5.0	20.9	0.0	0.0
1S+068-SVMP	Inside	4/13/2022	9:49	5.0	20.9	0.0	0.0
1S+068-SVMP	Inside	4/20/2022	9:44	5.0	20.9	0.0	0.0
1S+068-SVMP	Inside	4/27/2022	9:33	5.0	20.9	0.0	0.0
1S+068-SVMP	Inside	5/4/2022	13:11	5.0	20.9	0.0	0.0
1S+068-SVMP	Inside	5/9/2022	9:34	9.0	20.9	0.0	0.0
1S+068-SVMP	Inside	5/16/2022	10:00	1.0	20.9	0.0	0.0
1S+068-SVMP	Inside	5/23/2022	10:11	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	5/31/2022	11:55	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	6/6/2022	9:50	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	6/13/2022	10:25	3.0	20.9	0.0	0.0
1S+068-SVMP	Inside	6/20/2022	9:49	4.0	20.9	0.0	0.0
1S+068-SVMP	Inside	7/11/2022	9:59	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	8/8/2022	9:46	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	9/12/2022	10:10	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	11/7/2022	14:08	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	11/14/2022	11:28	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	11/21/2022	13:15	3.3	20.9	0.0	0.0
1S+068-SVMP	Inside	11/28/2022	11:35	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	12/19/2022	11:17	0.0	20.9	0.0	0.0
1S+068-SVMP	Inside	12/27/2022	13:57	2.1	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
1S+068-SVMP	Inside	1/9/2023	10:16	0.0	20.9	0.0	0.0
1S-25-SVMP	Inside	12/17/2021	12:09	12.7	NM	NM	NM
1S-25-SVMP	Inside	12/20/2021	15:40	16.3	NM	NM	NM
1S-25-SVMP	Inside	12/21/2021	14:25	42.9	NM	NM	NM
1S-50-SVMP	Inside	12/17/2021	11:59	32.9	NM	NM	NM
1S-50-SVMP	Inside	12/20/2021	15:25	20.8	NM	NM	NM
1S-50-SVMP	Inside	12/21/2021	14:14	30.6	NM	NM	NM
2S+025-SVMP	Inside	12/22/2021	10:19	38.6	20.9	0.0	NM
2S+025-SVMP	Inside	12/23/2021	10:38	204.7	20.9	0.0	4.0
2S+025-SVMP	Inside	12/24/2021	9:08	421.8	20.9	0.0	6.0
2S+025-SVMP	Inside	12/27/2021	10:23	59.2	20.9	0.0	0.0
2S+025-SVMP	Inside	12/29/2021	8:28	30.9	20.9	0.0	0.0
2S+025-SVMP	Inside	12/30/2021	8:35	39.8	20.9	0.0	0.0
2S+025-SVMP	Inside	12/19/2022	10:24	10.6	20.9	0.0	0.0
2S+050-SVMP	Inside	12/22/2021	10:27	65.3	20.9	0.0	NM
2S+050-SVMP	Inside	12/23/2021	10:49	192.3	20.9	0.0	3.0
2S+050-SVMP	Inside	12/24/2021	9:16	269.1	20.9	0.0	5.0
2S+050-SVMP	Inside	12/27/2021	10:32	68.2	20.9	0.0	0.0
2S+050-SVMP	Inside	12/29/2021	8:28	45.5	20.9	0.0	0.0
2S+050-SVMP	Inside	12/30/2021	8:34	46.4	20.9	0.0	0.0
2S+050-SVMP	Inside	12/31/2021	9:09	536.8	20.9	0.0	0.0
2S+050-SVMP	Inside	1/6/2022	9:49	531.7	20.9	0.0	0.0
2S+050-SVMP	Inside	1/12/2022	9:48	400.0	20.9	0.0	0.0
2S+050-SVMP	Inside	1/19/2022	10:26	398.2	20.9	0.0	0.0
2S+050-SVMP	Inside	1/26/2022	9:39	421.0	20.9	0.0	0.0
2S+050-SVMP	Inside	2/2/2022	10:01	490.0	20.9	0.0	0.0
2S+050-SVMP	Inside	2/9/2022	9:24	394.0	20.9	0.0	0.0
2S+050-SVMP	Inside	2/18/2022	9:51	118.0	20.9	0.0	0.0
2S+050-SVMP	Inside	2/23/2022	9:44	172.0	20.9	0.0	0.0
2S+050-SVMP	Inside	3/2/2022	9:16	260.0	20.9	0.0	0.0
2S+050-SVMP	Inside	3/16/2022	9:44	174.0	20.9	0.0	0.0
2S+050-SVMP	Inside	3/23/2022	9:30	117.0	20.9	0.0	0.0
2S+050-SVMP	Inside	3/30/2022	10:02	121.0	20.9	0.0	0.0
2S+050-SVMP	Inside	4/6/2022	9:45	130.0	20.9	0.0	0.0
2S+050-SVMP	Inside	4/13/2022	9:18	131.0	20.9	0.0	0.0
2S+050-SVMP	Inside	4/20/2022	9:14	103.0	20.9	0.0	0.0
2S+050-SVMP	Inside	4/27/2022	9:01	105.0	20.9	0.0	0.0
2S+050-SVMP	Inside	5/4/2022	12:42	91.0	20.9	0.0	0.0
2S+050-SVMP	Inside	5/9/2022	9:05	169.0	20.9	0.0	0.0
2S+050-SVMP	Inside	5/16/2022	9:11	74.0	20.9	0.0	0.0
2S+050-SVMP	Inside	5/23/2022	9:36	93.0	20.9	0.0	0.0
2S+050-SVMP	Inside	5/31/2022	11:02	74.0	20.9	0.0	0.0
2S+050-SVMP	Inside	6/6/2022	9:07	101.0	20.9	0.0	0.0
2S+050-SVMP	Inside	6/13/2022	9:29	102.0	20.9	0.0	0.0
2S+050-SVMP	Inside	6/20/2022	9:12	67.0	20.9	0.0	0.0
2S+050-SVMP	Inside	7/11/2022	9:19	161.0	20.9	0.0	0.0
2S+050-SVMP	Inside	8/8/2022	9:08	188.0	20.9	0.0	0.0
2S+050-SVMP	Inside	9/12/2022	9:34	102.0	20.9	0.0	0.0
2S+050-SVMP	Inside	11/7/2022	13:33	62.0	20.9	0.0	0.0
2S+050-SVMP	Inside	11/14/2022	10:47	55.2	20.9	0.0	0.0
2S+050-SVMP	Inside	11/21/2022	12:40	43.4	20.9	0.0	0.0
2S+050-SVMP	Inside	11/28/2022	10:49	27.3	20.9	0.0	0.0
2S+050-SVMP	Inside	12/19/2022	10:28	29.0	20.9	0.0	0.0
2S+050-SVMP	Inside	12/27/2022	13:24	26.6	20.9	0.0	0.0
2S+050-SVMP	Inside	1/9/2023	9:45	18.2	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	3/16/2022	9:59	55.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	3/23/2022	9:35	67.2	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	3/30/2022	10:09	50.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	4/6/2022	13:03	52.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
2S+075-05.0-SVMP	Inside	4/13/2022	9:22	43.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	4/20/2022	9:17	36.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	4/27/2022	9:05	39.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	5/4/2022	12:45	71.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	5/9/2022	9:07	120.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	5/16/2022	9:13	52.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	5/23/2022	9:40	55.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	5/31/2022	11:10	48.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	6/6/2022	9:10	63.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	6/13/2022	9:37	66.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	6/20/2022	9:17	48.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	7/11/2022	9:25	96.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	8/8/2022	9:13	114.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	9/12/2022	9:39	50.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	11/7/2022	13:38	33.0	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	11/14/2022	10:59	35.1	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	11/21/2022	12:47	24.9	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	11/28/2022	10:55	14.3	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	12/19/2022	10:36	18.4	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	12/27/2022	13:36	16.8	20.9	0.0	0.0
2S+075-05.0-SVMP	Inside	1/9/2023	9:30	9.5	20.9	0.0	0.0
2S+075-SVMP	Inside	12/22/2021	10:33	81.3	20.9	0.0	3.0
2S+075-SVMP	Inside	12/23/2021	10:59	252.4	20.9	0.0	4.0
2S+075-SVMP	Inside	12/24/2021	9:18	576.9	20.9	0.0	6.0
2S+075-SVMP	Inside	12/27/2021	10:42	157.8	20.9	0.0	3.0
2S+075-SVMP	Inside	12/29/2021	8:27	52.7	20.9	0.0	0.0
2S+075-SVMP	Inside	12/30/2021	8:34	52.1	20.9	0.0	0.0
2S+075-SVMP	Inside	12/31/2021	9:05	576.8	20.9	0.0	0.0
2S+075-SVMP	Inside	1/6/2022	9:45	606.9	20.9	0.0	0.0
2S+075-SVMP	Inside	1/12/2022	9:51	490.1	20.9	0.0	0.0
2S+075-SVMP	Inside	1/19/2022	10:21	456.8	20.9	0.0	0.0
2S+075-SVMP	Inside	1/26/2022	9:42	510.0	20.9	0.0	0.0
2S+075-SVMP	Inside	2/2/2022	10:03	569.0	20.9	0.0	0.0
2S+075-SVMP	Inside	2/9/2022	9:26	496.0	20.9	0.0	0.0
2S+075-SVMP	Inside	2/18/2022	12:52	281.0	20.9	0.0	0.0
2S+075-SVMP	Inside	2/23/2022	9:47	316.0	20.9	0.0	0.0
2S+075-SVMP	Inside	3/2/2022	9:18	422.0	20.9	0.0	0.0
2S+075-SVMP	Inside	3/16/2022	9:48	249.0	20.9	0.0	0.0
2S+075-SVMP	Inside	3/23/2022	9:32	369.0	20.9	0.0	0.0
2S+075-SVMP	Inside	3/30/2022	10:06	290.0	20.9	0.0	0.0
2S+075-SVMP	Inside	4/6/2022	9:47	411.0	20.9	0.0	0.0
2S+075-SVMP	Inside	4/13/2022	9:24	358.0	20.9	0.0	0.0
2S+075-SVMP	Inside	4/20/2022	9:19	302.0	20.9	0.0	0.0
2S+075-SVMP	Inside	4/27/2022	9:07	333.0	20.9	0.0	0.0
2S+075-SVMP	Inside	5/4/2022	12:47	278.0	20.9	0.0	0.0
2S+075-SVMP	Inside	5/9/2022	9:09	460.0	20.9	0.0	0.0
2S+075-SVMP	Inside	5/16/2022	9:16	238.0	20.9	0.0	0.0
2S+075-SVMP	Inside	5/23/2022	9:42	229.0	20.9	0.0	0.0
2S+075-SVMP	Inside	5/31/2022	11:07	192.0	20.9	0.0	0.0
2S+075-SVMP	Inside	6/6/2022	9:15	177.0	20.9	0.0	0.0
2S+075-SVMP	Inside	6/13/2022	9:33	170.0	20.9	0.0	0.0
2S+075-SVMP	Inside	6/20/2022	9:14	175.0	20.9	0.0	0.0
2S+075-SVMP	Inside	7/11/2022	9:21	286.0	20.9	0.0	0.0
2S+075-SVMP	Inside	8/8/2022	9:11	334.0	20.9	0.0	0.0
2S+075-SVMP	Inside	9/12/2022	9:36	182.0	20.9	0.0	0.0
2S+075-SVMP	Inside	11/7/2022	13:35	121.0	20.9	0.0	0.0
2S+075-SVMP	Inside	11/14/2022	10:49	88.9	20.9	0.0	0.0
2S+075-SVMP	Inside	11/21/2022	12:44	79.8	20.9	0.0	0.0
2S+075-SVMP	Inside	11/28/2022	10:53	47.6	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
2S+075-SVMP	Inside	12/15/2022	14:39	33.0	20.8	0.1	0.0
2S+075-SVMP	Inside	12/19/2022	10:32	50.1	20.9	0.0	0.0
2S+075-SVMP	Inside	12/27/2022	13:34	58.5	20.9	0.0	0.0
2S+075-SVMP	Inside	1/9/2023	9:48	49.4	20.9	0.0	0.0
2S+075-SVMP	Inside	1/16/2023	11:12	5.7	21.1	0.1	0.0
2S+100-SVMP	Inside	12/22/2021	10:42	83.5	20.9	0.0	NM
2S+100-SVMP	Inside	12/23/2021	11:08	241.5	20.9	0.0	4.0
2S+100-SVMP	Inside	12/24/2021	9:22	260.2	20.9	0.0	5.0
2S+100-SVMP	Inside	12/27/2021	10:46	127.5	20.9	0.0	3.0
2S+100-SVMP	Inside	12/29/2021	8:27	46.2	20.9	0.0	0.0
2S+100-SVMP	Inside	12/30/2021	8:33	50.4	20.9	0.0	0.0
2S+100-SVMP	Inside	12/31/2021	9:02	485.3	20.9	0.0	0.0
2S+100-SVMP	Inside	1/6/2022	9:43	526.7	20.9	0.0	0.0
2S+100-SVMP	Inside	1/12/2022	9:53	435.4	21.2	0.0	0.0
2S+100-SVMP	Inside	1/19/2022	10:17	394.8	20.9	0.0	0.0
2S+100-SVMP	Inside	1/26/2022	9:45	444.0	20.9	0.0	0.0
2S+100-SVMP	Inside	2/2/2022	10:07	454.0	20.9	0.0	0.0
2S+100-SVMP	Inside	2/9/2022	9:28	448.0	20.9	0.0	0.0
2S+100-SVMP	Inside	2/18/2022	9:54	149.0	20.9	0.0	0.0
2S+100-SVMP	Inside	2/23/2022	9:49	227.0	20.9	0.0	0.0
2S+100-SVMP	Inside	3/2/2022	9:21	338.0	20.9	0.0	0.0
2S+100-SVMP	Inside	3/16/2022	10:00	236.0	20.9	0.0	0.0
2S+100-SVMP	Inside	3/23/2022	9:34	219.0	20.9	0.0	0.0
2S+100-SVMP	Inside	3/30/2022	10:20	218.0	20.9	0.0	0.0
2S+100-SVMP	Inside	4/6/2022	9:50	248.0	20.9	0.0	0.0
2S+100-SVMP	Inside	4/13/2022	9:26	228.0	20.9	0.0	0.0
2S+100-SVMP	Inside	4/20/2022	9:22	207.0	20.9	0.0	0.0
2S+100-SVMP	Inside	4/27/2022	9:10	194.0	20.9	0.0	0.0
2S+100-SVMP	Inside	5/4/2022	12:49	155.0	20.9	0.0	0.0
2S+100-SVMP	Inside	5/9/2022	9:12	326.0	20.9	0.0	0.0
2S+100-SVMP	Inside	5/16/2022	9:19	146.0	20.9	0.0	0.0
2S+100-SVMP	Inside	5/23/2022	9:44	150.0	20.9	0.0	0.0
2S+100-SVMP	Inside	5/31/2022	11:14	124.0	20.9	0.0	0.0
2S+100-SVMP	Inside	6/6/2022	9:23	130.0	20.9	0.0	0.0
2S+100-SVMP	Inside	6/13/2022	9:42	118.0	20.9	0.0	0.0
2S+100-SVMP	Inside	6/20/2022	9:21	125.0	20.9	0.0	0.0
2S+100-SVMP	Inside	7/11/2022	9:29	188.0	20.9	0.0	0.0
2S+100-SVMP	Inside	8/8/2022	9:17	273.0	20.9	0.0	0.0
2S+100-SVMP	Inside	9/12/2022	9:42	137.0	20.9	0.0	0.0
2S+100-SVMP	Inside	11/7/2022	13:42	102.0	20.9	0.0	0.0
2S+100-SVMP	Inside	11/14/2022	10:59	97.3	20.9	0.0	0.0
2S+100-SVMP	Inside	11/21/2022	12:50	84.8	20.9	0.0	0.0
2S+100-SVMP	Inside	11/28/2022	10:59	96.7	20.9	0.0	0.0
2S+100-SVMP	Inside	12/15/2022	14:16	74.7	20.7	0.2	0.0
2S+100-SVMP	Inside	12/19/2022	10:42	84.3	20.9	0.0	0.0
2S+100-SVMP	Inside	12/27/2022	13:38	59.5	20.9	0.0	0.0
2S+100-SVMP	Inside	1/9/2023	9:53	31.2	20.9	0.0	0.0
2S+100-SVMP	Inside	1/16/2023	10:42	31.4	20.9	0.1	0.0
2S+125-SVMP	Inside	12/22/2021	10:50	57.7	20.9	0.0	NM
2S+125-SVMP	Inside	12/23/2021	11:17	142.2	20.9	0.0	3.0
2S+125-SVMP	Inside	12/24/2021	9:26	57.3	20.9	0.0	4.0
2S+125-SVMP	Inside	12/27/2021	10:52	67.4	20.9	0.0	3.0
2S+125-SVMP	Inside	12/29/2021	8:26	4.9	20.9	0.0	0.0
2S+125-SVMP	Inside	12/30/2021	8:33	3.8	20.9	0.0	0.0
2S+125-SVMP	Inside	12/31/2021	9:00	38.7	20.9	0.0	0.0
2S+125-SVMP	Inside	1/6/2022	9:41	39.5	20.9	0.0	0.0
2S+125-SVMP	Inside	1/12/2022	9:57	84.2	21.2	0.0	0.0
2S+125-SVMP	Inside	1/19/2022	10:11	10.1	20.9	0.0	0.0
2S+125-SVMP	Inside	1/26/2022	9:48	80.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
2S+125-SVMP	Inside	2/2/2022	10:10	31.0	20.9	0.0	0.0
2S+125-SVMP	Inside	2/9/2022	9:31	59.0	20.9	0.0	0.0
2S+125-SVMP	Inside	2/18/2022	9:55	28.0	20.9	0.0	0.0
2S+125-SVMP	Inside	2/23/2022	9:52	32.0	20.9	0.0	0.0
2S+125-SVMP	Inside	3/2/2022	9:24	55.0	20.9	0.0	0.0
2S+125-SVMP	Inside	3/16/2022	10:03	21.0	20.9	0.0	0.0
2S+125-SVMP	Inside	3/23/2022	9:41	26.0	20.9	0.0	0.0
2S+125-SVMP	Inside	3/30/2022	10:22	21.0	20.9	0.0	0.0
2S+125-SVMP	Inside	4/6/2022	9:53	22.0	20.9	0.0	0.0
2S+125-SVMP	Inside	4/13/2022	9:29	20.0	20.9	0.0	0.0
2S+125-SVMP	Inside	4/20/2022	9:23	28.0	20.9	0.0	0.0
2S+125-SVMP	Inside	4/27/2022	9:12	20.0	20.9	0.0	0.0
2S+125-SVMP	Inside	5/4/2022	12:53	17.0	20.9	0.0	0.0
2S+125-SVMP	Inside	5/9/2022	9:13	36.0	20.9	0.0	0.0
2S+125-SVMP	Inside	5/16/2022	9:32	8.0	20.9	0.0	0.0
2S+125-SVMP	Inside	5/23/2022	9:50	14.0	20.9	0.0	0.0
2S+125-SVMP	Inside	5/31/2022	11:20	9.0	20.9	0.0	0.0
2S+125-SVMP	Inside	6/6/2022	9:27	8.0	20.9	0.0	0.0
2S+125-SVMP	Inside	6/13/2022	9:46	8.0	20.9	0.0	0.0
2S+125-SVMP	Inside	6/20/2022	9:23	13.0	20.9	0.0	0.0
2S+125-SVMP	Inside	7/11/2022	9:32	12.0	20.9	0.0	0.0
2S+125-SVMP	Inside	8/8/2022	9:20	16.0	20.9	0.0	0.0
2S+125-SVMP	Inside	9/12/2022	9:45	4.0	20.9	0.0	0.0
2S+125-SVMP	Inside	11/7/2022	13:44	11.0	20.9	0.0	0.0
2S+125-SVMP	Inside	11/14/2022	11:02	7.9	20.9	0.0	0.0
2S+125-SVMP	Inside	11/21/2022	12:55	8.5	20.9	0.0	0.0
2S+125-SVMP	Inside	11/28/2022	11:02	15.9	20.9	0.0	0.0
2S+125-SVMP	Inside	12/19/2022	10:46	5.7	20.9	0.0	0.0
2S+125-SVMP	Inside	12/27/2022	13:39	9.9	20.9	0.0	0.0
2S+125-SVMP	Inside	1/9/2023	9:56	5.3	20.9	0.0	0.0
2S+150-SVMP	Inside	12/22/2021	10:57	38.0	20.9	0.0	3.0
2S+150-SVMP	Inside	12/23/2021	11:25	132.2	20.9	0.0	4.0
2S+150-SVMP	Inside	12/24/2021	9:30	133.5	20.9	0.0	5.0
2S+150-SVMP	Inside	12/27/2021	10:56	70.2	20.9	0.0	4.0
2S+150-SVMP	Inside	12/29/2021	8:26	9.2	20.9	0.0	0.0
2S+150-SVMP	Inside	12/30/2021	8:32	10.8	20.9	0.0	0.0
2S+150-SVMP	Inside	12/31/2021	8:57	98.5	20.4	0.0	0.0
2S+150-SVMP	Inside	1/6/2022	9:39	103.1	20.9	0.0	0.0
2S+150-SVMP	Inside	1/12/2022	9:58	102.8	21.1	0.0	0.0
2S+150-SVMP	Inside	1/19/2022	10:06	43.2	20.9	0.0	0.0
2S+150-SVMP	Inside	1/26/2022	9:51	78.0	20.9	0.0	0.0
2S+150-SVMP	Inside	2/2/2022	10:13	33.0	20.9	0.0	0.0
2S+150-SVMP	Inside	2/9/2022	9:33	54.0	20.9	0.0	0.0
2S+150-SVMP	Inside	2/18/2022	9:58	24.0	20.9	0.0	0.0
2S+150-SVMP	Inside	2/23/2022	9:53	23.0	20.9	0.0	0.0
2S+150-SVMP	Inside	3/2/2022	9:25	49.0	20.9	0.0	0.0
2S+150-SVMP	Inside	3/16/2022	10:05	19.0	20.9	0.0	0.0
2S+150-SVMP	Inside	3/23/2022	9:44	19.0	20.9	0.0	0.0
2S+150-SVMP	Inside	3/30/2022	10:23	17.0	20.9	0.0	0.0
2S+150-SVMP	Inside	4/6/2022	9:55	15.0	20.9	0.0	0.0
2S+150-SVMP	Inside	4/13/2022	9:31	14.0	20.9	0.0	0.0
2S+150-SVMP	Inside	4/20/2022	9:27	14.0	20.9	0.0	0.0
2S+150-SVMP	Inside	4/27/2022	9:14	13.0	20.9	0.0	0.0
2S+150-SVMP	Inside	5/4/2022	12:55	12.0	20.9	0.0	0.0
2S+150-SVMP	Inside	5/9/2022	9:16	22.0	20.9	0.0	0.0
2S+150-SVMP	Inside	5/16/2022	9:35	4.0	20.9	0.0	0.0
2S+150-SVMP	Inside	5/23/2022	9:52	5.0	20.9	0.0	0.0
2S+150-SVMP	Inside	5/31/2022	11:23	5.0	20.9	0.0	0.0
2S+150-SVMP	Inside	6/6/2022	9:30	7.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
2S+150-SVMP	Inside	6/13/2022	9:50	8.0	20.9	0.0	0.0
2S+150-SVMP	Inside	6/20/2022	9:26	6.0	20.9	0.0	0.0
2S+150-SVMP	Inside	7/11/2022	9:35	0.0	20.9	0.0	0.0
2S+150-SVMP	Inside	8/8/2022	9:23	7.0	20.9	0.0	0.0
2S+150-SVMP	Inside	9/12/2022	9:49	0.0	20.9	0.0	0.0
2S+150-SVMP	Inside	11/7/2022	13:47	4.0	20.9	0.0	0.0
2S+150-SVMP	Inside	11/14/2022	11:04	4.0	20.9	0.0	0.0
2S+150-SVMP	Inside	11/21/2022	12:58	4.8	20.9	0.0	0.0
2S+150-SVMP	Inside	11/28/2022	11:05	4.0	20.9	0.0	0.0
2S+150-SVMP	Inside	12/19/2022	10:48	2.7	20.9	0.0	0.0
2S+150-SVMP	Inside	12/27/2022	13:40	6.5	20.9	0.0	0.0
2S+150-SVMP	Inside	1/9/2023	9:58	0.3	20.9	0.0	0.0
2S+175-SVMP	Inside	12/22/2021	11:03	34.7	20.9	0.0	3.0
2S+175-SVMP	Inside	12/23/2021	11:31	133.6	20.9	0.0	4.0
2S+175-SVMP	Inside	12/24/2021	9:36	126.7	20.9	0.0	5.0
2S+175-SVMP	Inside	12/27/2021	20:44	66.3	20.9	0.0	4.0
2S+175-SVMP	Inside	12/29/2021	8:25	9.9	20.9	0.0	0.0
2S+175-SVMP	Inside	12/30/2021	8:32	13.3	20.9	0.0	0.0
2S+175-SVMP	Inside	12/31/2021	8:55	119.8	20.9	0.0	0.0
2S+175-SVMP	Inside	1/6/2022	9:37	112.1	20.9	0.0	0.0
2S+175-SVMP	Inside	1/12/2022	10:01	94.1	21.1	0.0	0.0
2S+175-SVMP	Inside	1/19/2022	10:00	30.2	20.9	0.0	0.0
2S+175-SVMP	Inside	1/26/2022	9:54	66.0	20.9	0.0	0.0
2S+175-SVMP	Inside	2/2/2022	10:16	13.0	20.9	0.0	0.0
2S+175-SVMP	Inside	2/9/2022	9:35	43.0	20.9	0.0	0.0
2S+175-SVMP	Inside	2/18/2022	9:59	17.0	20.9	0.0	0.0
2S+175-SVMP	Inside	2/23/2022	9:55	17.0	20.9	0.0	0.0
2S+175-SVMP	Inside	3/2/2022	9:28	36.0	20.9	0.0	0.0
2S+175-SVMP	Inside	3/16/2022	10:08	14.0	20.9	0.0	0.0
2S+175-SVMP	Inside	3/23/2022	9:47	14.0	20.9	0.0	0.0
2S+175-SVMP	Inside	3/30/2022	10:26	13.0	20.9	0.0	0.0
2S+175-SVMP	Inside	4/6/2022	9:57	12.0	20.9	0.0	0.0
2S+175-SVMP	Inside	4/13/2022	9:34	12.0	20.9	0.0	0.0
2S+175-SVMP	Inside	4/20/2022	9:28	12.0	20.9	0.0	0.0
2S+175-SVMP	Inside	4/27/2022	9:17	11.0	20.9	0.0	0.0
2S+175-SVMP	Inside	5/4/2022	12:57	11.0	20.9	0.0	0.0
2S+175-SVMP	Inside	5/9/2022	9:18	21.0	20.9	0.0	0.0
2S+175-SVMP	Inside	5/16/2022	9:37	5.0	20.9	0.0	0.0
2S+175-SVMP	Inside	5/23/2022	9:54	4.0	20.9	0.0	0.0
2S+175-SVMP	Inside	5/31/2022	11:24	4.0	20.9	0.0	0.0
2S+175-SVMP	Inside	6/6/2022	9:32	7.0	20.9	0.0	0.0
2S+175-SVMP	Inside	6/13/2022	9:56	7.0	20.9	0.0	0.0
2S+175-SVMP	Inside	6/20/2022	9:30	6.0	20.9	0.0	0.0
2S+175-SVMP	Inside	7/11/2022	9:38	0.0	20.9	0.0	0.0
2S+175-SVMP	Inside	8/8/2022	9:26	5.0	20.9	0.0	0.0
2S+175-SVMP	Inside	9/12/2022	9:52	0.0	20.9	0.0	0.0
2S+175-SVMP	Inside	11/7/2022	13:50	3.0	20.9	0.0	0.0
2S+175-SVMP	Inside	11/14/2022	11:07	3.1	20.9	0.0	0.0
2S+175-SVMP	Inside	11/21/2022	13:01	4.0	20.9	0.0	0.0
2S+175-SVMP	Inside	11/28/2022	11:08	2.2	20.9	0.0	0.0
2S+175-SVMP	Inside	12/19/2022	10:54	1.3	20.9	0.0	0.0
2S+175-SVMP	Inside	12/27/2022	13:41	5.8	20.9	0.0	0.0
2S+175-SVMP	Inside	1/9/2023	10:01	0.0	20.9	0.0	0.0
2S+200-SVMP	Inside	12/22/2021	11:10	28.0	20.9	0.0	3.0
2S+200-SVMP	Inside	12/23/2021	11:38	87.2	20.9	0.0	2.0
2S+200-SVMP	Inside	12/24/2021	9:44	76.0	20.9	0.0	5.0
2S+200-SVMP	Inside	12/27/2021	11:03	35.2	20.9	0.0	3.0
2S+200-SVMP	Inside	12/29/2021	8:25	3.8	20.9	0.0	0.0
2S+200-SVMP	Inside	12/30/2021	8:30	3.7	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
2S+200-SVMP	Inside	12/31/2021	8:53	45.3	20.9	0.0	0.0
2S+200-SVMP	Inside	1/6/2022	9:35	49.6	20.9	0.0	0.0
2S+200-SVMP	Inside	1/12/2022	10:04	40.9	21.2	0.0	0.0
2S+200-SVMP	Inside	1/19/2022	9:56	2.2	20.9	0.0	0.0
2S+200-SVMP	Inside	1/26/2022	9:56	34.0	20.9	0.0	0.0
2S+200-SVMP	Inside	2/2/2022	10:18	12.0	20.9	0.0	0.0
2S+200-SVMP	Inside	2/9/2022	9:38	26.0	20.9	0.0	0.0
2S+200-SVMP	Inside	2/18/2022	10:02	13.0	20.9	0.0	0.0
2S+200-SVMP	Inside	2/23/2022	10:00	17.0	20.9	0.0	0.0
2S+200-SVMP	Inside	3/2/2022	9:30	22.0	20.9	0.0	0.0
2S+200-SVMP	Inside	3/16/2022	10:11	10.0	20.9	0.0	0.0
2S+200-SVMP	Inside	3/23/2022	9:49	9.0	20.9	0.0	0.0
2S+200-SVMP	Inside	3/30/2022	10:28	8.0	20.9	0.0	0.0
2S+200-SVMP	Inside	4/6/2022	10:00	9.0	20.9	0.0	0.0
2S+200-SVMP	Inside	4/13/2022	9:36	8.0	20.9	0.0	0.0
2S+200-SVMP	Inside	4/20/2022	9:31	9.0	20.9	0.0	0.0
2S+200-SVMP	Inside	4/27/2022	9:19	8.0	20.9	0.0	0.0
2S+200-SVMP	Inside	5/4/2022	12:59	6.0	20.9	0.0	0.0
2S+200-SVMP	Inside	5/9/2022	9:21	11.0	20.9	0.0	0.0
2S+200-SVMP	Inside	5/16/2022	9:40	1.0	20.9	0.0	0.0
2S+200-SVMP	Inside	5/23/2022	9:55	1.0	20.9	0.0	0.0
2S+200-SVMP	Inside	5/31/2022	11:27	1.0	20.9	0.0	0.0
2S+200-SVMP	Inside	6/6/2022	9:34	4.0	20.9	0.0	0.0
2S+200-SVMP	Inside	6/13/2022	10:00	3.0	20.9	0.0	0.0
2S+200-SVMP	Inside	6/20/2022	9:32	4.0	20.9	0.0	0.0
2S+200-SVMP	Inside	7/11/2022	9:41	0.0	20.9	0.0	0.0
2S+200-SVMP	Inside	8/8/2022	9:29	0.0	20.9	0.0	0.0
2S+200-SVMP	Inside	9/12/2022	9:54	0.0	20.9	0.0	0.0
2S+200-SVMP	Inside	11/7/2022	13:53	1.0	20.9	0.0	0.0
2S+200-SVMP	Inside	11/14/2022	11:09	0.0	20.9	0.0	0.0
2S+200-SVMP	Inside	11/21/2022	13:04	2.9	20.9	0.0	0.0
2S+200-SVMP	Inside	11/28/2022	11:12	0.5	20.9	0.0	0.0
2S+200-SVMP	Inside	12/19/2022	10:57	0.7	20.9	0.0	0.0
2S+200-SVMP	Inside	12/27/2022	13:42	4.6	20.9	0.0	0.0
2S+200-SVMP	Inside	1/9/2023	10:03	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	12/22/2021	11:15	25.1	20.8	0.0	3.0
2S+225-SVMP	Inside	12/23/2021	11:45	82.1	20.9	0.0	3.0
2S+225-SVMP	Inside	12/24/2021	9:53	39.3	20.9	0.0	5.0
2S+225-SVMP	Inside	12/27/2021	11:04	30.5	20.9	0.0	3.0
2S+225-SVMP	Inside	12/29/2021	8:25	4.4	20.9	0.0	0.0
2S+225-SVMP	Inside	12/30/2021	8:29	5.0	20.9	0.0	0.0
2S+225-SVMP	Inside	12/31/2021	8:50	57.6	20.9	0.0	0.0
2S+225-SVMP	Inside	1/6/2022	9:33	70.0	20.9	0.0	0.0
2S+225-SVMP	Inside	1/12/2022	10:06	34.2	21.1	0.0	0.0
2S+225-SVMP	Inside	1/19/2022	9:52	1.3	20.9	0.0	0.0
2S+225-SVMP	Inside	1/26/2022	9:59	26.0	20.9	0.0	0.0
2S+225-SVMP	Inside	2/2/2022	10:20	6.0	20.9	0.0	0.0
2S+225-SVMP	Inside	2/9/2022	9:43	15.0	20.9	0.0	0.0
2S+225-SVMP	Inside	2/18/2022	10:05	9.0	20.9	0.0	0.0
2S+225-SVMP	Inside	2/23/2022	10:03	11.0	20.9	0.0	0.0
2S+225-SVMP	Inside	3/2/2022	9:32	17.0	20.9	0.0	0.0
2S+225-SVMP	Inside	3/16/2022	10:18	8.0	20.9	0.0	0.0
2S+225-SVMP	Inside	3/23/2022	9:51	6.0	20.9	0.0	0.0
2S+225-SVMP	Inside	3/30/2022	10:32	6.0	20.9	0.0	0.0
2S+225-SVMP	Inside	4/6/2022	10:01	6.0	20.9	0.0	0.0
2S+225-SVMP	Inside	4/13/2022	9:39	5.0	20.9	0.0	0.0
2S+225-SVMP	Inside	4/20/2022	9:33	6.0	20.9	0.0	0.0
2S+225-SVMP	Inside	4/27/2022	9:22	5.0	20.9	0.0	0.0
2S+225-SVMP	Inside	5/4/2022	13:01	6.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
2S+225-SVMP	Inside	5/9/2022	9:23	9.0	20.9	0.0	0.0
2S+225-SVMP	Inside	5/16/2022	9:42	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	5/23/2022	9:58	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	5/31/2022	11:32	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	6/6/2022	9:38	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	6/13/2022	10:05	4.0	20.9	0.0	0.0
2S+225-SVMP	Inside	6/20/2022	9:36	3.0	20.9	0.0	0.0
2S+225-SVMP	Inside	7/11/2022	9:43	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	8/8/2022	9:32	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	9/12/2022	9:57	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	11/7/2022	13:57	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	11/14/2022	11:11	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	11/21/2022	13:06	2.0	20.9	0.0	0.0
2S+225-SVMP	Inside	11/28/2022	11:15	0.0	20.9	0.0	0.0
2S+225-SVMP	Inside	12/19/2022	10:59	0.3	20.9	0.0	0.0
2S+225-SVMP	Inside	12/27/2022	13:52	2.6	20.9	0.0	0.0
2S+225-SVMP	Inside	1/9/2023	10:05	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	1/19/2022	9:45	0.8	20.9	0.0	0.0
2S+250-SVMP	Inside	1/26/2022	10:05	20.0	20.9	0.0	0.0
2S+250-SVMP	Inside	2/2/2022	10:21	5.0	20.9	0.0	0.0
2S+250-SVMP	Inside	2/9/2022	9:43	3.0	20.9	0.0	0.0
2S+250-SVMP	Inside	2/18/2022	10:06	7.0	20.9	0.0	0.0
2S+250-SVMP	Inside	2/23/2022	10:06	8.0	20.9	0.0	0.0
2S+250-SVMP	Inside	3/2/2022	9:35	14.0	20.9	0.0	0.0
2S+250-SVMP	Inside	3/16/2022	10:22	4.0	20.9	0.0	0.0
2S+250-SVMP	Inside	3/23/2022	9:56	6.0	20.9	0.0	0.0
2S+250-SVMP	Inside	3/30/2022	10:35	4.0	20.9	0.0	0.0
2S+250-SVMP	Inside	4/6/2022	10:03	4.0	20.9	0.0	0.0
2S+250-SVMP	Inside	4/13/2022	9:41	4.0	20.9	0.0	0.0
2S+250-SVMP	Inside	4/20/2022	9:36	4.0	20.9	0.0	0.0
2S+250-SVMP	Inside	4/27/2022	9:25	4.0	20.9	0.0	0.0
2S+250-SVMP	Inside	5/4/2022	13:03	8.0	20.9	0.0	0.0
2S+250-SVMP	Inside	5/9/2022	9:26	7.0	20.9	0.0	0.0
2S+250-SVMP	Inside	5/16/2022	9:45	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	5/23/2022	10:01	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	5/31/2022	11:36	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	6/6/2022	9:41	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	6/13/2022	10:11	2.0	20.9	0.0	0.0
2S+250-SVMP	Inside	6/20/2022	9:39	2.0	20.9	0.0	0.0
2S+250-SVMP	Inside	7/11/2022	9:47	0.0	20.8	0.0	0.0
2S+250-SVMP	Inside	8/8/2022	9:35	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	9/12/2022	10:00	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	11/7/2022	14:00	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	11/14/2022	11:16	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	11/21/2022	13:08	2.1	20.9	0.0	0.0
2S+250-SVMP	Inside	11/28/2022	11:20	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	12/19/2022	11:03	0.0	20.9	0.0	0.0
2S+250-SVMP	Inside	12/27/2022	13:53	2.9	20.9	0.0	0.0
2S+250-SVMP	Inside	1/9/2023	10:08	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	1/19/2022	9:37	1.1	20.9	0.0	0.0
2S+275-SVMP	Inside	1/26/2022	10:07	20.0	20.9	0.0	0.0
2S+275-SVMP	Inside	2/2/2022	10:23	5.0	20.9	0.0	0.0
2S+275-SVMP	Inside	2/9/2022	9:47	12.0	20.9	0.0	0.0
2S+275-SVMP	Inside	2/18/2022	10:08	6.0	20.9	0.0	0.0
2S+275-SVMP	Inside	2/23/2022	10:08	7.0	20.9	0.0	0.0
2S+275-SVMP	Inside	3/2/2022	9:38	11.0	20.9	0.0	0.0
2S+275-SVMP	Inside	3/16/2022	10:23	3.0	20.9	0.0	0.0
2S+275-SVMP	Inside	3/23/2022	9:58	4.0	20.9	0.0	0.0
2S+275-SVMP	Inside	3/30/2022	10:37	3.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
2S+275-SVMP	Inside	4/6/2022	10:07	3.0	20.9	0.0	0.0
2S+275-SVMP	Inside	4/13/2022	9:43	3.0	20.9	0.0	0.0
2S+275-SVMP	Inside	4/20/2022	9:38	4.0	20.9	0.0	0.0
2S+275-SVMP	Inside	4/27/2022	9:27	3.0	20.9	0.0	0.0
2S+275-SVMP	Inside	5/4/2022	13:09	4.0	20.9	0.0	0.0
2S+275-SVMP	Inside	5/9/2022	9:28	6.0	20.9	0.0	0.0
2S+275-SVMP	Inside	5/16/2022	9:48	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	5/23/2022	10:03	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	5/31/2022	11:40	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	6/6/2022	9:43	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	6/13/2022	10:15	2.0	20.9	0.0	0.0
2S+275-SVMP	Inside	6/20/2022	9:41	2.0	20.9	0.0	0.0
2S+275-SVMP	Inside	7/11/2022	9:49	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	8/8/2022	9:37	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	9/12/2022	10:03	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	11/7/2022	14:02	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	11/14/2022	11:17	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	11/21/2022	13:10	2.0	20.9	0.0	0.0
2S+275-SVMP	Inside	11/28/2022	11:24	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	12/19/2022	11:06	0.0	20.9	0.0	0.0
2S+275-SVMP	Inside	12/27/2022	13:55	2.8	20.9	0.0	0.0
2S+275-SVMP	Inside	1/9/2023	10:10	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	2/2/2022	10:24	6.0	20.9	0.0	0.0
2S+300-SVMP	Inside	2/9/2022	9:51	11.0	20.9	0.0	0.0
2S+300-SVMP	Inside	2/18/2022	10:13	6.0	20.9	0.0	0.0
2S+300-SVMP	Inside	2/23/2022	10:10	7.0	20.9	0.0	0.0
2S+300-SVMP	Inside	3/2/2022	9:39	11.0	20.9	0.0	0.0
2S+300-SVMP	Inside	3/16/2022	10:26	3.0	20.9	0.0	0.0
2S+300-SVMP	Inside	3/23/2022	10:01	4.0	20.9	0.0	0.0
2S+300-SVMP	Inside	3/30/2022	10:40	3.0	20.9	0.0	0.0
2S+300-SVMP	Inside	4/6/2022	10:10	3.0	20.9	0.0	0.0
2S+300-SVMP	Inside	4/13/2022	9:45	3.0	20.9	0.0	0.0
2S+300-SVMP	Inside	4/20/2022	9:41	3.0	20.9	0.0	0.0
2S+300-SVMP	Inside	4/27/2022	9:30	3.0	20.9	0.0	0.0
2S+300-SVMP	Inside	5/4/2022	13:07	5.0	20.9	0.0	0.0
2S+300-SVMP	Inside	5/9/2022	9:30	6.0	20.9	0.0	0.0
2S+300-SVMP	Inside	5/16/2022	9:51	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	5/23/2022	10:03	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	5/31/2022	11:46	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	6/6/2022	9:45	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	6/13/2022	10:18	2.0	20.9	0.0	0.0
2S+300-SVMP	Inside	6/20/2022	9:44	2.0	20.9	0.0	0.0
2S+300-SVMP	Inside	7/11/2022	9:51	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	8/8/2022	9:40	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	9/12/2022	10:05	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	11/7/2022	14:04	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	11/14/2022	11:18	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	11/21/2022	13:12	2.2	20.9	0.0	0.0
2S+300-SVMP	Inside	11/28/2022	11:27	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	12/19/2022	11:08	0.0	20.9	0.0	0.0
2S+300-SVMP	Inside	12/27/2022	13:56	2.8	20.9	0.0	0.0
2S+300-SVMP	Inside	1/9/2023	10:12	0.0	20.9	0.0	0.0
2S-100-SVMP	Inside	12/17/2021	8:30	48.7	NM	NM	NM
2S-100-SVMP	Inside	12/20/2021	14:28	473.8	NM	NM	NM
2S-100-SVMP	Inside	12/21/2021	13:37	189.0	NM	NM	NM
2S-125-SVMP	Inside	12/17/2021	8:44	68.5	NM	NM	NM
2S-125-SVMP	Inside	12/20/2021	14:39	82.9	NM	NM	NM
2S-125-SVMP	Inside	12/21/2021	13:43	86.4	NM	NM	NM
2S-150-SVMP	Inside	12/17/2021	8:52	78.9	NM	NM	NM

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
2S-150-SVMP	Inside	12/20/2021	14:53	84.3	NM	NM	NM
2S-150-SVMP	Inside	12/21/2021	13:52	93.5	NM	NM	NM
2S-175-SVMP	Inside	12/17/2021	11:22	40.2	NM	NM	NM
2S-175-SVMP	Inside	12/20/2021	15:01	82.4	NM	NM	NM
2S-175-SVMP	Inside	12/21/2021	13:57	66.7	NM	NM	NM
2S-200-SVMP	Inside	12/17/2021	11:35	20.4	NM	NM	NM
2S-200-SVMP	Inside	12/20/2021	15:12	38.6	NM	NM	NM
2S-200-SVMP	Inside	12/21/2021	14:06	40.1	NM	NM	NM
2S-225-SVMP	Inside	12/17/2021	11:46	32.5	NM	NM	NM
2S-225-SVMP	Inside	12/20/2021	15:17	37.2	NM	NM	NM
2S-225-SVMP	Inside	12/21/2021	14:10	42.3	NM	NM	NM
2S-25-SVMP	Inside	12/16/2021	15:10	59.3	NM	NM	NM
2S-25-SVMP	Inside	12/17/2021	15:10	59.3	NM	NM	NM
2S-25-SVMP	Inside	12/20/2021	14:00	109.7	NM	NM	NM
2S-25-SVMP	Inside	12/21/2021	13:17	13.7	NM	NM	NM
2S-50-SVMP	Inside	12/16/2021	15:15	89.7	NM	NM	NM
2S-50-SVMP	Inside	12/17/2021	15:15	89.7	NM	NM	NM
2S-50-SVMP	Inside	12/20/2021	14:10	134.6	NM	NM	NM
2S-50-SVMP	Inside	12/21/2021	13:23	86.4	NM	NM	NM
2S-75-SVMP	Inside	12/16/2021	15:21	88.6	NM	NM	NM
2S-75-SVMP	Inside	12/17/2021	15:21	88.6	NM	NM	NM
2S-75-SVMP	Inside	12/20/2021	14:20	525.1	NM	NM	NM
2S-75-SVMP	Inside	12/21/2021	13:29	237.5	NM	NM	NM
A3+050-SVMP	Inside	12/22/2021	13:16	37.2	20.9	0.0	4.0
A3+050-SVMP	Inside	12/23/2021	13:18	138.3	20.9	0.0	4.0
A3+050-SVMP	Inside	12/24/2021	11:05	101.5	20.9	0.0	5.0
A3+050-SVMP	Inside	12/27/2021	12:27	98.6	20.9	0.0	5.0
A3+050-SVMP	Inside	12/29/2021	10:25	6.6	20.9	0.0	0.0
A3+050-SVMP	Inside	12/30/2021	8:20	8.0	20.9	0.0	0.0
A3+050-SVMP	Inside	12/31/2021	9:51	64.9	20.9	0.0	0.0
A3+050-SVMP	Inside	1/6/2022	10:28	95.4	20.9	0.0	0.0
A3+050-SVMP	Inside	1/12/2022	11:14	64.1	21.1	0.0	0.0
A3+050-SVMP	Inside	1/19/2022	12:21	65.4	21.1	0.0	2.0
A3+050-SVMP	Inside	1/26/2022	10:51	64.0	20.9	0.0	0.0
A3+050-SVMP	Inside	2/2/2022	11:10	41.0	20.9	0.0	0.0
A3+050-SVMP	Inside	2/9/2022	10:28	50.0	20.9	0.0	0.0
A3+050-SVMP	Inside	2/18/2022	10:47	30.0	20.9	0.0	0.0
A3+050-SVMP	Inside	2/23/2022	10:51	41.0	20.7	0.0	0.0
A3+050-SVMP	Inside	3/2/2022	10:19	37.0	20.9	0.0	0.0
A3+050-SVMP	Inside	3/16/2022	11:03	15.0	20.9	0.0	0.0
A3+050-SVMP	Inside	3/23/2022	10:49	31.0	20.9	0.0	0.0
A3+050-SVMP	Inside	3/30/2022	11:36	17.0	20.9	0.0	0.0
A3+050-SVMP	Inside	4/6/2022	10:50	15.0	20.9	0.0	0.0
A3+050-SVMP	Inside	4/13/2022	10:24	17.0	20.9	0.0	0.0
A3+050-SVMP	Inside	4/20/2022	10:15	14.0	20.9	0.0	0.0
A3+050-SVMP	Inside	4/27/2022	10:06	14.0	20.9	0.0	0.0
A3+050-SVMP	Inside	5/4/2022	9:25	35.0	20.4	0.0	0.0
A3+050-SVMP	Inside	5/9/2022	10:04	64.0	20.9	0.0	0.0
A3+050-SVMP	Inside	5/16/2022	10:39	30.0	20.3	0.0	3.0
A3+050-SVMP	Inside	5/23/2022	10:52	21.0	20.9	0.0	0.0
A3+050-SVMP	Inside	5/31/2022	12:32	17.0	20.1	0.0	0.0
A3+050-SVMP	Inside	6/6/2022	11:02	18.0	20.3	0.0	0.0
A3+050-SVMP	Inside	6/13/2022	11:32	14.0	20.9	0.0	0.0
A3+050-SVMP	Inside	6/20/2022	10:30	16.0	20.9	0.0	0.0
A3+050-SVMP	Inside	7/11/2022	10:39	6.0	20.8	0.0	1.0
A3+050-SVMP	Inside	8/8/2022	10:31	0.0	20.9	0.0	0.0
A3+050-SVMP	Inside	9/12/2022	11:03	2.0	20.9	0.0	3.0
A3+050-SVMP	Inside	11/7/2022	14:51	10.0	20.2	0.0	0.0
A3+050-SVMP	Inside	11/14/2022	12:15	7.8	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3+050-SVMP	Inside	11/21/2022	14:38	20.1	20.5	0.0	0.0
A3+050-SVMP	Inside	11/28/2022	12:27	11.2	20.9	0.0	0.0
A3+050-SVMP	Inside	12/19/2022	12:26/13:29	4.6	20.9	0.0	0.0
A3+050-SVMP	Inside	12/27/2022	14:30	7.5	20.9	0.0	0.0
A3+050-SVMP	Inside	1/9/2023	10:52	0.4	20.9	0.0	0.0
A3+100-SVMP	Outside	12/16/2021	13:40	43.6	NM	NM	NM
A3+100-SVMP	Outside	12/20/2021	15:27	65.3	NM	NM	NM
A3+100-SVMP	Outside	12/21/2021	NR	NM	NM	NM	NM
A3+100-SVMP	Inside	12/22/2021	13:23	61.9	19.8	0.0	4.0
A3+100-SVMP	Inside	12/23/2021	13:26	205.1	20.8	0.0	4.0
A3+100-SVMP	Inside	12/24/2021	11:12	461.6	20.3	0.0	8.0
A3+100-SVMP	Inside	12/27/2021	12:30	141.8	20.3	0.0	5.0
A3+100-SVMP	Inside	12/29/2021	10:26	30.3	19.3	0.0	0.0
A3+100-SVMP	Inside	12/30/2021	8:20	30.7	20.9	0.0	0.0
A3+100-SVMP	Inside	12/31/2021	9:54	277.9	20.4	0.0	0.0
A3+100-SVMP	Inside	1/6/2022	10:34	415.8	20.2	0.0	0.0
A3+100-SVMP	Inside	1/12/2022	11:17	349.5	19.8	0.0	0.0
A3+100-SVMP	Inside	1/19/2022	12:23	342.7	20.9	0.0	3.0
A3+100-SVMP	Inside	1/26/2022	10:53	320.0	19.8	0.0	0.0
A3+100-SVMP	Inside	2/2/2022	11:21	389.0	17.2	0.0	0.0
A3+100-SVMP	Inside	2/9/2022	10:30	341.0	19.6	0.0	0.0
A3+100-SVMP	Inside	2/18/2022	10:49	181.0	19.6	0.0	0.0
A3+100-SVMP	Inside	2/23/2022	10:51	236.0	19.4	0.0	0.0
A3+100-SVMP	Inside	3/2/2022	10:22	298.0	19.6	0.0	0.0
A3+100-SVMP	Inside	3/16/2022	11:06	108.0	20.5	0.0	0.0
A3+100-SVMP	Inside	3/23/2022	10:52	77.0	20.9	0.0	0.0
A3+100-SVMP	Inside	3/30/2022	11:38	68.0	20.5	0.0	0.0
A3+100-SVMP	Inside	4/6/2022	12:56	57.0	19.8	0.0	0.0
A3+100-SVMP	Inside	4/13/2022	10:26	66.0	20.9	0.0	0.0
A3+100-SVMP	Inside	4/20/2022	10:10	59.0	20.3	0.0	0.0
A3+100-SVMP	Inside	4/27/2022	10:08	58.0	20.5	0.0	0.0
A3+100-SVMP	Inside	5/4/2022	9:27	53.0	20.3	0.0	0.0
A3+100-SVMP	Inside	5/9/2022	10:06	142.0	20.4	0.0	0.0
A3+100-SVMP	Inside	5/16/2022	10:45	72.0	19.9	0.0	3.0
A3+100-SVMP	Inside	5/23/2022	10:58	71.0	20.9	0.0	0.0
A3+100-SVMP	Inside	5/31/2022	12:34	48.0	19.9	0.0	0.0
A3+100-SVMP	Inside	6/6/2022	11:04	68.0	20.1	0.0	0.0
A3+100-SVMP	Inside	6/13/2022	11:34	87.0	20.9	0.0	0.0
A3+100-SVMP	Inside	6/20/2022	10:33	57.0	20.9	0.0	0.0
A3+100-SVMP	Inside	7/11/2022	10:41	61.0	20.6	0.0	1.0
A3+100-SVMP	Inside	8/8/2022	10:36	65.0	20.4	0.0	0.0
A3+100-SVMP	Inside	9/12/2022	11:06	19.0	20.9	0.0	3.0
A3+100-SVMP	Inside	11/7/2022	14:55	6.0	20.2	0.0	0.0
A3+100-SVMP	Inside	11/14/2022	12:17	2.6	20.9	0.0	0.0
A3+100-SVMP	Inside	11/21/2022	14:40	7.1	20.1	0.0	0.0
A3+100-SVMP	Inside	11/28/2022	12:30	7.8	18.9	0.0	0.0
A3+100-SVMP	Inside	12/19/2022	12:29/13:26	5.6	19.9	0.0	0.0
A3+100-SVMP	Inside	12/27/2022	14:32	6.0	20.9	0.0	0.0
A3+100-SVMP	Inside	1/9/2023	10:56	0.3	20.9	0.0	0.0
A3+125-SVMP	Outside	12/16/2021	13:49	28.7	NM	NM	NM
A3+125-SVMP	Outside	12/20/2021	11:43	31.7	NM	NM	NM
A3+125-SVMP	Outside	12/21/2021	NR	NM	NM	NM	NM
A3+150-SVMP	Inside	12/22/2021	13:32	61.7	19.0	0.0	5.0
A3+150-SVMP	Inside	12/23/2021	13:34	233.3	19.1	0.0	6.0
A3+150-SVMP	Inside	12/24/2021	11:16	130.7	19.6	0.0	7.0
A3+150-SVMP	Inside	12/27/2021	12:33	159.6	19.0	0.0	6.0
A3+150-SVMP	Inside	12/29/2021	10:26	32.3	18.8	0.0	0.0
A3+150-SVMP	Inside	12/30/2021	8:19	35.1	18.9	0.0	0.0
A3+150-SVMP	Inside	12/31/2021	10:00	341.0	18.8	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3+150-SVMP	Inside	1/6/2022	10:37	425.9	18.6	0.0	0.0
A3+150-SVMP	Inside	1/12/2022	11:21	385.6	17.2	0.0	0.0
A3+150-SVMP	Inside	1/19/2022	12:26	312.5	20.9	0.0	2.0
A3+150-SVMP	Inside	1/26/2022	10:56	335.0	18.6	0.0	0.0
A3+150-SVMP	Inside	2/2/2022	11:24	391.0	17.9	0.0	0.0
A3+150-SVMP	Inside	2/9/2022	10:35	298.0	18.1	0.0	0.0
A3+150-SVMP	Inside	2/18/2022	10:50	187.0	18.7	0.0	0.0
A3+150-SVMP	Inside	2/23/2022	10:35	220.0	18.2	0.0	0.0
A3+150-SVMP	Inside	3/2/2022	10:24	290.0	18.9	0.0	0.0
A3+150-SVMP	Inside	3/16/2022	11:10	103.0	19.4	0.0	0.0
A3+150-SVMP	Inside	3/23/2022	10:55	129.0	19.0	0.0	0.0
A3+150-SVMP	Inside	3/30/2022	11:40	157.0	18.9	0.0	4.0
A3+150-SVMP	Inside	4/6/2022	10:52	83.0	18.3	0.0	0.0
A3+150-SVMP	Inside	4/13/2022	10:28	152.0	19.2	0.0	0.0
A3+150-SVMP	Inside	4/20/2022	10:19	139.0	17.1	0.0	0.0
A3+150-SVMP	Inside	4/27/2022	10:10	133.0	18.6	0.0	0.0
A3+150-SVMP	Inside	5/4/2022	9:29	134.0	18.4	0.0	0.0
A3+150-SVMP	Inside	5/9/2022	10:09	259.0	19.2	0.0	0.0
A3+150-SVMP	Inside	5/16/2022	10:47	143.0	18.2	0.0	4.0
A3+150-SVMP	Inside	5/23/2022	11:03	141.0	20.9	0.0	0.0
A3+150-SVMP	Inside	5/31/2022	12:36	116.0	16.6	0.0	0.0
A3+150-SVMP	Inside	6/6/2022	11:08	158.0	18.0	0.0	5.0
A3+150-SVMP	Inside	6/13/2022	11:37	175.0	20.2	0.0	0.0
A3+150-SVMP	Inside	6/20/2022	10:36	136.0	20.3	0.0	0.0
A3+150-SVMP	Inside	7/11/2022	10:44	289.0	18.8	0.0	2.0
A3+150-SVMP	Inside	8/8/2022	10:40	38.0	18.9	0.0	4.0
A3+150-SVMP	Inside	9/12/2022	11:09	236.0	19.4	0.0	4.0
A3+150-SVMP	Inside	11/7/2022	14:58	124.0	18.7	0.0	0.0
A3+150-SVMP	Inside	11/14/2022	12:18	110.5	17.7	0.0	0.0
A3+150-SVMP	Inside	11/21/2022	14:42	100.0	18.3	0.0	0.0
A3+150-SVMP	Inside	11/28/2022	12:33	90.5	17.5	0.0	0.0
A3+150-SVMP	Inside	12/15/2022	9:44	128.4	18.3	0.8	0.0
A3+150-SVMP	Inside	12/19/2022	12:32/13:24	77.9	19.5	0.0	0.0
A3+150-SVMP	Inside	12/27/2022	14:34	108.4	20.4	0.0	0.0
A3+150-SVMP	Inside	1/9/2023	11:01	20.3	19.2	0.0	0.0
A3+150-SVMP	Inside	1/17/2023	11:32	19.2	19.2	0.5	0.0
A3+175-SVMP	Outside	12/16/2021	14:03	68.7	NM	NM	NM
A3+175-SVMP	Outside	12/20/2021	12:04	42.4	NM	NM	NM
A3+175-SVMP	Outside	12/21/2021	NR	NM	NM	NM	NM
A3+200-SVMP	Inside	12/22/2021	13:40	51.2	19.0	0.0	5.0
A3+200-SVMP	Inside	12/23/2021	13:42	192.5	19.1	0.0	5.0
A3+200-SVMP	Inside	12/24/2021	11:20	281.5	19.3	0.0	7.0
A3+200-SVMP	Inside	12/27/2021	12:32	79.0	19.3	0.0	5.0
A3+200-SVMP	Inside	12/29/2021	10:27	18.0	18.7	0.0	0.0
A3+200-SVMP	Inside	12/30/2021	8:19	19.4	18.7	0.0	0.0
A3+200-SVMP	Inside	12/31/2021	10:03	175.1	18.7	0.0	0.0
A3+200-SVMP	Inside	1/6/2022	10:40	238.8	18.6	0.0	0.0
A3+200-SVMP	Inside	1/12/2022	11:26	184.0	17.2	0.0	0.0
A3+200-SVMP	Inside	1/19/2022	12:28	147.6	18.0	0.0	3.0
A3+200-SVMP	Inside	1/26/2022	11:00	157.0	18.3	0.0	0.0
A3+200-SVMP	Inside	2/2/2022	11:27	159.0	17.2	0.0	0.0
A3+200-SVMP	Inside	2/9/2022	10:38	135.0	18.1	0.0	0.0
A3+200-SVMP	Inside	2/18/2022	10:54	77.0	18.6	0.0	0.0
A3+200-SVMP	Inside	2/23/2022	10:57	104.0	18.3	0.0	0.0
A3+200-SVMP	Inside	3/2/2022	10:27	125.0	18.6	0.0	0.0
A3+200-SVMP	Inside	3/16/2022	11:13	60.0	20.4	0.0	0.0
A3+200-SVMP	Inside	3/23/2022	10:58	45.0	20.3	0.0	0.0
A3+200-SVMP	Inside	3/30/2022	11:45	42.0	19.1	0.0	3.0
A3+200-SVMP	Inside	4/6/2022	10:54	32.0	19.7	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3+200-SVMP	Inside	4/13/2022	10:31	36.0	20.9	0.0	0.0
A3+200-SVMP	Inside	4/20/2022	10:21	34.0	19.1	0.0	0.0
A3+200-SVMP	Inside	4/27/2022	10:14	34.0	20.2	0.0	0.0
A3+200-SVMP	Inside	5/4/2022	9:31	30.0	19.3	0.0	0.0
A3+200-SVMP	Inside	5/9/2022	10:11	53.0	19.8	0.0	0.0
A3+200-SVMP	Inside	5/16/2022	10:30	19.0	19.4	0.0	3.0
A3+200-SVMP	Inside	5/23/2022	11:10	10.0	20.9	0.0	0.0
A3+200-SVMP	Inside	5/31/2022	12:38	11.0	18.8	0.0	0.0
A3+200-SVMP	Inside	6/6/2022	11:10	11.0	19.4	0.0	3.0
A3+200-SVMP	Inside	6/13/2022	11:41	16.0	20.9	0.0	0.0
A3+200-SVMP	Inside	6/20/2022	10:39	15.0	20.9	0.0	0.0
A3+200-SVMP	Inside	7/11/2022	10:47	95.0	20.5	0.0	1.0
A3+200-SVMP	Inside	8/8/2022	10:43	10.0	20.1	0.0	0.0
A3+200-SVMP	Inside	9/12/2022	11:13	4.0	20.5	0.0	3.0
A3+200-SVMP	Inside	11/7/2022	15:01	13.0	17.6	0.0	0.0
A3+200-SVMP	Inside	11/14/2022	12:20	6.4	19.9	0.0	0.0
A3+200-SVMP	Inside	11/21/2022	14:45	7.1	18.5	0.0	0.0
A3+200-SVMP	Inside	11/28/2022	12:35	9.3	20.1	0.0	0.0
A3+200-SVMP	Inside	12/19/2022	12:48	4.3	20.2	0.0	0.0
A3+200-SVMP	Inside	12/27/2022	14:35	11.8	20.4	0.0	0.0
A3+200-SVMP	Inside	1/9/2023	11:04	0.8	19.9	0.0	0.0
A3+225-SVMP	Outside	12/16/2021	14:21	12.5	NM	NM	NM
A3+225-SVMP	Outside	12/20/2021	12:32	6.8	NM	NM	NM
A3+225-SVMP	Outside	12/21/2021	13:09	14.7	NM	NM	NM
A3+250-SVMP	Outside	12/16/2021	14:28	26.7	NM	NM	NM
A3+250-SVMP	Outside	12/17/2021	14:28	26.7	NM	NM	NM
A3+250-SVMP	Outside	12/20/2021	13:08	38.7	NM	NM	NM
A3+250-SVMP	Outside	12/21/2021	13:03	66.4	NM	NM	NM
A3+250-SVMP	Inside	12/22/2021	13:47	106.4	19.2	0.0	6.0
A3+250-SVMP	Inside	12/23/2021	13:49	350.1	19.5	0.0	7.0
A3+250-SVMP	Inside	12/24/2021	11:25	280.8	19.1	0.0	8.0
A3+250-SVMP	Inside	12/27/2021	12:58	240.5	19.3	0.0	7.0
A3+250-SVMP	Inside	12/29/2021	10:27	NM	NM	NM	NM
A3+250-SVMP	Inside	12/30/2021	8:18	NM	NM	NM	NM
A3+250-SVMP	Inside	12/31/2021	NR	NM	NM	NM	NM
A3+250-SVMP	Inside	1/6/2022	10:43	614.4	18.4	0.0	0.0
A3+250-SVMP	Inside	1/12/2022	11:28	549.9	16.8	0.0	0.0
A3+250-SVMP	Inside	1/19/2022	12:34	531.2	16.0	0.0	3.0
A3+250-SVMP	Inside	1/26/2022	11:06	667.0	18.6	0.0	0.0
A3+250-SVMP	Inside	2/2/2022	11:30	598.0	15.6	0.0	0.0
A3+250-SVMP	Inside	2/9/2022	10:40	498.0	16.5	0.0	0.0
A3+250-SVMP	Inside	2/18/2022	12:06	295.0	17.6	0.0	0.0
A3+250-SVMP	Inside	2/23/2022	11:00	383.0	15.8	0.0	0.0
A3+250-SVMP	Inside	3/2/2022	10:30	424.0	17.5	0.0	0.0
A3+250-SVMP	Inside	3/16/2022	11:17	213.0	20.3	0.0	0.0
A3+250-SVMP	Inside	3/23/2022	11:01	150.0	19.9	0.0	0.0
A3+250-SVMP	Inside	3/30/2022	11:50	181.0	19.5	0.0	4.0
A3+250-SVMP	Inside	4/6/2022	10:56	89.0	20.1	0.0	0.0
A3+250-SVMP	Inside	4/13/2022	10:34	163.0	20.5	0.0	0.0
A3+250-SVMP	Inside	4/20/2022	10:24	136.0	19.8	0.0	0.0
A3+250-SVMP	Inside	4/27/2022	10:17	131.0	20.2	0.0	0.0
A3+250-SVMP	Inside	5/4/2022	9:36	147.0	14.9	0.0	0.0
A3+250-SVMP	Inside	5/9/2022	10:13	283.0	16.5	0.0	4.0
A3+250-SVMP	Inside	5/16/2022	10:53	145.0	15.8	0.0	4.0
A3+250-SVMP	Inside	5/23/2022	11:15	137.0	19.1	0.0	0.0
A3+250-SVMP	Inside	5/31/2022	12:42	116.0	13.2	0.0	3.0
A3+250-SVMP	Inside	6/6/2022	11:13	164.0	10.2	0.0	5.0
A3+250-SVMP	Inside	6/13/2022	11:45	156.0	19.6	0.0	0.0
A3+250-SVMP	Inside	6/20/2022	10:42	160.0	20.2	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3+250-SVMP	Inside	7/11/2022	10:50	262.0	16.6	0.0	3.0
A3+250-SVMP	Inside	8/8/2022	10:47	253.0	15.5	0.0	5.0
A3+250-SVMP	Inside	9/12/2022	11:16	101.0	16.9	0.0	5.0
A3+250-SVMP	Inside	11/7/2022	15:03	13.0	16.4	0.0	0.0
A3+250-SVMP	Inside	11/14/2022	12:25	7.4	17.9	0.0	0.0
A3+250-SVMP	Inside	11/21/2022	14:47	8.8	17.2	0.0	0.0
A3+250-SVMP	Inside	11/28/2022	12:37	8.7	16.4	0.0	0.0
A3+250-SVMP	Inside	12/19/2022	12:52	6.4	20.2	0.0	0.0
A3+250-SVMP	Inside	12/27/2022	14:37	9.5	20.3	0.0	0.0
A3+250-SVMP	Inside	1/9/2023	11:06	0.4	19.0	0.0	0.0
A3+25-SVMP	Inside	12/16/2021	12:58	27.7	NM	NM	NM
A3+25-SVMP	Inside	12/20/2021	16:01	56.8	NM	NM	NM
A3+25-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3+275-SVMP	Outside	12/16/2021	14:38	35.8	NM	NM	NM
A3+275-SVMP	Outside	12/17/2021	14:38	35.8	NM	NM	NM
A3+275-SVMP	Outside	12/20/2021	13:51	58.4	NM	NM	NM
A3+275-SVMP	Outside	12/21/2021	12:55	68.3	NM	NM	NM
A3+300-SVMP	Inside	12/22/2021	13:59	55.3	18.4	0.0	6.0
A3+300-SVMP	Inside	12/23/2021	13:57	106.0	18.5	0.0	7.0
A3+300-SVMP	Inside	12/24/2021	11:44	120.1	18.7	0.0	13.0
A3+300-SVMP	Inside	12/27/2021	NR	NM	NM	NM	NM
A3+300-SVMP	Inside	12/29/2021	10:28	NM	NM	NM	NM
A3+300-SVMP	Inside	12/30/2021	8:17	NM	NM	NM	NM
A3+300-SVMP	Inside	12/30/2021	8:11	NM	NM	NM	NM
A3+300-SVMP	Inside	12/31/2021	NR	NM	NM	NM	NM
A3+300-SVMP	Inside	1/6/2022	NR	NM	NM	NM	NM
A3+300-SVMP	Inside	1/12/2022	11:31	628.0	15.3	0.0	0.0
A3+300-SVMP	Inside	1/19/2022	12:38	653.8	13.7	0.0	5.0
A3+300-SVMP	Inside	1/26/2022	NR	NM	NM	NM	NM
A3+300-SVMP	Inside	2/2/2022	NR	NM	NM	NM	NM
A3+300-SVMP	Inside	2/9/2022	10:43	664.0	14.6	0.0	0.0
A3+300-SVMP	Inside	2/18/2022	10:57	369.0	13.9	0.0	0.0
A3+300-SVMP	Inside	2/23/2022	11:03	442.0	13.9	0.0	0.0
A3+300-SVMP	Inside	3/2/2022	10:33	508.0	13.9	0.0	0.0
A3+300-SVMP	Inside	3/16/2022	11:20	295.0	16.4	0.0	0.0
A3+300-SVMP	Inside	3/23/2022	11:07	169.0	15.6	0.0	0.0
A3+300-SVMP	Inside	3/30/2022	11:54	245.0	13.9	0.0	10.0
A3+300-SVMP	Inside	4/6/2022	12:51	192.0	14.0	0.0	7.0
A3+300-SVMP	Inside	4/13/2022	10:36	236.0	18.6	0.0	0.0
A3+300-SVMP	Inside	4/20/2022	10:27	227.0	10.1	0.0	0.0
A3+300-SVMP	Inside	4/27/2022	10:19	234.0	14.3	0.0	0.0
A3+300-SVMP	Inside	5/4/2022	9:39	272.0	11.2	0.0	0.0
A3+300-SVMP	Inside	5/9/2022	10:15	862.0	14.3	0.0	6.0
A3+300-SVMP	Inside	5/16/2022	10:56	254.0	13.1	0.0	5.0
A3+300-SVMP	Inside	5/23/2022	11:20	278.0	18.3	0.0	0.0
A3+300-SVMP	Inside	5/31/2022	12:46	244.0	6.1	0.0	6.0
A3+300-SVMP	Inside	6/6/2022	11:16	303.0	13.0	0.0	7.0
A3+300-SVMP	Inside	6/13/2022	11:52	350.0	18.8	0.0	0.0
A3+300-SVMP	Inside	6/20/2022	10:45	325.0	18.8	0.0	0.0
A3+300-SVMP	Inside	7/11/2022	10:54	435.0	12.9	0.0	4.0
A3+300-SVMP	Inside	8/8/2022	10:41	613.0	15.7	0.0	6.0
A3+300-SVMP	Inside	9/12/2022	11:22	342.0	14.9	0.0	6.0
A3+300-SVMP	Inside	11/7/2022	15:06	80.0	14.9	0.0	0.0
A3+300-SVMP	Inside	11/14/2022	12:27	74.0	18.3	0.0	0.0
A3+300-SVMP	Inside	11/21/2022	14:50	62.1	16.4	0.0	0.0
A3+300-SVMP	Inside	11/28/2022	12:40	65.2	19.0	0.0	0.0
A3+300-SVMP	Inside	12/19/2022	12:55	31.2	19.7	0.0	0.0
A3+300-SVMP	Inside	12/27/2022	14:42	31.2	20.0	0.0	0.0
A3+300-SVMP	Inside	1/9/2023	11:09	1.3	20.5	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3+325-SVMP	Outside	12/16/2021	14:52	33.9	NM	NM	NM
A3+325-SVMP	Outside	12/17/2021	14:52	33.9	NM	NM	NM
A3+325-SVMP	Outside	12/20/2021	13:26	142.3	NM	NM	NM
A3+325-SVMP	Outside	12/21/2021	12:32	72.4	NM	NM	NM
A3+370-SVMP	Inside	12/17/2021	10:51	287.5	NM	NM	NM
A3+370-SVMP	Inside	12/20/2021	12:57	290.3	NM	NM	NM
A3+370-SVMP	Inside	12/21/2021	12:11	180.6	NM	NM	NM
A3+400-SVMP	Inside	12/20/2021	12:47	15.4	NM	NM	NM
A3+400-SVMP	Inside	12/21/2021	12:05	17.3	NM	NM	NM
A3+400-SVMP	Inside	12/22/2021	14:20	64.0	17.8	0.0	6.0
A3+400-SVMP	Inside	12/23/2021	14:17	215.3	18.0	0.0	6.0
A3+400-SVMP	Inside	12/24/2021	12:00	101.2	17.9	0.0	8.0
A3+400-SVMP	Inside	12/27/2021	13:14	134.5	17.9	0.0	6.0
A3+400-SVMP	Inside	12/29/2021	10:29	MNA	17.6	0.0	0.0
A3+400-SVMP	Inside	12/30/2021	8:16	7.6	18.0	0.0	0.0
A3+400-SVMP	Inside	12/31/2021	10:13	85.0	17.8	0.0	0.0
A3+400-SVMP	Inside	1/6/2022	10:53	97.3	15.9	0.0	0.0
A3+400-SVMP	Inside	1/12/2022	11:39	71.9	13.8	0.0	0.0
A3+400-SVMP	Inside	1/19/2022	12:51	72.1	15.2	0.0	3.0
A3+400-SVMP	Inside	1/26/2022	11:15	64.0	17.2	0.0	0.0
A3+400-SVMP	Inside	2/2/2022	11:39	36.0	20.9	0.0	0.0
A3+400-SVMP	Inside	2/9/2022	10:52	67.0	16.5	0.0	0.0
A3+400-SVMP	Inside	2/18/2022	11:04	55.0	17.3	0.0	0.0
A3+400-SVMP	Inside	2/23/2022	11:11	50.0	10.2	0.0	0.0
A3+400-SVMP	Inside	3/2/2022	10:39	73.0	16.9	0.0	0.0
A3+400-SVMP	Inside	3/16/2022	11:28	15.0	18.6	0.0	0.0
A3+400-SVMP	Inside	3/23/2022	11:17	21.0	16.1	0.0	0.0
A3+400-SVMP	Inside	3/30/2022	12:04	13.0	17.3	0.0	4.0
A3+400-SVMP	Inside	4/6/2022	11:05	26.0	17.2	0.0	0.0
A3+400-SVMP	Inside	4/13/2022	10:43	17.0	20.9	0.0	0.0
A3+400-SVMP	Inside	4/20/2022	10:36	12.0	15.7	0.0	0.0
A3+400-SVMP	Inside	4/27/2022	10:27	18.0	17.8	0.0	0.0
A3+400-SVMP	Inside	5/4/2022	9:48	16.0	18.6	0.0	0.0
A3+400-SVMP	Inside	5/9/2022	10:23	29.0	19.3	0.0	0.0
A3+400-SVMP	Inside	5/16/2022	11:05	10.0	18.2	0.0	4.0
A3+400-SVMP	Inside	5/23/2022	11:29	7.0	20.9	0.0	0.0
A3+400-SVMP	Inside	5/31/2022	12:55	10.0	16.4	0.0	0.0
A3+400-SVMP	Inside	6/6/2022	11:25	15.0	17.5	0.0	5.0
A3+400-SVMP	Inside	6/13/2022	12:03	16.0	20.9	0.0	0.0
A3+400-SVMP	Inside	6/20/2022	10:54	15.0	20.0	0.0	0.0
A3+400-SVMP	Inside	7/11/2022	11:03	11.0	18.3	0.0	2.0
A3+400-SVMP	Inside	8/8/2022	10:59	13.0	18.4	0.0	5.0
A3+400-SVMP	Inside	9/12/2022	11:32	0.0	18.0	0.0	5.0
A3+400-SVMP	Inside	11/7/2022	15:17	5.0	15.7	0.0	0.0
A3+400-SVMP	Inside	11/14/2022	12:33	9.5	17.2	0.0	0.0
A3+400-SVMP	Inside	11/21/2022	15:09	6.4	17.5	0.0	0.0
A3+400-SVMP	Inside	11/28/2022	12:46	4.8	17.8	0.0	0.0
A3+400-SVMP	Inside	12/19/2022	13:04	3.8	17.6	0.0	0.0
A3+400-SVMP	Inside	12/27/2022	14:45	7.1	20.4	0.0	0.0
A3+400-SVMP	Inside	1/9/2023	11:17	0.0	18.7	0.0	0.0
A3+425-SVMP	Inside	12/22/2021	14:27	49.5	18.4	0.0	6.0
A3+425-SVMP	Inside	12/23/2021	14:25	177.7	18.5	0.0	6.0
A3+425-SVMP	Inside	12/24/2021	12:04	96.1	18.9	0.0	7.0
A3+425-SVMP	Inside	12/27/2021	13:18	33.2	18.7	0.0	6.0
A3+425-SVMP	Inside	12/29/2021	10:30	4.8	17.6	0.0	0.0
A3+425-SVMP	Inside	12/30/2021	8:16	10.5	19.0	0.0	0.0
A3+425-SVMP	Inside	12/31/2021	10:18	61.5	18.8	0.0	0.0
A3+425-SVMP	Inside	1/6/2022	10:56	69.9	17.2	0.0	0.0
A3+425-SVMP	Inside	1/12/2022	11:41	56.5	16.4	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3+425-SVMP	Inside	1/19/2022	12:54	59.3	20.9	0.0	2.0
A3+425-SVMP	Inside	1/26/2022	11:18	50.0	18.2	0.0	0.0
A3+425-SVMP	Inside	2/2/2022	11:41	27.0	20.5	0.0	0.0
A3+425-SVMP	Inside	2/9/2022	10:54	42.0	18.1	0.0	0.0
A3+425-SVMP	Inside	2/18/2022	11:07	40.0	18.3	0.0	0.0
A3+425-SVMP	Inside	2/23/2022	11:15	40.0	17.7	0.0	0.0
A3+425-SVMP	Inside	3/2/2022	10:41	49.0	17.6	0.0	0.0
A3+425-SVMP	Inside	3/16/2022	11:31	12.0	19.5	0.0	0.0
A3+425-SVMP	Inside	3/23/2022	11:19	15.0	18.8	0.0	0.0
A3+425-SVMP	Inside	3/30/2022	12:07	9.0	18.0	0.0	4.0
A3+425-SVMP	Inside	4/6/2022	11:00	21.0	18.7	0.0	0.0
A3+425-SVMP	Inside	4/13/2022	10:45	12.0	20.9	0.0	0.0
A3+425-SVMP	Inside	4/20/2022	10:38	10.0	18.0	0.0	0.0
A3+425-SVMP	Inside	4/27/2022	10:29	15.0	19.0	0.0	0.0
A3+425-SVMP	Inside	5/4/2022	9:50	11.0	19.2	0.0	0.0
A3+425-SVMP	Inside	5/9/2022	10:24	23.0	19.5	0.0	0.0
A3+425-SVMP	Inside	5/16/2022	11:08	7.0	18.5	0.0	3.0
A3+425-SVMP	Inside	5/23/2022	11:31	6.0	20.9	0.0	0.0
A3+425-SVMP	Inside	5/31/2022	12:58	7.0	17.3	0.0	0.0
A3+425-SVMP	Inside	6/6/2022	11:27	9.0	18.1	0.0	4.0
A3+425-SVMP	Inside	6/13/2022	12:06	13.0	20.9	0.0	0.0
A3+425-SVMP	Inside	6/20/2022	10:56	13.0	19.8	0.0	0.0
A3+425-SVMP	Inside	7/11/2022	11:06	6.0	18.4	0.0	3.0
A3+425-SVMP	Inside	8/8/2022	11:03	6.0	18.3	0.0	5.0
A3+425-SVMP	Inside	9/12/2022	11:35	0.0	18.4	0.0	4.0
A3+425-SVMP	Inside	11/7/2022	15:19	0.0	16.8	0.0	0.0
A3+425-SVMP	Inside	11/14/2022	12:35	8.5	17.4	0.0	0.0
A3+425-SVMP	Inside	11/21/2022	15:14	5.6	17.7	0.0	0.0
A3+425-SVMP	Inside	11/28/2022	12:48	5.7	18.0	0.0	0.0
A3+425-SVMP	Inside	12/19/2022	13:07	3.4	17.5	0.0	0.0
A3+425-SVMP	Inside	12/27/2022	14:48	3.3	20.4	0.0	0.0
A3+425-SVMP	Inside	1/9/2023	11:19	0.0	18.7	0.0	0.0
A3+450-SVMP	Inside	12/22/2021	14:35	42.5	19.5	0.0	5.0
A3+450-SVMP	Inside	12/23/2021	14:35	159.7	19.6	0.0	6.0
A3+450-SVMP	Inside	12/24/2021	12:11	82.5	19.7	0.0	7.0
A3+450-SVMP	Inside	12/27/2021	13:24	113.0	19.6	0.0	6.0
A3+450-SVMP	Inside	12/29/2021	10:30	4.9	19.6	0.0	0.0
A3+450-SVMP	Inside	12/30/2021	8:15	4.0	19.8	0.0	0.0
A3+450-SVMP	Inside	12/31/2021	10:20	44.7	19.7	0.0	0.0
A3+450-SVMP	Inside	1/6/2022	10:58	53.4	18.0	0.0	0.0
A3+450-SVMP	Inside	1/12/2022	11:43	45.2	18.6	0.0	0.0
A3+450-SVMP	Inside	1/19/2022	13:01	53.7	19.3	0.0	3.0
A3+450-SVMP	Inside	1/26/2022	11:20	37.0	19.9	0.0	0.0
A3+450-SVMP	Inside	2/2/2022	11:44	21.0	19.4	0.0	0.0
A3+450-SVMP	Inside	2/9/2022	10:57	31.0	19.5	0.0	0.0
A3+450-SVMP	Inside	2/18/2022	11:08	33.0	19.8	0.0	0.0
A3+450-SVMP	Inside	2/23/2022	11:16	30.0	19.4	0.0	0.0
A3+450-SVMP	Inside	3/2/2022	10:43	40.0	19.4	0.0	0.0
A3+450-SVMP	Inside	3/16/2022	11:34	9.0	20.2	0.0	0.0
A3+450-SVMP	Inside	3/23/2022	11:22	12.0	19.7	0.0	0.0
A3+450-SVMP	Inside	3/30/2022	12:11	8.0	19.3	0.0	0.0
A3+450-SVMP	Inside	4/6/2022	11:08	17.0	19.5	0.0	0.0
A3+450-SVMP	Inside	4/13/2022	10:47	11.0	20.9	0.0	0.0
A3+450-SVMP	Inside	4/20/2022	10:40	9.0	19.1	0.0	0.0
A3+450-SVMP	Inside	4/27/2022	10:31	12.0	19.8	0.0	0.0
A3+450-SVMP	Inside	5/4/2022	9:52	10.0	19.4	0.0	0.0
A3+450-SVMP	Inside	5/9/2022	10:26	24.0	19.5	0.0	0.0
A3+450-SVMP	Inside	5/16/2022	11:10	5.0	18.4	0.0	3.0
A3+450-SVMP	Inside	5/23/2022	11:33	4.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3+450-SVMP	Inside	5/31/2022	13:01	4.0	16.0	0.0	0.0
A3+450-SVMP	Inside	6/6/2022	11:30	7.0	17.8	0.0	4.0
A3+450-SVMP	Inside	6/13/2022	12:08	12.0	20.9	0.0	0.0
A3+450-SVMP	Inside	6/20/2022	10:59	10.0	20.0	0.0	0.0
A3+450-SVMP	Inside	7/11/2022	11:08	4.0	17.8	0.0	2.0
A3+450-SVMP	Inside	8/8/2022	11:05	66.0	17.5	0.0	5.0
A3+450-SVMP	Inside	9/12/2022	11:37	0.0	17.7	0.0	5.0
A3+450-SVMP	Inside	11/7/2022	15:20	0.0	16.4	0.0	0.0
A3+450-SVMP	Inside	11/14/2022	12:38	7.1	17.0	0.0	0.0
A3+450-SVMP	Inside	11/21/2022	15:20	0.0	16.4	0.0	0.0
A3+450-SVMP	Inside	11/28/2022	12:50	2.4	16.9	0.0	0.0
A3+450-SVMP	Inside	12/19/2022	13:10	3.7	16.3	0.0	0.0
A3+450-SVMP	Inside	12/27/2022	14:49	2.9	20.2	0.0	0.0
A3+450-SVMP	Inside	1/9/2023	11:22	0.0	17.4	0.0	0.0
A3+475-SVMP	Inside	12/22/2021	14:42	41.4	20.3	0.0	4.0
A3+475-SVMP	Inside	12/23/2021	14:42	144.8	20.3	0.0	5.0
A3+475-SVMP	Inside	12/24/2021	12:15	76.4	20.2	0.0	7.0
A3+475-SVMP	Inside	12/27/2021	13:29	90.3	18.2	0.0	5.0
A3+475-SVMP	Inside	12/29/2021	10:31	3.6	20.2	0.0	0.0
A3+475-SVMP	Inside	12/30/2021	8:12	3.4	20.2	0.0	0.0
A3+475-SVMP	Inside	12/31/2021	10:23	38.1	20.4	0.0	0.0
A3+475-SVMP	Inside	1/6/2022	11:00	45.1	18.0	0.0	0.0
A3+475-SVMP	Inside	1/12/2022	11:45	38.4	16.3	0.0	0.0
A3+475-SVMP	Inside	1/19/2022	13:06	41.9	20.3	0.0	3.0
A3+475-SVMP	Inside	1/26/2022	11:23	30.0	20.5	0.0	0.0
A3+475-SVMP	Inside	2/2/2022	11:45	17.0	19.4	0.0	0.0
A3+475-SVMP	Inside	2/9/2022	10:59	26.0	19.7	0.0	0.0
A3+475-SVMP	Inside	2/18/2022	11:00	27.0	20.3	0.0	0.0
A3+475-SVMP	Inside	2/23/2022	11:15	25.0	19.7	0.0	0.0
A3+475-SVMP	Inside	3/2/2022	10:46	36.0	20.2	0.0	0.0
A3+475-SVMP	Inside	3/16/2022	11:36	9.0	20.5	0.0	0.0
A3+475-SVMP	Inside	3/23/2022	11:25	9.0	19.8	0.0	0.0
A3+475-SVMP	Inside	3/30/2022	12:15	7.0	20.0	0.0	0.0
A3+475-SVMP	Inside	4/6/2022	11:10	14.0	20.2	0.0	0.0
A3+475-SVMP	Inside	4/13/2022	10:49	9.0	20.9	0.0	0.0
A3+475-SVMP	Inside	4/20/2022	10:43	8.0	20.1	0.0	0.0
A3+475-SVMP	Inside	4/27/2022	10:33	9.0	20.4	0.0	0.0
A3+475-SVMP	Inside	5/4/2022	9:55	8.0	19.5	0.0	0.0
A3+475-SVMP	Inside	5/9/2022	10:28	19.0	19.1	0.0	0.0
A3+475-SVMP	Inside	5/16/2022	11:12	6.0	17.8	0.0	3.0
A3+475-SVMP	Inside	5/23/2022	11:35	3.0	20.9	0.0	0.0
A3+475-SVMP	Inside	5/31/2022	13:03	3.0	15.2	0.0	0.0
A3+475-SVMP	Inside	6/6/2022	11:33	4.0	16.9	0.0	4.0
A3+475-SVMP	Inside	6/13/2022	12:12	9.0	20.9	0.0	0.0
A3+475-SVMP	Inside	6/20/2022	11:01	9.0	19.6	0.0	0.0
A3+475-SVMP	Inside	7/11/2022	11:11	1.0	17.5	0.0	2.0
A3+475-SVMP	Inside	8/8/2022	11:08	4.0	17.0	0.0	5.0
A3+475-SVMP	Inside	9/12/2022	11:39	0.0	17.8	0.0	5.0
A3+475-SVMP	Inside	11/7/2022	15:23	0.0	16.4	0.0	0.0
A3+475-SVMP	Inside	11/14/2022	12:41	7.1	16.4	0.0	0.0
A3+475-SVMP	Inside	11/21/2022	15:28	0.0	16.6	0.0	0.0
A3+475-SVMP	Inside	11/28/2022	12:52	1.4	16.6	0.0	0.0
A3+475-SVMP	Inside	12/19/2022	13:13	4.7	16.5	0.0	0.0
A3+475-SVMP	Inside	12/27/2022	14:51	1.9	20.0	0.0	0.0
A3+475-SVMP	Inside	1/9/2023	11:24	0.0	17.9	0.0	0.0
A3+500-SVMP	Inside	12/22/2021	14:49	56.2	19.4	0.0	6.0
A3+500-SVMP	Inside	12/23/2021	14:48	193.5	19.9	0.0	5.0
A3+500-SVMP	Inside	12/24/2021	12:19	121.6	19.7	0.0	7.0
A3+500-SVMP	Inside	12/27/2021	NR	NM	NM	NM	NM

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3+500-SVMP	Inside	12/29/2021	10:01	NM	NM	NM	NM
A3+500-SVMP	Inside	12/31/2021	NR	NM	NM	NM	NM
A3+500-SVMP	Inside	1/6/2022	NR	NM	NM	NM	NM
A3+500-SVMP	Inside	1/12/2022	11:49	106.5	20.0	0.0	0.0
A3+500-SVMP	Inside	1/19/2022	NR	NM	NM	NM	NM
A3+500-SVMP	Inside	1/26/2022	11:26	291.0	19.3	0.0	0.0
A3+500-SVMP	Inside	2/2/2022	11:49	444.0	20.3	0.0	0.0
A3+500-SVMP	Inside	2/9/2022	11:00	112.0	19.5	0.0	0.0
A3+500-SVMP	Inside	2/18/2022	11:13	118.0	18.6	0.0	0.0
A3+500-SVMP	Inside	2/23/2022	11:20	70.0	18.2	0.0	0.0
A3+500-SVMP	Inside	3/2/2022	10:49	148.0	19.0	0.0	0.0
A3+500-SVMP	Inside	3/16/2022	11:38	83.0	19.7	0.0	0.0
A3+500-SVMP	Inside	3/23/2022	11:29	28.0	20.0	0.0	0.0
A3+500-SVMP	Inside	3/30/2022	12:18	75.0	18.4	0.0	4.0
A3+500-SVMP	Inside	4/6/2022	11:13	46.0	18.7	0.0	0.0
A3+500-SVMP	Inside	4/13/2022	10:51	76.0	19.9	0.0	0.0
A3+500-SVMP	Inside	4/20/2022	10:45	70.0	18.2	0.0	0.0
A3+500-SVMP	Inside	4/27/2022	10:36	68.0	19.3	0.0	0.0
A3+500-SVMP	Inside	5/4/2022	9:57	12.0	20.9	0.0	0.0
A3+500-SVMP	Inside	5/9/2022	10:30	20.0	20.9	0.0	0.0
A3+500-SVMP	Inside	5/16/2022	11:14	4.0	20.6	0.0	2.0
A3+500-SVMP	Inside	5/23/2022	11:38	0.0	20.9	0.0	0.0
A3+500-SVMP	Inside	5/31/2022	13:05	1.0	20.5	0.0	0.0
A3+500-SVMP	Inside	6/6/2022	11:37	4.0	20.5	0.0	0.0
A3+500-SVMP	Inside	6/13/2022	12:15	8.0	20.9	0.0	0.0
A3+500-SVMP	Inside	6/20/2022	11:14	13.0	20.9	0.0	0.0
A3+500-SVMP	Inside	7/11/2022	11:14	1.0	20.8	0.0	0.0
A3+500-SVMP	Inside	8/8/2022	11:11	0.0	20.4	0.0	0.0
A3+500-SVMP	Inside	9/12/2022	11:41	0.0	20.9	0.0	3.0
A3+500-SVMP	Inside	11/7/2022	15:26	0.0	18.4	0.0	0.0
A3+500-SVMP	Inside	11/14/2022	12:44	20.9	20.9	0.0	0.0
A3+500-SVMP	Inside	11/21/2022	15:29	9.4	19.4	0.0	0.0
A3+500-SVMP	Inside	11/28/2022	12:54	16.8	20.5	0.0	0.0
A3+500-SVMP	Inside	12/19/2022	13:16	8.3	20.9	0.0	0.0
A3+500-SVMP	Inside	12/27/2022	14:54	16.7	20.9	0.0	0.0
A3+500-SVMP	Inside	1/9/2023	11:26	0.7	20.9	0.0	0.0
A3+505-SVMP	Inside	12/17/2021	10:40	2.3	NM	NM	NM
A3+75-SVMP	Outside	12/16/2021	13:36	35.9	NM	NM	NM
A3+75-SVMP	Outside	12/20/2021	15:33	NM	NM	NM	NM
A3+75-SVMP	Outside	12/21/2021	NR	NM	NM	NM	NM
A3-025-SVMP	Outside	12/31/2021	9:42	111.4	20.9	0.0	0.0
A3-025-SVMP	Outside	1/6/2022	10:16	132.6	20.9	0.0	0.0
A3-025-SVMP	Outside	1/12/2022	11:07	98.4	21.1	0.0	0.0
A3-025-SVMP	Outside	1/19/2022	12:10	88.9	20.9	0.0	2.0
A3-025-SVMP	Outside	1/26/2022	10:40	96.0	20.9	0.0	0.0
A3-025-SVMP	Outside	2/2/2022	11:09	75.0	20.2	0.0	0.0
A3-025-SVMP	Outside	2/9/2022	10:22	77.0	20.9	0.0	0.0
A3-025-SVMP	Outside	2/18/2022	10:40	35.0	20.8	0.0	0.0
A3-025-SVMP	Outside	2/23/2022	10:42	53.0	20.7	0.0	0.0
A3-025-SVMP	Outside	3/2/2022	10:09	66.0	20.9	0.0	0.0
A3-025-SVMP	Outside	3/16/2022	10:54	22.0	20.9	0.0	0.0
A3-025-SVMP	Outside	3/23/2022	10:42	34.0	20.3	0.0	0.0
A3-025-SVMP	Outside	3/30/2022	11:23	13.0	20.9	0.0	3.0
A3-025-SVMP	Outside	4/6/2022	10:43	17.0	20.9	0.0	0.0
A3-025-SVMP	Outside	4/13/2022	10:17	15.0	20.9	0.0	0.0
A3-025-SVMP	Outside	4/20/2022	10:09	16.0	20.9	0.0	0.0
A3-025-SVMP	Outside	4/27/2022	9:59	17.0	20.9	0.0	0.0
A3-025-SVMP	Outside	5/4/2022	9:20	42.0	20.1	0.0	0.0
A3-025-SVMP	Outside	5/9/2022	9:59	71.0	20.4	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-025-SVMP	Outside	5/16/2022	10:32	30.0	20.1	0.0	3.0
A3-025-SVMP	Outside	5/23/2022	10:35	25.0	20.9	0.0	0.0
A3-025-SVMP	Outside	5/31/2022	12:23	18.0	19.9	0.0	0.0
A3-025-SVMP	Outside	6/6/2022	10:54	26.0	20.3	0.0	0.0
A3-025-SVMP	Outside	6/13/2022	11:16	19.0	20.9	0.0	0.0
A3-025-SVMP	Outside	6/20/2022	10:23	21.0	20.9	0.0	0.0
A3-025-SVMP	Outside	7/11/2022	10:27	14.0	20.4	0.0	1.0
A3-025-SVMP	Outside	8/8/2022	10:19	14.0	20.2	0.0	0.0
A3-025-SVMP	Outside	9/12/2022	10:52	0.0	20.5	0.0	4.0
A3-025-SVMP	Outside	11/7/2022	14:39	2.0	20.0	0.0	0.0
A3-025-SVMP	Outside	11/14/2022	12:06	7.9	20.3	0.0	0.0
A3-025-SVMP	Outside	11/21/2022	14:30	7.0	20.3	0.0	0.0
A3-025-SVMP	Outside	11/28/2022	12:16	1.1	20.2	0.0	0.0
A3-025-SVMP	Outside	12/19/2022	12:02	14.1	20.3	0.0	0.0
A3-025-SVMP	Outside	12/27/2022	14:17	3.1	20.9	0.0	0.0
A3-025-SVMP	Outside	1/9/2023	10:44	0.0	20.9	0.0	0.0
A3-075-SVMP	Outside	12/22/2021	12:30	12.2	20.9	0.0	NF
A3-075-SVMP	Outside	12/23/2021	12:39	9.3	20.9	0.0	3.0
A3-075-SVMP	Outside	12/24/2021	10:38	NF	NF	NF	NF
A3-075-SVMP	Outside	12/27/2021	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	12/29/2021	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	12/30/2021	8:23	NM	NM	NM	NM
A3-075-SVMP	Outside	12/31/2021	NR	NM	NM	NM	NM
A3-075-SVMP	Outside	1/6/2022	NR	NM	NM	NM	NM
A3-075-SVMP	Outside	1/12/2022	NR	NM	NM	NM	NM
A3-075-SVMP	Outside	1/19/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	1/26/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	2/2/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	2/9/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	2/18/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	2/23/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	3/2/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	3/16/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	3/23/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	3/30/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	4/6/2022	NR	NM	NM	NM	NM
A3-075-SVMP	Outside	4/13/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	4/20/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	4/27/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	5/4/2022	NR	NM	NM	NM	NM
A3-075-SVMP	Outside	5/9/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	5/16/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	5/23/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	5/31/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	6/6/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	6/13/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	6/20/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	7/11/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	8/8/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	9/12/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	11/7/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	11/14/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	11/21/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	11/28/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	12/19/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	12/27/2022	NR	NF	NF	NF	NF
A3-075-SVMP	Outside	1/9/2023	NR	NF	NF	NF	NF
A3-100-SVMP	Inside	12/16/2021	11:12	39.1	NM	NM	NM
A3-100-SVMP	Inside	12/20/2021	16:20	67.3	NM	NM	NM

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-100-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-100-SVMP	Outside	12/22/2021	12:25	92.2	20.3	0.0	5.0
A3-100-SVMP	Outside	12/23/2021	12:35	382.2	20.3	0.0	6.0
A3-100-SVMP	Outside	12/24/2021	10:34	487.4	20.9	0.0	7.0
A3-100-SVMP	Outside	12/27/2021	12:00	263.9	20.9	0.0	6.0
A3-100-SVMP	Outside	12/29/2021	8:22	53.6	20.8	0.0	0.0
A3-100-SVMP	Outside	12/30/2021	8:25	50.1	20.4	0.0	0.0
A3-100-SVMP	Outside	12/31/2021	9:31	678.8	20.3	0.0	0.0
A3-100-SVMP	Outside	1/6/2022	10:07	618.2	20.3	0.0	0.0
A3-100-SVMP	Outside	1/12/2022	10:47	416.3	20.9	0.0	0.0
A3-100-SVMP	Outside	1/19/2022	12:00	438.5	20.2	0.0	3.0
A3-100-SVMP	Outside	1/26/2022	10:32	624.0	19.9	0.0	0.0
A3-100-SVMP	Outside	2/2/2022	10:59	673.0	19.3	0.0	0.0
A3-100-SVMP	Outside	2/9/2022	10:14	474.0	19.1	0.0	0.0
A3-100-SVMP	Outside	2/18/2022	10:33	254.0	19.2	0.0	0.0
A3-100-SVMP	Outside	2/23/2022	10:40	362.0	19.0	0.0	0.0
A3-100-SVMP	Outside	3/2/2022	10:02	437.0	19.3	0.0	0.0
A3-100-SVMP	Outside	3/16/2022	10:48	238.0	19.8	0.0	0.0
A3-100-SVMP	Outside	3/23/2022	10:32	158.0	19.9	0.0	0.0
A3-100-SVMP	Outside	3/30/2022	11:15	173.0	19.3	0.0	5.0
A3-100-SVMP	Outside	4/6/2022	10:36	171.0	19.4	0.0	0.0
A3-100-SVMP	Outside	4/13/2022	10:10	162.0	19.5	0.0	0.0
A3-100-SVMP	Outside	4/20/2022	10:04	146.0	18.5	0.0	0.0
A3-100-SVMP	Outside	4/27/2022	9:53	151.0	19.4	0.0	0.0
A3-100-SVMP	Outside	5/4/2022	13:27	157.0	19.8	0.0	0.0
A3-100-SVMP	Outside	5/9/2022	9:52	300.0	20.3	0.0	0.0
A3-100-SVMP	Outside	5/16/2022	10:22	158.0	19.8	0.0	4.0
A3-100-SVMP	Outside	5/23/2022	10:27	155.0	20.9	0.0	0.0
A3-100-SVMP	Outside	5/31/2022	12:13	124.0	19.9	0.0	0.0
A3-100-SVMP	Outside	6/6/2022	10:48	206.0	20.0	0.0	0.0
A3-100-SVMP	Outside	6/13/2022	11:00	160.0	20.4	0.0	0.0
A3-100-SVMP	Outside	6/20/2022	10:15	190.0	20.6	0.0	0.0
A3-100-SVMP	Outside	7/11/2022	10:18	437.0	20.2	0.0	2.0
A3-100-SVMP	Outside	8/8/2022	10:08	504.0	20.2	0.0	0.0
A3-100-SVMP	Outside	9/12/2022	10:29	406.0	20.0	0.0	4.0
A3-100-SVMP	Outside	11/7/2022	14:30	202.0	20.2	0.0	0.0
A3-100-SVMP	Outside	11/14/2022	11:52	193.4	20.4	0.0	0.0
A3-100-SVMP	Outside	11/21/2022	14:23	175.9	20.4	0.0	0.0
A3-100-SVMP	Outside	11/28/2022	12:06	155.3	20.4	0.0	0.0
A3-100-SVMP	Outside	12/19/2022	11:48	136.0	20.5	0.0	0.0
A3-100-SVMP	Outside	12/27/2022	14:09	73.3	20.9	0.0	0.0
A3-100-SVMP	Outside	1/9/2023	10:35	30.7	20.5	0.0	0.0
A3-125-SVMP	Outside	12/22/2021	12:07	15.6	19.7	0.0	3.0
A3-125-SVMP	Outside	12/23/2021	12:30	8.5	20.2	0.0	3.0
A3-125-SVMP	Outside	12/24/2021	10:30	NF	NF	NF	NF
A3-125-SVMP	Outside	12/27/2021	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	12/29/2021	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	12/30/2021	8:26	NM	NM	NM	NM
A3-125-SVMP	Outside	12/31/2021	9:30	NM	NM	NM	NM
A3-125-SVMP	Outside	1/6/2022	NR	NM	NM	NM	NM
A3-125-SVMP	Outside	1/12/2022	NR	NM	NM	NM	NM
A3-125-SVMP	Outside	1/19/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	1/26/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	2/2/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	2/9/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	2/18/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	2/23/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	3/2/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	3/16/2022	NR	NF	NF	NF	NF

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-125-SVMP	Outside	3/23/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	3/30/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	4/6/2022	NR	NM	NM	NM	NM
A3-125-SVMP	Outside	4/13/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	4/20/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	4/27/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	5/4/2022	NR	NM	NM	NM	NM
A3-125-SVMP	Outside	5/9/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	5/16/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	5/23/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	5/31/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	6/6/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	6/13/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	6/20/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	7/11/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	8/8/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	9/12/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	11/7/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	11/14/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	11/21/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	11/28/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	12/19/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	12/27/2022	NR	NF	NF	NF	NF
A3-125-SVMP	Outside	1/9/2023	NR	NF	NF	NF	NF
A3-150-SVMP	Inside	12/16/2021	11:04	42.8	NM	NM	NM
A3-150-SVMP	Inside	12/20/2021	16:27	95.7	NM	NM	NM
A3-150-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-175-SVMP	Outside	12/22/2021	11:55	35.7	20.9	0.0	3.0
A3-175-SVMP	Outside	12/23/2021	10:29	111.6	20.9	0.0	4.0
A3-175-SVMP	Outside	12/24/2021	10:22	70.5	20.9	0.0	5.0
A3-175-SVMP	Outside	12/27/2021	11:30	49.2	20.9	0.0	4.0
A3-175-SVMP	Outside	12/29/2021	8:21	13.2	20.9	0.0	0.0
A3-175-SVMP	Outside	12/30/2021	8:27	10.7	20.9	0.0	0.0
A3-175-SVMP	Inside	12/31/2021	9:20	114.1	20.9	0.0	0.0
A3-175-SVMP	Inside	1/6/2022	9:59	358.3	20.9	0.0	0.0
A3-175-SVMP	Inside	1/12/2022	10:40	74.0	20.9	0.0	0.0
A3-175-SVMP	Outside	1/19/2022	11:44	88.7	20.9	0.0	0.0
A3-175-SVMP	Inside	1/26/2022	10:23	93.0	20.9	0.0	0.0
A3-175-SVMP	Outside	2/2/2022	10:47	109.0	20.4	0.0	0.0
A3-175-SVMP	Outside	2/9/2022	10:07	85.0	20.9	0.0	0.0
A3-175-SVMP	Outside	2/18/2022	10:28	21.0	20.9	0.0	0.0
A3-175-SVMP	Outside	2/23/2022	10:33	22.0	20.5	0.0	0.0
A3-175-SVMP	Outside	3/2/2022	9:55	53.0	20.9	0.0	0.0
A3-175-SVMP	Outside	3/16/2022	10:41	56.0	20.9	0.0	0.0
A3-175-SVMP	Outside	3/23/2022	10:24	27.0	20.9	0.0	0.0
A3-175-SVMP	Outside	3/30/2022	11:03	46.0	20.5	0.0	0.0
A3-175-SVMP	Outside	4/6/2022	10:30	14.0	20.9	0.0	0.0
A3-175-SVMP	Outside	4/13/2022	10:04	13.0	20.9	0.0	0.0
A3-175-SVMP	Outside	4/20/2022	9:56	17.0	20.5	0.0	0.0
A3-175-SVMP	Outside	4/27/2022	9:45	18.0	20.9	0.0	0.0
A3-175-SVMP	Outside	5/4/2022	13:21	12.0	20.9	0.0	0.0
A3-175-SVMP	Outside	5/9/2022	9:45	18.0	20.9	0.0	0.0
A3-175-SVMP	Outside	5/16/2022	10:15	3.0	20.9	0.0	0.0
A3-175-SVMP	Outside	5/23/2022	10:21	3.0	20.9	0.0	0.0
A3-175-SVMP	Outside	5/31/2022	12:06	2.0	20.9	0.0	0.0
A3-175-SVMP	Outside	6/6/2022	10:40	6.0	20.9	0.0	0.0
A3-175-SVMP	Outside	6/13/2022	10:42	5.0	20.9	0.0	0.0
A3-175-SVMP	Outside	6/20/2022	10:03	6.0	20.9	0.0	0.0
A3-175-SVMP	Outside	7/11/2022	10:10	0.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-175-SVMP	Outside	8/8/2022	9:59	0.0	20.9	0.0	0.0
A3-175-SVMP	Outside	9/12/2022	10:23	0.0	20.9	0.0	0.0
A3-175-SVMP	Outside	11/7/2022	14:23	0.0	20.9	0.0	0.0
A3-175-SVMP	Outside	11/14/2022	11:43	4.1	20.9	0.0	0.0
A3-175-SVMP	Outside	11/21/2022	14:17	5.8	20.9	0.0	0.0
A3-175-SVMP	Outside	11/28/2022	11:50	0.0	20.9	0.0	0.0
A3-175-SVMP	Outside	12/19/2022	11:35	5.9	20.9	0.0	0.0
A3-175-SVMP	Outside	12/27/2022	14:04	4.5	20.9	0.0	0.0
A3-175-SVMP	Outside	1/9/2023	10:28	0.0	20.9	0.0	0.0
A3-200-SVMP	Inside	12/16/2021	10:49	52.3	NM	NM	NM
A3-200-SVMP	Inside	12/20/2021	NR	87.9	NM	NM	NM
A3-200-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-225-SVMP	Outside	12/22/2021	10:15	7.0	20.9	0.0	MNA
A3-225-SVMP	Outside	12/23/2021	10:03	4.1	20.9	0.0	0.0
A3-225-SVMP	Outside	12/24/2021	9:04	NM	NM	NM	NM
A3-225-SVMP	Outside	12/27/2021	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	12/29/2021	8:20	NM	NM	NM	NM
A3-225-SVMP	Outside	12/30/2021	8:37	NM	NM	NM	NM
A3-225-SVMP	Outside	12/31/2021	NR	NM	NM	NM	NM
A3-225-SVMP	Outside	1/6/2022	NR	NM	NM	NM	NM
A3-225-SVMP	Outside	1/12/2022	NR	NM	NM	NM	NM
A3-225-SVMP	Outside	1/19/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	1/26/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	2/2/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	2/9/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	2/18/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	2/23/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	3/2/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	3/16/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	3/23/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	3/30/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	4/6/2022	NR	NM	NM	NM	NM
A3-225-SVMP	Outside	4/13/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	4/20/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	4/27/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	5/4/2022	NR	NM	NM	NM	NM
A3-225-SVMP	Outside	5/9/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	5/16/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	5/23/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	5/31/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	6/6/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	6/13/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	6/20/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	7/11/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	8/8/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	9/12/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	11/7/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	11/14/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	11/21/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	11/28/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	12/19/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	12/27/2022	NR	NF	NF	NF	NF
A3-225-SVMP	Outside	1/9/2023	NR	NF	NF	NF	NF
A3-250-SVMP	Inside	12/16/2021	10:40	100.8	NM	NM	NM
A3-250-SVMP	Inside	12/20/2021	16:45	178.4	NM	NM	NM
A3-250-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-250-SVMP	Outside	12/22/2021	10:08	30.5	20.9	0.0	NM
A3-250-SVMP	Outside	12/23/2021	9:54	102.5	20.9	0.0	0.0
A3-250-SVMP	Outside	12/24/2021	9:00	97.4	20.9	0.0	4.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-250-SVMP	Outside	12/27/2021	10:15	36.3	20.9	0.0	0.0
A3-250-SVMP	Outside	12/29/2021	8:20	20.9	20.9	0.0	0.0
A3-250-SVMP	Outside	12/30/2021	8:37	23.9	20.9	0.0	0.0
A3-250-SVMP	Outside	12/31/2021	8:41	227.8	20.9	0.0	0.0
A3-250-SVMP	Outside	1/6/2022	9:25	196.4	20.9	0.0	0.0
A3-250-SVMP	Outside	1/12/2022	9:39	173.8	20.9	0.0	0.0
A3-250-SVMP	Outside	1/19/2022	11:34	159.7	20.9	0.0	0.0
A3-250-SVMP	Outside	1/26/2022	9:33	151.0	20.9	0.0	0.0
A3-250-SVMP	Outside	2/2/2022	9:56	152.0	20.9	0.0	0.0
A3-250-SVMP	Outside	2/9/2022	9:18	151.0	20.9	0.0	0.0
A3-250-SVMP	Outside	2/18/2022	9:46	49.0	20.9	0.0	0.0
A3-250-SVMP	Outside	2/23/2022	9:41	68.0	20.9	0.0	0.0
A3-250-SVMP	Outside	3/2/2022	9:10	113.0	20.9	0.0	0.0
A3-250-SVMP	Outside	3/16/2022	9:35	63.0	20.9	0.0	0.0
A3-250-SVMP	Outside	3/23/2022	9:22	53.0	20.9	0.0	0.0
A3-250-SVMP	Outside	3/30/2022	9:54	53.0	20.9	0.0	0.0
A3-250-SVMP	Outside	4/6/2022	9:40	59.0	20.9	0.0	0.0
A3-250-SVMP	Outside	4/13/2022	9:13	50.0	20.9	0.0	0.0
A3-250-SVMP	Outside	4/20/2022	9:10	41.0	20.9	0.0	0.0
A3-250-SVMP	Outside	4/27/2022	8:56	44.0	20.9	0.0	0.0
A3-250-SVMP	Outside	5/4/2022	12:38	35.0	20.9	0.0	0.0
A3-250-SVMP	Outside	5/9/2022	8:59	56.0	20.9	0.0	0.0
A3-250-SVMP	Outside	5/16/2022	9:06	25.0	20.9	0.0	0.0
A3-250-SVMP	Outside	5/23/2022	9:31	23.0	20.9	0.0	0.0
A3-250-SVMP	Outside	5/31/2022	10:54	17.0	20.9	0.0	0.0
A3-250-SVMP	Outside	6/6/2022	10:29	19.0	20.9	0.0	0.0
A3-250-SVMP	Outside	6/13/2022	9:23	18.0	20.9	0.0	0.0
A3-250-SVMP	Outside	6/20/2022	9:04	14.0	20.9	0.0	0.0
A3-250-SVMP	Outside	7/11/2022	9:08	20.0	20.9	0.0	0.0
A3-250-SVMP	Outside	8/8/2022	9:00	24.0	20.9	0.0	0.0
A3-250-SVMP	Outside	9/12/2022	9:25	53.0	20.9	0.0	0.0
A3-250-SVMP	Outside	11/7/2022	13:28	26.0	20.9	0.0	0.0
A3-250-SVMP	Outside	11/14/2022	10:41	18.7	20.9	0.0	0.0
A3-250-SVMP	Outside	11/21/2022	12:32	14.5	20.9	0.0	0.0
A3-250-SVMP	Outside	11/28/2022	10:42	9.7	20.9	0.0	0.0
A3-250-SVMP	Outside	12/19/2022	10:06	10.2	20.9	0.0	0.0
A3-250-SVMP	Outside	12/27/2022	13:20	8.9	20.9	0.0	0.0
A3-250-SVMP	Outside	1/9/2023	9:39	14.4	20.9	0.0	0.0
A3-275-SVMP	Outside	12/22/2021	9:51	49.7	20.9	0.0	NM
A3-275-SVMP	Outside	12/23/2021	9:45	121.1	20.9	0.0	0.0
A3-275-SVMP	Outside	12/24/2021	8:59	408.2	20.9	0.0	5.0
A3-275-SVMP	Outside	12/27/2021	10:09	61.9	20.9	0.0	0.0
A3-275-SVMP	Outside	12/29/2021	8:20	30.2	20.9	0.0	0.0
A3-275-SVMP	Outside	12/30/2021	8:38	32.6	20.9	0.0	0.0
A3-275-SVMP	Outside	12/31/2021	8:38	307.5	20.9	0.0	0.0
A3-275-SVMP	Outside	1/6/2022	9:23	370.1	20.3	0.0	0.0
A3-275-SVMP	Outside	1/12/2022	9:37	338.1	20.9	0.0	0.0
A3-275-SVMP	Outside	1/19/2022	11:30	276.9	21.1	0.0	0.0
A3-275-SVMP	Outside	1/26/2022	9:29	291.0	20.9	0.0	0.0
A3-275-SVMP	Outside	2/2/2022	9:52	365.0	20.9	0.0	0.0
A3-275-SVMP	Outside	2/9/2022	9:16	268.0	20.9	0.0	0.0
A3-275-SVMP	Outside	2/18/2022	9:45	69.0	20.9	0.0	0.0
A3-275-SVMP	Outside	2/23/2022	9:38	113.0	20.9	0.0	0.0
A3-275-SVMP	Outside	3/2/2022	9:07	147.0	20.9	0.0	0.0
A3-275-SVMP	Outside	3/16/2022	9:33	145.0	20.9	0.0	0.0
A3-275-SVMP	Outside	3/23/2022	9:15	112.0	20.9	0.0	0.0
A3-275-SVMP	Outside	3/30/2022	9:51	78.0	20.9	0.0	0.0
A3-275-SVMP	Outside	4/6/2022	9:38	96.0	20.9	0.0	0.0
A3-275-SVMP	Outside	4/13/2022	9:11	86.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-275-SVMP	Outside	4/20/2022	9:07	68.0	20.9	0.0	0.0
A3-275-SVMP	Outside	4/27/2022	8:54	76.0	20.9	0.0	0.0
A3-275-SVMP	Outside	5/4/2022	12:36	47.0	20.9	0.0	0.0
A3-275-SVMP	Outside	5/9/2022	8:58	75.0	20.9	0.0	0.0
A3-275-SVMP	Outside	5/16/2022	9:03	35.0	20.9	0.0	0.0
A3-275-SVMP	Outside	5/23/2022	9:28	31.0	20.9	0.0	0.0
A3-275-SVMP	Outside	5/31/2022	10:49	22.0	20.9	0.0	0.0
A3-275-SVMP	Outside	6/6/2022	10:27	24.0	20.9	0.0	0.0
A3-275-SVMP	Outside	6/13/2022	9:16	23.0	20.9	0.0	0.0
A3-275-SVMP	Outside	6/20/2022	9:01	17.0	20.9	0.0	0.0
A3-275-SVMP	Outside	7/11/2022	9:05	23.0	20.9	0.0	0.0
A3-275-SVMP	Outside	8/8/2022	8:57	24.0	20.9	0.0	0.0
A3-275-SVMP	Outside	9/12/2022	9:22	9.0	20.9	0.0	0.0
A3-275-SVMP	Outside	11/7/2022	13:25	222.0	20.9	0.0	0.0
A3-275-SVMP	Outside	11/14/2022	10:36	209.9	20.9	0.0	0.0
A3-275-SVMP	Outside	11/21/2022	12:29	156.0	20.9	0.0	0.0
A3-275-SVMP	Outside	11/28/2022	10:39	99.6	20.9	0.0	0.0
A3-275-SVMP	Outside	12/15/2022	15:10	155.0	20.8	0.1	0.0
A3-275-SVMP	Outside	12/19/2022	10:02	123.7	20.9	0.0	0.0
A3-275-SVMP	Outside	12/27/2022	12:06	112.5	20.9	0.0	0.0
A3-275-SVMP	Outside	1/9/2023	9:36	95.2	20.9	0.0	0.0
A3-275-SVMP	Outside	1/17/2023	9:17	50.7	20.5	0.1	0.0
A3-300-SVMP	Inside	12/16/2021	10:30	66.9	NM	NM	NM
A3-300-SVMP	Inside	12/20/2021	16:54	234.5	NF	NF	NF
A3-300-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-325-SVMP	Outside	12/22/2021	9:30	48.6	20.9	0.0	NM
A3-325-SVMP	Outside	12/23/2021	9:16	162.9	20.9	0.0	0.0
A3-325-SVMP	Outside	12/24/2021	8:50	139.1	20.9	0.0	4.0
A3-325-SVMP	Outside	12/27/2021	9:43	58.2	20.9	0.0	0.0
A3-325-SVMP	Outside	12/29/2021	8:18	32.3	20.9	0.0	0.0
A3-325-SVMP	Outside	12/30/2021	8:40	36.3	20.9	0.0	0.0
A3-325-SVMP	Outside	12/31/2021	8:31	377.4	20.9	0.0	0.0
A3-325-SVMP	Outside	1/6/2022	9:12	398.7	20.9	0.0	0.0
A3-325-SVMP	Outside	1/12/2022	9:28	327.9	20.9	0.0	0.0
A3-325-SVMP	Outside	1/19/2022	11:08	337.6	21.1	0.0	0.0
A3-325-SVMP	Outside	1/26/2022	9:21	339.0	20.9	0.0	0.0
A3-325-SVMP	Outside	2/2/2022	9:44	374.0	20.9	0.0	0.0
A3-325-SVMP	Outside	2/9/2022	9:10	312.0	20.9	0.0	0.0
A3-325-SVMP	Outside	2/18/2022	9:39	80.0	20.9	0.0	0.0
A3-325-SVMP	Outside	2/23/2022	9:33	138.0	20.9	0.0	0.0
A3-325-SVMP	Outside	3/2/2022	9:00	219.0	20.9	0.0	0.0
A3-325-SVMP	Outside	3/16/2022	9:24	115.0	20.9	0.0	0.0
A3-325-SVMP	Outside	3/23/2022	9:06	114.0	20.9	0.0	0.0
A3-325-SVMP	Outside	3/30/2022	9:42	114.0	20.9	0.0	0.0
A3-325-SVMP	Outside	4/6/2022	9:32	121.0	20.9	0.0	0.0
A3-325-SVMP	Outside	4/13/2022	9:04	121.0	20.9	0.0	0.0
A3-325-SVMP	Outside	4/20/2022	9:01	103.0	20.9	0.0	0.0
A3-325-SVMP	Outside	4/27/2022	8:47	92.0	20.9	0.0	0.0
A3-325-SVMP	Outside	5/4/2022	12:31	90.0	20.9	0.0	0.0
A3-325-SVMP	Outside	5/9/2022	8:52	156.0	20.9	0.0	0.0
A3-325-SVMP	Outside	5/16/2022	8:57	77.0	20.9	0.0	0.0
A3-325-SVMP	Outside	5/23/2022	9:22	70.0	20.9	0.0	0.0
A3-325-SVMP	Outside	5/31/2022	10:39	63.0	20.9	0.0	0.0
A3-325-SVMP	Outside	6/6/2022	10:20	77.0	20.9	0.0	0.0
A3-325-SVMP	Outside	6/13/2022	9:05	79.0	20.9	0.0	0.0
A3-325-SVMP	Outside	6/20/2022	8:50	61.0	20.9	0.0	0.0
A3-325-SVMP	Outside	7/11/2022	8:58	134.0	20.9	0.0	0.0
A3-325-SVMP	Outside	8/8/2022	8:49	166.0	20.9	0.0	0.0
A3-325-SVMP	Outside	9/12/2022	9:14	78.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-325-SVMP	Outside	11/7/2022	13:18	69.0	20.9	0.0	0.0
A3-325-SVMP	Outside	11/14/2022	10:27	81.2	20.9	0.0	0.0
A3-325-SVMP	Outside	11/21/2022	12:07	39.3	20.9	0.0	0.0
A3-325-SVMP	Outside	11/28/2022	10:25	40.1	20.9	0.0	0.0
A3-325-SVMP	Outside	12/19/2022	9:51	36.7	20.9	0.0	0.0
A3-325-SVMP	Outside	12/27/2022	11:53	29.9	20.9	0.0	0.0
A3-325-SVMP	Outside	1/9/2023	9:22	25.5	20.9	0.0	0.0
A3-375-05.0-SVMP	Inside	3/16/2022	9:13	124.0	20.5	0.0	0.0
A3-375-05.0-SVMP	Inside	3/23/2022	8:59	106.0	20.2	0.0	0.0
A3-375-05.0-SVMP	Inside	3/30/2022	9:27	123.0	20.4	0.0	0.0
A3-375-05.0-SVMP	Inside	4/6/2022	13:07	117.0	20.3	0.0	0.0
A3-375-05.0-SVMP	Inside	4/13/2022	8:54	100.0	20.9	0.0	0.0
A3-375-05.0-SVMP	Inside	4/20/2022	8:53	108.0	20.0	0.0	0.0
A3-375-05.0-SVMP	Inside	4/27/2022	8:39	113.0	20.3	0.0	0.0
A3-375-05.0-SVMP	Inside	5/4/2022	12:23	107.0	20.2	0.0	0.0
A3-375-05.0-SVMP	Inside	5/9/2022	8:49	189.0	20.5	0.0	0.0
A3-375-05.0-SVMP	Inside	5/16/2022	8:48	95.0	20.2	0.0	0.0
A3-375-05.0-SVMP	Inside	5/23/2022	9:15	92.0	20.9	0.0	0.0
A3-375-05.0-SVMP	Inside	5/31/2022	10:21	83.0	20.9	0.0	0.0
A3-375-05.0-SVMP	Inside	6/6/2022	10:07	47.0	20.2	0.0	0.0
A3-375-05.0-SVMP	Inside	6/13/2022	8:48	81.0	20.9	0.0	0.0
A3-375-05.0-SVMP	Inside	6/20/2022	8:38	89.0	20.5	0.0	0.0
A3-375-05.0-SVMP	Inside	7/11/2022	8:50	210.0	20.4	0.0	1.0
A3-375-05.0-SVMP	Inside	8/8/2022	8:40	320.0	20.6	0.0	0.0
A3-375-05.0-SVMP	Inside	9/12/2022	NR	NM	NM	NM	NM
A3-375-05.0-SVMP	Inside	11/7/2022	13:04	NM	NM	NM	NM
A3-375-05.0-SVMP	Inside	11/14/2022	10:19	77.7	19.6	0.0	0.0
A3-375-05.0-SVMP	Inside	11/21/2022	11:20	26.2	20.0	0.0	0.0
A3-375-05.0-SVMP	Inside	11/28/2022	10:12	22.2	19.9	0.0	0.0
A3-375-05.0-SVMP	Inside	12/16/2022	10:42	34.1	20.0	0.5	0.0
A3-375-05.0-SVMP	Inside	12/19/2022	9:38	22.1	19.9	0.0	0.0
A3-375-05.0-SVMP	Inside	12/27/2022	11:18	19.1	20.9	0.0	0.0
A3-375-05.0-SVMP	Inside	1/9/2023	9:10	7.5	19.8	0.0	0.0
A3-375-05.0-SVMP	Inside	1/16/2023	13:05	6.3	20.2	0.4	0.0
A3-375-SVMP	Inside	12/22/2021	8:56	95.6	20.3	0.0	NM
A3-375-SVMP	Inside	12/23/2021	8:49	406.7	20.3	0.0	5.0
A3-375-SVMP	Inside	12/24/2021	8:30	450.0	20.3	0.0	6.0
A3-375-SVMP	Inside	12/27/2021	9:07	442.9	20.9	0.0	5.0
A3-375-SVMP	Inside	12/29/2021	8:08	51.1	20.4	0.0	0.0
A3-375-SVMP	Inside	12/30/2021	8:44	53.7	20.4	0.0	0.0
A3-375-SVMP	Inside	12/31/2021	8:20	443.5	20.4	0.0	0.0
A3-375-SVMP	Inside	1/6/2022	9:05	410.0	20.4	0.0	0.0
A3-375-SVMP	Inside	1/12/2022	9:17	395.5	20.9	0.0	0.0
A3-375-SVMP	Inside	1/19/2022	10:39	408.3	20.4	0.0	0.0
A3-375-SVMP	Inside	1/26/2022	9:11	416.0	20.5	0.0	0.0
A3-375-SVMP	Inside	2/2/2022	9:32	399.0	20.3	0.0	0.0
A3-375-SVMP	Inside	2/9/2022	9:03	397.0	20.2	0.0	0.0
A3-375-SVMP	Inside	2/18/2022	9:37	91.0	20.4	0.0	0.0
A3-375-SVMP	Inside	2/23/2022	9:24	152.0	20.9	0.0	0.0
A3-375-SVMP	Inside	3/2/2022	8:53	248.0	20.4	0.0	0.0
A3-375-SVMP	Inside	3/16/2022	9:09	79.0	20.9	0.0	0.0
A3-375-SVMP	Inside	3/23/2022	8:53	59.0	20.4	0.0	0.0
A3-375-SVMP	Inside	3/30/2022	9:25	57.0	20.5	0.0	0.0
A3-375-SVMP	Inside	4/6/2022	9:26	51.0	20.5	0.0	0.0
A3-375-SVMP	Inside	4/13/2022	8:52	66.0	20.9	0.0	0.0
A3-375-SVMP	Inside	4/20/2022	8:50	52.0	20.3	0.0	0.0
A3-375-SVMP	Inside	4/27/2022	8:36	56.0	20.5	0.0	0.0
A3-375-SVMP	Inside	5/4/2022	12:20	69.0	20.9	0.0	0.0
A3-375-SVMP	Inside	5/9/2022	8:48	129.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-375-SVMP	Inside	5/16/2022	8:45	66.0	20.9	0.0	0.0
A3-375-SVMP	Inside	5/23/2022	9:11	71.0	20.9	0.0	0.0
A3-375-SVMP	Inside	5/31/2022	10:19	70.0	20.9	0.0	0.0
A3-375-SVMP	Inside	6/6/2022	10:02	34.0	20.9	0.0	0.0
A3-375-SVMP	Inside	6/13/2022	8:43	53.0	20.9	0.0	0.0
A3-375-SVMP	Inside	6/20/2022	8:33	85.0	20.9	0.0	0.0
A3-375-SVMP	Inside	7/11/2022	8:46	176.0	20.8	0.0	1.0
A3-375-SVMP	Inside	8/8/2022	8:37	300.0	20.9	0.0	0.0
A3-375-SVMP	Inside	9/12/2022	9:04	137.0	20.9	0.0	0.0
A3-375-SVMP	Inside	11/7/2022	13:02	82.0	20.9	0.0	0.0
A3-375-SVMP	Inside	11/14/2022	10:16	88.9	20.9	0.0	0.0
A3-375-SVMP	Inside	11/21/2022	11:16	54.5	20.9	0.0	0.0
A3-375-SVMP	Inside	11/28/2022	10:08	52.1	20.9	0.0	0.0
A3-375-SVMP	Inside	12/16/2022	9:47	116.1	20.2	0.1	0.0
A3-375-SVMP	Inside	12/19/2022	9:31	68.1	20.9	0.0	0.0
A3-375-SVMP	Inside	12/27/2022	11:25	36.5	20.9	0.0	0.0
A3-375-SVMP	Inside	1/9/2023	9:09	14.9	20.9	0.0	0.0
A3-375-SVMP	Inside	1/16/2023	13:24	20.0	21.1	0.1	0.0
A3-400-SVMP	Inside	12/17/2021	10:06	55.2	NM	NM	NM
A3-400-SVMP	Inside	12/20/2021	NR	243.6	NM	NM	NM
A3-400-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-400-SVMP	Inside	12/22/2021	8:32	2.8	20.5	0.0	NM
A3-400-SVMP	Inside	12/23/2021	8:40	24.1	20.5	0.0	0.0
A3-400-SVMP	Inside	12/24/2021	8:26	17.3	20.5	0.0	0.0
A3-400-SVMP	Inside	12/27/2021	8:48	19.2	20.3	0.0	0.0
A3-400-SVMP	Inside	12/29/2021	8:06	MNA	20.4	0.0	0.0
A3-400-SVMP	Inside	12/30/2021	8:44	0.7	20.4	0.0	0.0
A3-400-SVMP	Inside	12/31/2021	8:17	14.3	20.9	0.0	0.0
A3-400-SVMP	Inside	1/6/2022	9:01	7.5	20.9	0.0	0.0
A3-400-SVMP	Inside	1/12/2022	9:09	0.5	20.9	0.0	0.0
A3-400-SVMP	Inside	1/19/2022	10:42	68.6	20.9	0.0	0.0
A3-400-SVMP	Inside	1/26/2022	9:06	3.0	20.9	0.0	0.0
A3-400-SVMP	Inside	2/2/2022	9:26	1.0	20.5	0.0	0.0
A3-400-SVMP	Inside	2/9/2022	8:59	1.0	20.3	0.0	0.0
A3-400-SVMP	Inside	2/18/2022	9:30	1.0	20.4	0.0	0.0
A3-400-SVMP	Inside	2/23/2022	9:18	1.0	20.9	0.0	0.0
A3-400-SVMP	Inside	3/2/2022	8:50	2.0	20.3	0.0	0.0
A3-400-SVMP	Inside	3/16/2022	9:06	1.0	20.9	0.0	0.0
A3-400-SVMP	Inside	3/23/2022	8:52	1.0	20.9	0.0	0.0
A3-400-SVMP	Inside	3/30/2022	9:20	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	4/6/2022	9:23	1.0	20.4	0.0	0.0
A3-400-SVMP	Inside	4/13/2022	8:49	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	4/20/2022	8:48	1.0	20.3	0.0	0.0
A3-400-SVMP	Inside	4/27/2022	8:33	0.0	20.5	0.0	0.0
A3-400-SVMP	Inside	5/4/2022	12:16	1.0	20.5	0.0	0.0
A3-400-SVMP	Inside	5/9/2022	8:47	2.0	20.9	0.0	0.0
A3-400-SVMP	Inside	5/16/2022	8:43	0.0	20.5	0.0	0.0
A3-400-SVMP	Inside	5/23/2022	9:08	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	5/31/2022	10:17	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	6/6/2022	8:35	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	6/13/2022	8:37	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	6/20/2022	8:29	1.0	20.9	0.0	0.0
A3-400-SVMP	Inside	7/11/2022	8:44	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	8/8/2022	8:34	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	9/12/2022	9:00	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	11/7/2022	13:00	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	11/14/2022	10:09	0.5	20.9	0.0	0.0
A3-400-SVMP	Inside	11/21/2022	11:13	0.5	20.9	0.0	0.0
A3-400-SVMP	Inside	11/28/2022	10:05	0.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-400-SVMP	Inside	12/19/2022	9:26	0.5	20.9	0.0	0.0
A3-400-SVMP	Inside	12/27/2022	11:15	0.0	20.9	0.0	0.0
A3-400-SVMP	Inside	1/9/2023	9:06	0.1	20.5	0.0	0.0
A3-425-SVMP	Inside	12/17/2021	9:53	20.3	NM	NM	NM
A3-425-SVMP	Inside	12/20/2021	17:23	86.4	NM	NM	NM
A3-425-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-425-SVMP	Inside	1/19/2022	10:47	55.1	20.9	0.0	0.0
A3-425-SVMP	Inside	1/26/2022	9:04	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	2/2/2022	9:23	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	2/9/2022	8:57	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	2/18/2022	9:27	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	2/23/2022	9:16	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	3/2/2022	8:47	2.0	20.9	0.0	0.0
A3-425-SVMP	Inside	3/16/2022	9:02	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	3/23/2022	8:50	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	3/30/2022	9:17	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	4/6/2022	9:21	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	4/13/2022	8:46	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	4/20/2022	8:46	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	4/27/2022	8:31	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	5/4/2022	12:14	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	5/9/2022	8:43	2.0	20.9	0.0	0.0
A3-425-SVMP	Inside	5/16/2022	8:41	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	5/23/2022	9:06	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	5/31/2022	10:14	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	6/6/2022	8:33	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	6/13/2022	8:32	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	6/20/2022	8:26	1.0	20.9	0.0	0.0
A3-425-SVMP	Inside	7/11/2022	8:42	0.0	20.8	0.0	1.0
A3-425-SVMP	Inside	8/8/2022	8:32	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	9/12/2022	8:57	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	11/7/2022	12:58	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	11/14/2022	10:06	0.5	20.9	0.0	0.0
A3-425-SVMP	Inside	11/21/2022	11:07	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	11/28/2022	10:02	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	12/19/2022	9:22	0.5	20.9	0.0	0.0
A3-425-SVMP	Inside	12/27/2022	11:11	0.0	20.9	0.0	0.0
A3-425-SVMP	Inside	1/9/2023	9:04	0.1	20.9	0.0	0.0
A3-450-SVMP	Inside	12/17/2021	9:42	2.9	NM	NM	NM
A3-450-SVMP	Inside	12/20/2021	17:30	54.3	NM	NM	NM
A3-450-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-450-SVMP	Inside	1/19/2022	11:19	51.8	20.9	0.0	0.0
A3-450-SVMP	Inside	1/26/2022	8:59	1.0	20.9	0.0	0.0
A3-450-SVMP	Inside	2/2/2022	9:18	2.0	20.4	0.0	0.0
A3-450-SVMP	Inside	2/9/2022	8:52	1.0	20.9	0.0	0.0
A3-450-SVMP	Inside	2/18/2022	9:20	1.0	20.9	0.0	0.0
A3-450-SVMP	Inside	2/23/2022	9:13	1.0	20.9	0.0	0.0
A3-450-SVMP	Inside	3/2/2022	8:45	2.0	20.5	0.0	0.0
A3-450-SVMP	Inside	3/16/2022	9:00	1.0	20.9	0.0	0.0
A3-450-SVMP	Inside	3/23/2022	8:48	1.0	20.9	0.0	0.0
A3-450-SVMP	Inside	3/30/2022	9:13	0.0	20.9	0.0	0.0
A3-450-SVMP	Inside	4/6/2022	9:18	1.0	20.5	0.0	0.0
A3-450-SVMP	Inside	4/13/2022	8:45	0.0	20.9	0.0	0.0
A3-450-SVMP	Inside	4/20/2022	8:43	1.0	20.9	0.0	0.0
A3-450-SVMP	Inside	4/27/2022	8:28	0.0	20.9	0.0	0.0
A3-450-SVMP	Inside	5/4/2022	12:12	1.0	20.4	0.0	0.0
A3-450-SVMP	Inside	5/9/2022	8:43	2.0	20.9	0.0	0.0
A3-450-SVMP	Inside	5/16/2022	8:39	0.0	20.5	0.0	0.0
A3-450-SVMP	Inside	5/23/2022	9:04	0.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3-450-SVMP	Inside	5/31/2022	10:09	0.0	20.9	0.0	0.0
A3-450-SVMP	Inside	6/6/2022	8:30	0.0	20.5	0.0	0.0
A3-450-SVMP	Inside	6/13/2022	8:16	1.0	20.9	0.0	0.0
A3-450-SVMP	Inside	6/20/2022	8:23	1.0	20.9	0.0	0.0
A3-450-SVMP	Inside	7/11/2022	8:39	0.0	20.6	0.0	1.0
A3-450-SVMP	Inside	8/8/2022	8:29	0.0	20.5	0.0	0.0
A3-450-SVMP	Inside	9/12/2022	8:54	0.0	20.9	0.0	0.0
A3-450-SVMP	Inside	11/7/2022	12:55	0.0	20.9	0.0	0.0
A3-450-SVMP	Inside	11/14/2022	10:04	0.6	20.9	0.0	0.0
A3-450-SVMP	Inside	11/21/2022	11:01	1.4	20.9	0.0	0.0
A3-450-SVMP	Inside	11/28/2022	9:59	0.0	20.5	0.0	0.0
A3-450-SVMP	Inside	12/19/2022	9:19	0.6	20.5	0.0	0.0
A3-450-SVMP	Inside	12/27/2022	11:07	0.1	20.9	0.0	0.0
A3-450-SVMP	Inside	1/9/2023	9:00	0.2	20.5	0.0	0.0
A3-475-SVMP	Inside	12/17/2021	9:29	3.5	NM	NM	NM
A3-475-SVMP	Inside	12/20/2021	17:38	55.8	NM	NM	NM
A3-475-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-500-SVMP	Inside	12/17/2021	9:05	33.2	NM	NM	NM
A3-500-SVMP	Inside	12/20/2021	17:48	96.5	NM	NM	NM
A3-500-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3-50-SVMP	Inside	12/16/2021	11:26	40.2	NM	NM	NM
A3-50-SVMP	Inside	12/20/2021	16:13	84.6	NM	NM	NM
A3-50-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3a+000-SVMP	Outside	12/16/2021	12:47	23.8	NM	NM	NM
A3a+000-SVMP	Outside	12/20/2021	NR	64.5	NM	NM	NM
A3a+000-SVMP	Outside	12/21/2021	NR	NM	NM	NM	NM
A3a+000-SVMP	Outside	12/22/2021	12:57	45.3	20.3	0.0	4.0
A3a+000-SVMP	Outside	12/23/2021	13:05	215.1	20.2	0.0	4.0
A3a+000-SVMP	Outside	12/24/2021	11:01	447.7	20.4	0.0	7.0
A3a+000-SVMP	Outside	12/27/2021	12:24	180.4	20.5	0.0	5.0
A3a+000-SVMP	Outside	12/29/2021	10:24	31.6	20.4	0.0	0.0
A3a+000-SVMP	Outside	12/30/2021	8:21	36.4	20.3	0.0	0.0
A3a+000-SVMP	Outside	12/31/2021	9:48	341.7	20.9	0.0	0.0
A3a+000-SVMP	Outside	1/6/2022	10:26	496.7	20.5	0.0	0.0
A3a+000-SVMP	Outside	1/12/2022	11:11	398.1	20.5	0.0	0.0
A3a+000-SVMP	Outside	1/19/2022	12:17	315.6	20.9	0.0	3.0
A3a+000-SVMP	Outside	1/26/2022	10:46	334.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	2/2/2022	11:46	400.0	20.2	0.0	0.0
A3a+000-SVMP	Outside	2/9/2022	10:26	293.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	2/18/2022	10:43	186.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	2/23/2022	10:43	253.0	20.5	0.0	0.0
A3a+000-SVMP	Outside	3/2/2022	10:11	307.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	3/16/2022	10:57	112.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	3/23/2022	10:44	97.0	20.4	0.0	0.0
A3a+000-SVMP	Outside	3/30/2022	12:26	62.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	4/6/2022	10:46	88.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	4/13/2022	10:21	74.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	4/20/2022	10:11	80.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	4/27/2022	10:02	78.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	5/4/2022	9:23	78.0	19.8	0.0	0.0
A3a+000-SVMP	Outside	5/9/2022	10:02	95.0	20.2	0.0	0.0
A3a+000-SVMP	Outside	5/16/2022	10:36	37.0	19.7	0.0	3.0
A3a+000-SVMP	Outside	5/23/2022	10:39	26.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	5/31/2022	12:24	12.0	19.6	0.0	0.0
A3a+000-SVMP	Outside	6/6/2022	10:57	16.0	19.9	0.0	0.0
A3a+000-SVMP	Outside	6/13/2022	11:20	6.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	6/20/2022	10:25	76.0	20.9	0.0	0.0
A3a+000-SVMP	Outside	7/11/2022	10:32	164.0	20.8	0.0	1.0
A3a+000-SVMP	Outside	8/8/2022	10:26	52.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3a+000-SVMP	Outside	9/12/2022	10:57	88.0	20.9	0.0	4.0
A3a+000-SVMP	Outside	11/7/2022	14:48	17.0	19.7	0.0	0.0
A3a+000-SVMP	Outside	11/14/2022	12:10	21.9	20.9	0.0	0.0
A3a+000-SVMP	Outside	11/21/2022	14:33	4.1	20.1	0.0	0.0
A3a+000-SVMP	Outside	11/28/2022	12:23	9.0	20.5	0.0	0.0
A3a+000-SVMP	Outside	12/19/2022	12:09	0.0	20.1	0.0	0.0
A3a+000-SVMP	Outside	12/27/2022	14:21	11.7	20.9	0.0	0.0
A3a+000-SVMP	Outside	1/9/2023	10:49	4.9	20.9	0.0	0.0
A3a+150-SVMP	Outside	12/21/2021	NR	NM	NM	NM	NM
A3a+200-SVMP	Outside	12/16/2021	14:07	56.6	NM	NM	NM
A3a+200-SVMP	Outside	12/20/2021	12:24	57.4	NM	NM	NM
A3a+200-SVMP	Outside	12/21/2021	14:36	70.7	NM	NM	NM
A3a+300-SVMP	Outside	12/16/2021	14:42	36.4	NM	NM	NM
A3a+300-SVMP	Outside	12/17/2021	14:42	36.4	NM	NM	NM
A3a+300-SVMP	Outside	12/20/2021	13:41	52.6	NM	NM	NM
A3a+300-SVMP	Outside	12/21/2021	12:46	66.4	NM	NM	NM
A3a+350-SVMP	Outside	12/16/2021	14:57	36.4	NM	NM	NM
A3a+350-SVMP	Outside	12/17/2021	14:57	36.4	NM	NM	NM
A3a+350-SVMP	Outside	12/20/2021	13:15	274.5	NM	NM	NM
A3a+350-SVMP	Outside	12/21/2021	12:26	75.6	NM	NM	NM
A3a+375-SVMP	Outside	12/22/2021	14:06	114.5	19.7	0.0	6.0
A3a+375-SVMP	Outside	12/23/2021	14:04	405.1	19.9	0.0	6.0
A3a+375-SVMP	Outside	12/24/2021	11:37	200.5	20.0	0.0	7.0
A3a+375-SVMP	Outside	12/27/2021	13:07	239.3	19.8	0.0	6.0
A3a+375-SVMP	Outside	12/29/2021	10:29	59.1	20.0	0.0	0.0
A3a+375-SVMP	Outside	12/30/2021	8:16	52.5	18.9	0.0	0.0
A3a+375-SVMP	Outside	12/31/2021	10:08	785.4	20.0	0.0	0.0
A3a+375-SVMP	Outside	1/6/2022	10:46	560.3	19.6	0.0	0.0
A3a+375-SVMP	Outside	1/12/2022	11:34	486.0	19.3	0.0	0.0
A3a+375-SVMP	Outside	1/19/2022	12:46	458.0	19.7	0.0	3.0
A3a+375-SVMP	Outside	1/26/2022	11:10	683.0	19.5	0.0	0.0
A3a+375-SVMP	Outside	2/2/2022	11:33	438.0	20.0	0.0	0.0
A3a+375-SVMP	Outside	2/9/2022	10:51	384.0	13.0	0.0	0.0
A3a+375-SVMP	Outside	2/18/2022	11:01	239.0	19.1	0.0	0.0
A3a+375-SVMP	Outside	2/23/2022	11:06	323.0	18.6	0.0	0.0
A3a+375-SVMP	Outside	3/2/2022	10:36	405.0	19.2	0.0	0.0
A3a+375-SVMP	Outside	3/16/2022	11:23	193.0	19.8	0.0	0.0
A3a+375-SVMP	Outside	3/23/2022	11:15	151.0	18.3	0.0	0.0
A3a+375-SVMP	Outside	3/30/2022	11:58	151.0	19.1	0.0	4.0
A3a+375-SVMP	Outside	4/6/2022	11:00	85.0	19.3	0.0	0.0
A3a+375-SVMP	Outside	4/13/2022	10:38	141.0	20.2	0.0	0.0
A3a+375-SVMP	Outside	4/20/2022	10:30	129.0	18.5	0.0	0.0
A3a+375-SVMP	Outside	4/27/2022	10:22	126.0	19.5	0.0	0.0
A3a+375-SVMP	Outside	5/4/2022	9:44	128.0	17.1	0.0	0.0
A3a+375-SVMP	Outside	5/9/2022	10:19	249.0	18.5	0.0	4.0
A3a+375-SVMP	Outside	5/16/2022	10:59	146.0	17.7	0.0	4.0
A3a+375-SVMP	Outside	5/23/2022	11:25	143.0	20.2	0.0	0.0
A3a+375-SVMP	Outside	5/31/2022	12:50	123.0	16.2	0.0	0.0
A3a+375-SVMP	Outside	6/6/2022	11:20	180.0	17.0	0.0	5.0
A3a+375-SVMP	Outside	6/13/2022	11:56	179.0	20.2	0.0	0.0
A3a+375-SVMP	Outside	6/20/2022	10:49	153.0	20.5	0.0	0.0
A3a+375-SVMP	Outside	7/11/2022	10:57	280.0	17.4	0.0	3.0
A3a+375-SVMP	Outside	8/8/2022	10:54	376.0	17.9	0.0	5.0
A3a+375-SVMP	Outside	9/12/2022	11:27	159.0	17.7	0.0	5.0
A3a+375-SVMP	Outside	11/7/2022	15:11	37.0	14.5	0.0	0.0
A3a+375-SVMP	Outside	11/14/2022	12:29	50.6	17.5	0.0	0.0
A3a+375-SVMP	Outside	11/21/2022	15:00	38.8	18.0	0.0	0.0
A3a+375-SVMP	Outside	11/28/2022	12:45	36.5	18.2	0.0	0.0
A3a+375-SVMP	Outside	12/19/2022	12:59	11.7	17.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3a+375-SVMP	Outside	12/27/2022	14:43	22.6	20.3	0.0	0.0
A3a+375-SVMP	Outside	1/9/2023	11:15	0.9	18.9	0.0	0.0
A3a+50-SVMP	Outside	12/16/2021	13:05	23.9	NM	NM	NM
A3a+50-SVMP	Outside	12/20/2021	15:47	54.2	NM	NM	NM
A3a+50-SVMP	Outside	12/21/2021	NR	NM	NM	NM	NM
A3a-025-SVMP	Outside	12/22/2021	12:50	42.3	20.9	0.0	4.0
A3a-025-SVMP	Outside	12/29/2021	10:24	9.8	20.9	0.0	0.0
A3a-025-SVMP	Outside	12/30/2021	8:22	12.5	20.9	0.0	0.0
A3a-050-SVMP	Outside	12/22/2021	12:42	56.4	20.4	0.0	4.0
A3a-050-SVMP	Outside	12/22/2021	12:10	68.5	20.9	0.0	4.0
A3a-050-SVMP	Outside	12/23/2021	12:10	256.5	20.4	0.0	4.0
A3a-050-SVMP	Outside	12/23/2021	12:45	257.9	20.2	0.0	5.0
A3a-050-SVMP	Outside	12/24/2021	10:50	423.2	20.0	0.0	8.0
A3a-050-SVMP	Outside	12/24/2021	10:32	489.5	20.9	0.0	7.0
A3a-050-SVMP	Outside	12/27/2021	11:42	156.6	20.5	0.0	5.0
A3a-050-SVMP	Outside	12/27/2021	12:12	159.5	20.1	0.0	7.0
A3a-050-SVMP	Outside	12/29/2021	10:23	21.3	19.7	0.0	0.0
A3a-050-SVMP	Outside	12/29/2021	8:21	48.6	20.4	0.0	0.0
A3a-050-SVMP	Outside	12/30/2021	8:26	12.1	20.9	0.0	0.0
A3a-050-SVMP	Outside	12/30/2021	8:23	26.7	19.9	0.0	0.0
A3a-050-SVMP	Outside	12/31/2021	9:39	227.3	19.8	0.0	0.0
A3a-050-SVMP	Outside	1/6/2022	10:13	117.6	19.4	0.0	0.0
A3a-050-SVMP	Outside	1/12/2022	11:02	238.8	20.3	0.0	0.0
A3a-050-SVMP	Outside	1/19/2022	12:08	176.5	19.5	0.0	3.0
A3a-050-SVMP	Outside	1/26/2022	10:35	364.0	19.8	0.0	0.0
A3a-050-SVMP	Outside	2/2/2022	11:06	219.0	18.6	0.0	0.0
A3a-050-SVMP	Outside	2/9/2022	10:20	167.0	19.0	0.0	0.0
A3a-050-SVMP	Outside	2/18/2022	10:35	181.0	19.0	0.0	0.0
A3a-050-SVMP	Outside	2/23/2022	10:40	126.0	18.3	0.0	0.0
A3a-050-SVMP	Outside	3/2/2022	10:06	142.0	18.9	0.0	0.0
A3a-050-SVMP	Outside	3/16/2022	10:50	55.0	20.4	0.0	0.0
A3a-050-SVMP	Outside	3/23/2022	10:37	37.0	20.9	0.0	0.0
A3a-050-SVMP	Outside	3/30/2022	11:19	38.0	20.2	0.0	3.0
A3a-050-SVMP	Outside	4/6/2022	10:38	61.0	18.8	0.0	0.0
A3a-050-SVMP	Outside	4/13/2022	10:12	57.0	20.0	0.0	0.0
A3a-050-SVMP	Outside	4/20/2022	10:05	42.0	17.4	0.0	0.0
A3a-050-SVMP	Outside	4/27/2022	9:55	41.0	18.8	0.0	0.0
A3a-050-SVMP	Outside	5/4/2022	9:16	55.0	20.4	0.0	0.0
A3a-050-SVMP	Outside	5/9/2022	9:56	83.0	20.9	0.0	0.0
A3a-050-SVMP	Outside	5/16/2022	10:28	37.0	20.3	0.0	3.0
A3a-050-SVMP	Outside	5/23/2022	10:33	32.0	20.9	0.0	0.0
A3a-050-SVMP	Outside	5/31/2022	12:19	28.0	20.2	0.0	0.0
A3a-050-SVMP	Outside	6/6/2022	10:50	47.0	20.4	0.0	0.0
A3a-050-SVMP	Outside	6/13/2022	11:08	26.0	20.9	0.0	0.0
A3a-050-SVMP	Outside	6/20/2022	10:18	44.0	20.9	0.0	0.0
A3a-050-SVMP	Outside	7/11/2022	10:22	47.0	20.0	0.0	1.0
A3a-050-SVMP	Outside	8/8/2022	10:16	82.0	20.9	0.0	0.0
A3a-050-SVMP	Outside	9/12/2022	10:46	25.0	20.5	0.0	4.0
A3a-050-SVMP	Outside	11/7/2022	14:33	23.0	20.5	0.0	0.0
A3a-050-SVMP	Outside	11/14/2022	12:05	13.2	20.9	0.0	0.0
A3a-050-SVMP	Outside	11/21/2022	14:26	25.6	20.9	0.0	0.0
A3a-050-SVMP	Outside	11/28/2022	12:13	9.3	20.6	0.0	0.0
A3a-050-SVMP	Outside	12/19/2022	11:55	23.9	20.9	0.0	0.0
A3a-050-SVMP	Outside	12/27/2022	14:15	5.5	20.9	0.0	0.0
A3a-050-SVMP	Outside	1/9/2023	10:41	0.1	20.9	0.0	0.0
A3a-100-SVMP	Outside	12/15/2022	12:46	146.4	20.6	0.3	0.0
A3a-100-SVMP	Outside	12/15/2022	12:46	146.4	20.6	0.3	0.0
A3a-100-SVMP	Outside	1/16/2023	10:14	22.5	20.5	0.3	0.0
A3a-100-SVMP	Outside	1/16/2023	10:14	22.5	20.5	0.3	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3a-150-SVMP	Outside	12/31/2021	9:25	616.6	20.5	0.0	0.0
A3a-150-SVMP	Outside	1/6/2022	10:04	527.3	20.9	0.0	0.0
A3a-150-SVMP	Outside	1/12/2022	10:42	461.1	20.9	0.0	0.0
A3a-150-SVMP	Outside	1/19/2022	11:50	597.3	20.9	0.0	3.0
A3a-150-SVMP	Outside	1/26/2022	10:28	538.0	20.4	0.0	0.0
A3a-150-SVMP	Outside	2/2/2022	10:53	432.0	20.3	0.0	0.0
A3a-150-SVMP	Outside	2/9/2022	10:11	457.0	20.1	0.0	0.0
A3a-150-SVMP	Outside	2/18/2022	10:29	230.0	20.2	0.0	0.0
A3a-150-SVMP	Outside	2/23/2022	10:36	353.0	20.2	0.0	0.0
A3a-150-SVMP	Outside	3/2/2022	9:57	401.0	20.2	0.0	0.0
A3a-150-SVMP	Outside	3/16/2022	10:43	125.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	3/23/2022	10:27	81.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	3/30/2022	11:06	78.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	4/6/2022	10:32	96.0	20.4	0.0	0.0
A3a-150-SVMP	Outside	4/13/2022	10:05	110.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	4/20/2022	9:58	97.0	20.1	0.0	0.0
A3a-150-SVMP	Outside	4/27/2022	9:48	97.0	20.4	0.0	0.0
A3a-150-SVMP	Outside	5/4/2022	13:23	92.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	5/9/2022	9:47	152.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	5/16/2022	10:17	77.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	5/23/2022	10:23	72.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	5/31/2022	12:08	50.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	6/6/2022	10:42	78.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	6/13/2022	10:50	78.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	6/20/2022	10:09	55.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	7/11/2022	10:15	94.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	8/8/2022	10:03	140.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	9/12/2022	10:27	61.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	11/7/2022	14:26	35.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	11/14/2022	11:47	38.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	11/21/2022	14:18	25.4	20.9	0.0	0.0
A3a-150-SVMP	Outside	11/28/2022	11:55	25.3	20.9	0.0	0.0
A3a-150-SVMP	Outside	12/19/2022	11:45	24.0	20.9	0.0	0.0
A3a-150-SVMP	Outside	12/27/2022	14:06	16.4	20.9	0.0	0.0
A3a-150-SVMP	Outside	1/9/2023	10:33	3.1	20.9	0.0	0.0
A3a-200-SVMP	Outside	12/22/2021	11:49	36.1	20.9	0.0	NM
A3a-200-SVMP	Outside	12/23/2021	10:08	73.2	20.9	0.0	0.0
A3a-200-SVMP	Outside	12/24/2021	10:20	116.1	20.9	0.0	5.0
A3a-200-SVMP	Outside	12/27/2021	11:34	65.5	20.9	0.0	4.0
A3a-200-SVMP	Outside	12/29/2021	8:20	12.5	20.9	0.0	0.0
A3a-200-SVMP	Outside	12/30/2021	8:36	25.2	20.9	0.0	0.0
A3a-200-SVMP	Outside	12/31/2021	8:48	146.3	20.9	0.0	0.0
A3a-200-SVMP	Outside	1/6/2022	9:31	157.8	20.9	0.0	0.0
A3a-200-SVMP	Outside	1/12/2022	10:37	105.0	21.2	0.0	0.0
A3a-200-SVMP	Outside	1/19/2022	11:41	138.2	20.9	0.0	0.0
A3a-200-SVMP	Outside	1/26/2022	10:17	81.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	2/2/2022	10:41	105.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	2/9/2022	10:00	71.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	2/18/2022	10:23	33.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	2/23/2022	10:29	221.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	3/2/2022	9:50	48.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	3/16/2022	10:37	28.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	3/23/2022	10:18	30.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	3/30/2022	10:55	21.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	4/6/2022	10:23	20.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	4/13/2022	9:58	19.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	4/20/2022	9:51	18.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	4/27/2022	9:40	17.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	5/4/2022	13:17	14.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3a-200-SVMP	Outside	5/9/2022	9:40	24.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	5/16/2022	10:09	6.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	5/23/2022	10:16	4.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	5/31/2022	12:00	4.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	6/6/2022	10:33	9.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	6/13/2022	10:35	8.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	6/20/2022	9:58	7.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	7/11/2022	10:05	0.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	8/8/2022	9:53	5.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	9/12/2022	10:19	3.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	11/7/2022	14:17	2.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	11/14/2022	11:37	5.0	21.2	0.0	0.0
A3a-200-SVMP	Outside	11/21/2022	14:15	7.0	20.9	0.0	0.0
A3a-200-SVMP	Outside	11/28/2022	11:45	2.1	20.9	0.0	0.0
A3a-200-SVMP	Outside	12/19/2022	11:28	3.5	20.9	0.0	0.0
A3a-200-SVMP	Outside	12/27/2022	14:02	4.2	20.9	0.0	0.0
A3a-200-SVMP	Outside	1/9/2023	10:26	1.3	20.9	0.0	0.0
A3a-300-SVMP	Outside	12/22/2021	9:45	23.2	20.9	0.0	NM
A3a-300-SVMP	Outside	12/23/2021	9:35	85.3	20.9	0.0	0.0
A3a-300-SVMP	Outside	12/24/2021	8:52	73.3	20.9	0.0	4.0
A3a-300-SVMP	Outside	12/27/2021	9:51	29.3	20.9	0.0	0.0
A3a-300-SVMP	Outside	12/29/2021	8:19	7.3	20.9	0.0	0.0
A3a-300-SVMP	Outside	12/30/2021	8:39	77.9	20.9	0.0	0.0
A3a-300-SVMP	Outside	12/31/2021	8:36	80.3	20.9	0.0	0.0
A3a-300-SVMP	Outside	1/6/2022	9:10	74.3	20.9	0.0	0.0
A3a-300-SVMP	Outside	1/12/2022	9:34	51.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	1/19/2022	11:24	66.1	21.1	0.0	0.0
A3a-300-SVMP	Outside	1/26/2022	9:27	53.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	2/2/2022	9:47	61.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	2/9/2022	9:13	42.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	2/18/2022	9:49	16.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	2/23/2022	9:33	34.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	3/2/2022	9:04	34.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	3/16/2022	9:28	42.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	3/23/2022	9:12	22.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	3/30/2022	9:48	19.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	4/6/2022	9:35	21.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	4/13/2022	9:08	18.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	4/20/2022	9:05	20.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	4/27/2022	8:50	15.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	5/4/2022	12:32	17.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	5/9/2022	8:55	24.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	5/16/2022	8:59	15.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	5/23/2022	9:24	10.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	5/31/2022	10:42	10.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	6/6/2022	10:22	12.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	6/13/2022	9:10	7.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	6/20/2022	8:54	6.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	7/11/2022	9:01	15.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	8/8/2022	8:52	20.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	9/12/2022	9:20	8.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	11/7/2022	13:23	2.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	11/14/2022	10:33	11.6	20.9	0.0	0.0
A3a-300-SVMP	Outside	11/21/2022	12:16	4.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	11/28/2022	10:30	5.3	20.9	0.0	0.0
A3a-300-SVMP	Outside	12/19/2022	9:54	3.3	20.9	0.0	0.0
A3a-300-SVMP	Outside	12/27/2022	12:00	3.0	20.9	0.0	0.0
A3a-300-SVMP	Outside	1/9/2023	9:26	5.5	20.9	0.0	0.0
A3a-350-SVMP	Outside	12/22/2021	9:20	40.6	20.9	0.0	NM

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3a-350-SVMP	Outside	12/23/2021	9:08	195.7	20.9	0.0	0.0
A3a-350-SVMP	Outside	12/24/2021	8:41	408.6	20.9	0.0	5.0
A3a-350-SVMP	Outside	12/27/2021	9:23	57.9	20.9	0.0	0.0
A3a-350-SVMP	Outside	12/29/2021	8:15	47.1	20.9	0.0	0.0
A3a-350-SVMP	Outside	12/30/2021	8:40	36.9	20.9	0.0	0.0
A3a-350-SVMP	Outside	12/31/2021	8:28	365.4	20.9	0.0	0.0
A3a-350-SVMP	Outside	1/6/2022	9:10	342.3	20.9	0.0	0.0
A3a-350-SVMP	Outside	1/12/2022	9:23	318.3	20.9	0.0	0.0
A3a-350-SVMP	Outside	1/19/2022	10:46	348.7	20.9	0.0	0.0
A3a-350-SVMP	Outside	1/26/2022	9:18	352.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	2/2/2022	9:44	400.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	2/9/2022	9:07	251.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	2/18/2022	9:38	81.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	2/23/2022	9:26	133.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	3/2/2022	8:57	188.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	3/16/2022	9:20	95.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	3/23/2022	9:01	76.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	3/30/2022	9:38	89.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	4/6/2022	9:29	87.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	4/13/2022	9:00	91.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	4/20/2022	8:59	85.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	4/27/2022	8:45	79.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	5/4/2022	12:28	59.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	5/9/2022	8:51	102.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	5/16/2022	8:55	54.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	5/23/2022	9:19	53.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	5/31/2022	10:34	48.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	6/6/2022	10:16	30.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	6/13/2022	9:02	58.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	6/20/2022	8:47	38.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	7/11/2022	8:57	96.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	8/8/2022	8:46	138.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	9/12/2022	9:11	80.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	11/7/2022	13:15	53.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	11/14/2022	10:25	60.0	20.9	0.0	0.0
A3a-350-SVMP	Outside	11/21/2022	11:57	44.2	20.9	0.0	0.0
A3a-350-SVMP	Outside	11/28/2022	10:21	23.8	20.9	0.0	0.0
A3a-350-SVMP	Outside	12/19/2022	9:45	27.2	20.9	0.0	0.0
A3a-350-SVMP	Outside	12/27/2022	11:40	21.7	20.9	0.0	0.0
A3a-350-SVMP	Outside	1/9/2023	9:19	18.2	20.9	0.0	0.0
A3a-375-SVMP	Outside	12/16/2021	10:10	120.7	NM	NM	NM
A3a-375-SVMP	Outside	12/20/2021	17:05	268.6	NM	NM	NM
A3a-375-SVMP	Outside	12/21/2021	NR	NM	NM	NM	NM
A3b+000-SVMP	Inside	12/16/2021	12:51	32.8	NM	NM	NM
A3b+000-SVMP	Inside	12/20/2021	16:07	79.3	NM	NM	NM
A3b+000-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3b+000-SVMP	Inside	12/22/2021	13:07	59.9	20.1	0.0	4.0
A3b+000-SVMP	Inside	12/23/2021	13:11	203.5	20.1	0.0	5.0
A3b+000-SVMP	Inside	12/24/2021	10:58	470.5	20.3	0.0	8.0
A3b+000-SVMP	Inside	12/27/2021	12:21	181.4	20.3	0.0	5.0
A3b+000-SVMP	Inside	12/29/2021	10:24	39.4	20.4	0.0	0.0
A3b+000-SVMP	Inside	12/30/2021	8:21	40.2	20.4	0.0	0.0
A3b+000-SVMP	Inside	12/31/2021	9:45	386.8	20.5	0.0	0.0
A3b+000-SVMP	Inside	1/6/2022	10:21	544.7	20.4	0.0	0.0
A3b+000-SVMP	Inside	1/12/2022	11:09	409.8	20.9	0.0	0.0
A3b+000-SVMP	Inside	1/19/2022	12:14	344.3	20.9	0.0	3.0
A3b+000-SVMP	Inside	1/26/2022	10:43	386.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	2/2/2022	11:10	414.0	20.5	0.0	0.0
A3b+000-SVMP	Inside	2/9/2022	10:24	325.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3b+000-SVMP	Inside	2/18/2022	10:42	180.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	2/23/2022	10:48	255.0	20.6	0.0	0.0
A3b+000-SVMP	Inside	3/2/2022	10:11	330.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	3/16/2022	10:58	57.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	3/23/2022	10:47	123.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	3/30/2022	11:29	123.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	4/6/2022	12:59	133.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	4/13/2022	10:19	110.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	4/20/2022	10:10	101.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	4/27/2022	10:00	104.0	20.9	0.0	0.0
A3b+000-SVMP	Inside	5/4/2022	9:21	118.0	18.9	0.0	0.0
A3b+000-SVMP	Inside	5/9/2022	10:00	199.0	19.7	0.0	0.0
A3b+000-SVMP	Inside	5/16/2022	10:34	99.0	19.0	0.0	4.0
A3b+000-SVMP	Inside	5/23/2022	10:37	111.0	20.5	0.0	0.0
A3b+000-SVMP	Inside	5/31/2022	12:25	94.0	18.2	0.0	0.0
A3b+000-SVMP	Inside	6/6/2022	10:58	152.0	18.8	0.0	4.0
A3b+000-SVMP	Inside	6/13/2022	11:24	129.0	20.3	0.0	0.0
A3b+000-SVMP	Inside	6/20/2022	10:27	151.0	20.6	0.0	0.0
A3b+000-SVMP	Inside	7/11/2022	10:30	330.0	19.4	0.0	2.0
A3b+000-SVMP	Inside	8/8/2022	NR	NM	NM	NM	NM
A3b+000-SVMP	Inside	9/12/2022	10:54	402.0	18.7	0.0	5.0
A3b+000-SVMP	Inside	11/7/2022	14:45	307.0	19.0	0.0	0.0
A3b+000-SVMP	Inside	11/14/2022	12:08	349.7	20.5	0.0	0.0
A3b+000-SVMP	Inside	11/21/2022	14:35	325.2	19.5	0.0	0.0
A3b+000-SVMP	Inside	11/28/2022	12:20	249.1	19.5	0.0	0.0
A3b+000-SVMP	Inside	12/15/2022	10:16	1.3	19.7	0.5	0.0
A3b+000-SVMP	Inside	12/15/2022	10:16	1.3	19.7	0.5	0.0
A3b+000-SVMP	Inside	12/19/2022	12:17	334.3	19.1	0.0	0.0
A3b+000-SVMP	Inside	12/27/2022	14:20	192.4	20.9	0.0	0.0
A3b+000-SVMP	Inside	1/9/2023	10:47	95.5	19.5	0.0	0.0
A3b+000-SVMP	Inside	1/16/2023	9:30	0.1	20.3	0.2	0.0
A3b+150-SVMP	Inside	12/16/2021	13:54	82.8	NM	NM	NM
A3b+150-SVMP	Inside	12/16/2021	13:57	95.2	NM	NM	NM
A3b+150-SVMP	Inside	12/20/2021	11:53	92.7	NM	NM	NM
A3b+150-SVMP	Inside	12/20/2021	11:59	108.4	NM	NM	NM
A3b+150-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3b+200-SVMP	Inside	12/16/2021	14:10	50.8	NM	NM	NM
A3b+200-SVMP	Inside	12/20/2021	12:15	69.3	NM	NM	NM
A3b+200-SVMP	Inside	12/21/2021	14:32	78.4	NM	NM	NM
A3b+300-SVMP	Inside	12/16/2021	14:45	42.7	NM	NM	NM
A3b+300-SVMP	Inside	12/17/2021	14:45	42.7	NM	NM	NM
A3b+300-SVMP	Inside	12/20/2021	13:37	74.8	NM	NM	NM
A3b+300-SVMP	Inside	12/21/2021	12:40	75.6	NM	NM	NM
A3b+350-SVMP	Inside	12/16/2021	15:00	47.4	NM	NM	NM
A3b+350-SVMP	Inside	12/17/2021	15:00	47.4	NM	NM	NM
A3b+350-SVMP	Inside	12/20/2021	13:05	246.3	NM	NM	NM
A3b+350-SVMP	Inside	12/21/2021	12:18	87.4	NM	NM	NM
A3b+375-SVMP	Inside	12/22/2021	14:13	113.5	18.1	0.0	6.0
A3b+375-SVMP	Inside	12/23/2021	14:11	408.8	18.1	0.0	8.0
A3b+375-SVMP	Inside	12/24/2021	11:42	244.2	18.7	0.0	8.0
A3b+375-SVMP	Inside	12/27/2021	13:10	281.4	17.2	0.0	8.0
A3b+375-SVMP	Inside	12/29/2021	10:29	40.9	17.9	0.0	0.0
A3b+375-SVMP	Inside	12/30/2021	8:16	50.4	17.3	0.0	0.0
A3b+375-SVMP	Inside	12/31/2021	10:11	673.4	17.6	0.0	0.0
A3b+375-SVMP	Inside	1/6/2022	10:49	473.5	17.0	0.0	0.0
A3b+375-SVMP	Inside	1/12/2022	11:36	263.4	13.5	0.0	0.0
A3b+375-SVMP	Inside	1/19/2022	12:43	163.0	13.1	0.0	3.0
A3b+375-SVMP	Inside	1/26/2022	11:13	225.0	15.4	0.0	0.0
A3b+375-SVMP	Inside	2/2/2022	11:36	144.0	15.0	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3b+375-SVMP	Inside	2/9/2022	10:49	169.0	14.0	0.0	0.0
A3b+375-SVMP	Inside	2/18/2022	11:00	136.0	15.2	0.0	0.0
A3b+375-SVMP	Inside	2/23/2022	11:06	124.0	14.5	0.0	0.0
A3b+375-SVMP	Inside	3/2/2022	10:35	187.0	15.4	0.0	0.0
A3b+375-SVMP	Inside	3/16/2022	11:24	82.0	17.8	0.0	0.0
A3b+375-SVMP	Inside	3/23/2022	11:12	58.0	17.2	0.0	0.0
A3b+375-SVMP	Inside	3/30/2022	12:00	53.0	16.4	0.0	5.0
A3b+375-SVMP	Inside	4/6/2022	11:02	49.0	16.2	0.0	0.0
A3b+375-SVMP	Inside	4/13/2022	10:40	53.0	18.5	0.0	0.0
A3b+375-SVMP	Inside	4/20/2022	10:32	51.0	13.5	0.0	0.0
A3b+375-SVMP	Inside	4/27/2022	10:24	52.0	16.9	0.0	0.0
A3b+375-SVMP	Inside	5/4/2022	9:45	57.0	17.2	0.0	0.0
A3b+375-SVMP	Inside	5/9/2022	10:21	102.0	18.6	0.0	4.0
A3b+375-SVMP	Inside	5/16/2022	11:02	49.0	17.4	0.0	4.0
A3b+375-SVMP	Inside	5/23/2022	11:27	42.0	19.8	0.0	0.0
A3b+375-SVMP	Inside	5/31/2022	12:52	35.0	17.7	0.0	0.0
A3b+375-SVMP	Inside	6/6/2022	11:22	49.0	17.0	0.0	5.0
A3b+375-SVMP	Inside	6/13/2022	12:00	44.0	20.3	0.0	0.0
A3b+375-SVMP	Inside	6/20/2022	10:52	46.0	19.6	0.0	0.0
A3b+375-SVMP	Inside	7/11/2022	11:00	43.0	17.7	0.0	2.0
A3b+375-SVMP	Inside	8/8/2022	10:57	41.0	17.6	0.0	6.0
A3b+375-SVMP	Inside	9/12/2022	11:29	85.0	17.7	0.0	5.0
A3b+375-SVMP	Inside	11/7/2022	15:14	8.0	14.4	0.0	0.0
A3b+375-SVMP	Inside	11/14/2022	12:31	14.2	17.2	0.0	0.0
A3b+375-SVMP	Inside	11/21/2022	15:05	9.9	17.4	0.0	0.0
A3b+375-SVMP	Inside	11/28/2022	12:43	7.1	17.8	0.0	0.0
A3b+375-SVMP	Inside	12/19/2022	13:01	5.1	17.4	0.0	0.0
A3b+375-SVMP	Inside	12/27/2022	14:44	5.2	20.4	0.0	0.0
A3b+375-SVMP	Inside	1/9/2023	11:12	0.0	18.0	0.0	0.0
A3b+50-SVMP	Inside	12/16/2021	13:10	34.6	NM	NM	NM
A3b+50-SVMP	Inside	12/20/2021	15:52	68.7	NM	NM	NM
A3b+50-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM
A3b-025-SVMP	Inside	12/23/2021	12:58	150.5	20.9	0.0	4.0
A3b-025-SVMP	Inside	12/24/2021	10:55	105.3	20.9	0.0	6.0
A3b-025-SVMP	Inside	12/27/2021	12:15	105.9	20.9	0.0	4.0
A3b-050-SVMP	Inside	12/22/2021	12:36	45.3	19.9	0.0	4.0
A3b-050-SVMP	Inside	12/22/2021	12:04	85.4	20.2	0.0	4.0
A3b-050-SVMP	Inside	12/23/2021	12:52	180.9	19.7	0.0	5.0
A3b-050-SVMP	Inside	12/23/2021	12:20	321.4	20.4	0.0	3.0
A3b-050-SVMP	Inside	12/24/2021	10:45	208.4	19.7	0.0	7.0
A3b-050-SVMP	Inside	12/24/2021	10:37	475.3	20.9	0.0	7.0
A3b-050-SVMP	Inside	12/27/2021	12:07	118.2	19.7	0.0	6.0
A3b-050-SVMP	Inside	12/27/2021	11:56	264.5	20.9	0.0	5.0
A3b-050-SVMP	Inside	12/29/2021	8:21	58.6	20.5	0.0	0.0
A3b-050-SVMP	Inside	12/29/2021	10:23	92.3	19.6	0.0	0.0
A3b-050-SVMP	Inside	12/30/2021	8:23	11.0	19.7	0.0	0.0
A3b-050-SVMP	Inside	12/30/2021	8:26	58.0	20.9	0.0	0.0
A3b-050-SVMP	Inside	12/31/2021	9:35	109.9	19.6	0.0	0.0
A3b-050-SVMP	Inside	1/6/2022	10:10	139.3	12.1	0.0	0.0
A3b-050-SVMP	Inside	1/12/2022	10:59	108.2	19.7	0.0	0.0
A3b-050-SVMP	Inside	1/19/2022	12:04	108.3	19.0	0.0	3.0
A3b-050-SVMP	Inside	1/26/2022	10:38	99.0	19.3	0.0	0.0
A3b-050-SVMP	Inside	2/2/2022	11:03	78.0	18.1	0.0	0.0
A3b-050-SVMP	Inside	2/9/2022	10:17	103.0	19.1	0.0	0.0
A3b-050-SVMP	Inside	2/18/2022	10:34	60.0	14.7	0.0	0.0
A3b-050-SVMP	Inside	2/23/2022	10:40	63.0	18.3	0.0	0.0
A3b-050-SVMP	Inside	3/2/2022	10:05	72.0	18.7	0.0	0.0
A3b-050-SVMP	Inside	3/16/2022	10:51	31.0	20.0	0.0	0.0
A3b-050-SVMP	Inside	3/23/2022	10:40	24.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3b-050-SVMP	Inside	3/30/2022	11:20	29.0	19.8	0.0	3.0
A3b-050-SVMP	Inside	4/6/2022	10:40	23.0	18.4	0.0	0.0
A3b-050-SVMP	Inside	4/13/2022	10:14	22.0	19.3	0.0	0.0
A3b-050-SVMP	Inside	4/20/2022	10:06	13.0	17.2	0.0	0.0
A3b-050-SVMP	Inside	4/27/2022	9:56	15.0	18.8	0.0	0.0
A3b-050-SVMP	Inside	5/4/2022	9:18	37.0	20.5	0.0	0.0
A3b-050-SVMP	Inside	5/9/2022	9:54	55.0	20.9	0.0	0.0
A3b-050-SVMP	Inside	5/16/2022	10:26	29.0	20.3	0.0	3.0
A3b-050-SVMP	Inside	5/23/2022	10:31	29.0	20.9	0.0	0.0
A3b-050-SVMP	Inside	5/31/2022	12:21	19.0	20.1	0.0	0.0
A3b-050-SVMP	Inside	6/6/2022	10:58	31.0	20.4	0.0	0.0
A3b-050-SVMP	Inside	6/13/2022	11:12	14.0	20.9	0.0	0.0
A3b-050-SVMP	Inside	6/20/2022	10:20	29.0	20.9	0.0	0.0
A3b-050-SVMP	Inside	7/11/2022	10:24	23.0	20.6	0.0	1.0
A3b-050-SVMP	Inside	8/8/2022	10:17	34.0	20.9	0.0	0.0
A3b-050-SVMP	Inside	9/12/2022	10:44	0.0	20.5	0.0	4.0
A3b-050-SVMP	Inside	11/7/2022	14:36	6.0	20.5	0.0	0.0
A3b-050-SVMP	Inside	11/14/2022	12:00	11.0	20.9	0.0	0.0
A3b-050-SVMP	Inside	11/21/2022	14:28	10.0	20.9	0.0	0.0
A3b-050-SVMP	Inside	11/28/2022	12:10	5.4	20.5	0.0	0.0
A3b-050-SVMP	Inside	12/19/2022	11:58	17.8	20.9	0.0	0.0
A3b-050-SVMP	Inside	12/27/2022	14:12	6.4	20.9	0.0	0.0
A3b-050-SVMP	Inside	1/9/2023	10:40	2.5	20.9	0.0	0.0
A3b-150-SVMP	Inside	12/31/2021	9:22	681.7	20.9	0.0	0.0
A3b-150-SVMP	Inside	1/6/2022	10:02	621.2	20.9	0.0	0.0
A3b-150-SVMP	Inside	1/12/2022	10:53	547.3	20.9	0.0	0.0
A3b-150-SVMP	Inside	1/19/2022	11:46	621.7	20.9	0.0	0.0
A3b-150-SVMP	Inside	1/26/2022	10:26	669.0	20.4	0.0	0.0
A3b-150-SVMP	Inside	2/2/2022	10:50	701.0	20.0	0.0	0.0
A3b-150-SVMP	Inside	2/9/2022	10:09	535.0	20.1	0.0	0.0
A3b-150-SVMP	Inside	2/18/2022	12:30	259.0	20.4	0.0	0.0
A3b-150-SVMP	Inside	2/23/2022	10:36	396.0	20.2	0.0	0.0
A3b-150-SVMP	Inside	3/2/2022	9:57	440.0	20.2	0.0	0.0
A3b-150-SVMP	Inside	3/16/2022	10:44	175.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	3/23/2022	10:29	120.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	3/30/2022	11:11	119.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	4/6/2022	10:33	139.0	20.5	0.0	0.0
A3b-150-SVMP	Inside	4/13/2022	10:07	140.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	4/20/2022	10:00	135.0	20.0	0.0	0.0
A3b-150-SVMP	Inside	4/27/2022	9:50	141.0	20.4	0.0	0.0
A3b-150-SVMP	Inside	5/4/2022	13:26	119.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	5/9/2022	9:49	196.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	5/16/2022	10:20	88.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	5/23/2022	10:25	85.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	5/31/2022	12:10	66.0	20.6	0.0	0.0
A3b-150-SVMP	Inside	6/6/2022	10:44	107.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	6/13/2022	10:54	90.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	6/20/2022	10:10	73.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	7/11/2022	10:13	124.0	20.9	0.0	1.0
A3b-150-SVMP	Inside	8/8/2022	10:01	124.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	9/12/2022	10:25	99.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	11/7/2022	14:28	39.0	20.9	0.0	0.0
A3b-150-SVMP	Inside	11/14/2022	11:45	31.1	20.9	0.0	0.0
A3b-150-SVMP	Inside	11/21/2022	14:20	27.2	20.9	0.0	0.0
A3b-150-SVMP	Inside	11/28/2022	12:00	26.2	20.9	0.0	0.0
A3b-150-SVMP	Inside	12/19/2022	11:41	18.1	20.9	0.0	0.0
A3b-150-SVMP	Inside	12/27/2022	14:05	12.9	20.9	0.0	0.0
A3b-150-SVMP	Inside	1/9/2023	10:31	2.6	20.9	0.0	0.0
A3b-200-SVMP	Inside	12/22/2021	11:42	45.3	20.9	0.0	NM

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3b-200-SVMP	Inside	12/23/2021	10:20	156.8	20.9	0.0	4.0
A3b-200-SVMP	Inside	12/24/2021	10:18	373.6	20.9	0.0	6.0
A3b-200-SVMP	Inside	12/27/2021	11:22	53.7	20.9	0.0	2.0
A3b-200-SVMP	Inside	12/29/2021	8:20	25.8	20.9	0.0	0.0
A3b-200-SVMP	Inside	12/30/2021	8:36	41.7	20.9	0.0	0.0
A3b-200-SVMP	Inside	12/31/2021	8:45	403.8	20.9	0.0	0.0
A3b-200-SVMP	Inside	1/6/2022	9:29	422.3	20.9	0.0	0.0
A3b-200-SVMP	Inside	1/12/2022	10:33	342.5	21.1	0.0	0.0
A3b-200-SVMP	Inside	1/19/2022	11:37	312.3	20.9	0.0	0.0
A3b-200-SVMP	Inside	1/26/2022	10:20	336.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	2/2/2022	10:44	362.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	2/9/2022	10:00	283.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	2/18/2022	10:21	140.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	2/23/2022	10:29	213.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	3/2/2022	9:50	235.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	3/16/2022	10:38	134.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	3/23/2022	10:15	99.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	3/30/2022	10:59	101.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	4/6/2022	10:24	87.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	4/13/2022	10:00	83.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	4/20/2022	9:53	83.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	4/27/2022	9:42	79.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	5/4/2022	13:19	69.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	5/9/2022	9:42	130.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	5/16/2022	10:12	65.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	5/23/2022	10:18	58.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	5/31/2022	12:03	47.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	6/6/2022	10:36	59.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	6/13/2022	10:40	62.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	6/20/2022	10:00	58.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	7/11/2022	10:07	74.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	8/8/2022	9:55	90.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	9/12/2022	10:16	45.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	11/7/2022	14:20	23.0	20.9	0.0	0.0
A3b-200-SVMP	Inside	11/14/2022	11:40	23.5	20.9	0.0	0.0
A3b-200-SVMP	Inside	11/21/2022	14:12	27.4	20.9	0.0	0.0
A3b-200-SVMP	Inside	11/28/2022	11:47	14.2	20.9	0.0	0.0
A3b-200-SVMP	Inside	12/19/2022	11:31	17.3	20.9	0.0	0.0
A3b-200-SVMP	Inside	12/27/2022	NR	17.4	20.9	0.0	0.0
A3b-200-SVMP	Inside	1/9/2023	10:23	3.7	20.9	0.0	0.0
A3b-300-SVMP	Inside	12/22/2021	9:36	35.0	20.9	0.0	NM
A3b-300-SVMP	Inside	12/23/2021	9:26	120.1	20.9	0.0	0.0
A3b-300-SVMP	Inside	12/24/2021	8:54	196.9	20.9	0.0	4.0
A3b-300-SVMP	Inside	12/27/2021	9:56	35.8	20.9	0.0	0.0
A3b-300-SVMP	Inside	12/29/2021	8:19	15.4	20.9	0.0	0.0
A3b-300-SVMP	Inside	12/30/2021	8:39	18.3	20.9	0.0	0.0
A3b-300-SVMP	Inside	12/31/2021	8:34	134.6	20.9	0.0	0.0
A3b-300-SVMP	Inside	1/6/2022	9:15	166.5	20.9	0.0	0.0
A3b-300-SVMP	Inside	1/12/2022	9:31	131.7	20.9	0.0	0.0
A3b-300-SVMP	Inside	1/19/2022	11:15	184.1	20.9	0.0	0.0
A3b-300-SVMP	Inside	1/26/2022	9:24	123.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	2/2/2022	9:44	105.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	2/9/2022	9:12	127.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	2/18/2022	9:47	41.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	2/23/2022	9:34	68.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	3/2/2022	9:03	90.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	3/16/2022	9:27	72.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	3/23/2022	9:08	67.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	3/30/2022	9:46	54.0	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3b-300-SVMP	Inside	4/6/2022	9:34	65.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	4/13/2022	9:06	58.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	4/20/2022	9:03	47.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	4/27/2022	8:52	44.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	5/4/2022	12:34	38.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	5/9/2022	8:34	62.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	5/16/2022	9:01	34.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	5/23/2022	9:26	26.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	5/31/2022	10:46	21.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	6/6/2022	10:25	25.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	6/13/2022	9:13	25.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	6/20/2022	8:56	19.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	7/11/2022	9:02	27.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	8/8/2022	8:54	41.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	9/12/2022	9:17	24.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	11/7/2022	13:20	14.0	20.9	0.0	0.0
A3b-300-SVMP	Inside	11/14/2022	10:30	14.7	20.9	0.0	0.0
A3b-300-SVMP	Inside	11/21/2022	12:10	7.4	20.9	0.0	0.0
A3b-300-SVMP	Inside	11/28/2022	10:33	4.6	20.9	0.0	0.0
A3b-300-SVMP	Inside	12/19/2022	9:58	4.2	20.9	0.0	0.0
A3b-300-SVMP	Inside	12/27/2022	11:58	4.8	20.9	0.0	0.0
A3b-300-SVMP	Inside	1/9/2023	9:33	6.1	20.9	0.0	0.0
A3b-350-SVMP	Inside	12/22/2021	9:07	48.5	20.9	0.0	NM
A3b-350-SVMP	Inside	12/23/2021	8:59	228.3	20.9	0.0	2.0
A3b-350-SVMP	Inside	12/24/2021	8:43	155.0	20.9	0.0	4.0
A3b-350-SVMP	Inside	12/27/2021	9:36	25.6	20.9	0.0	0.0
A3b-350-SVMP	Inside	12/29/2021	8:15	31.2	20.9	0.0	0.0
A3b-350-SVMP	Inside	12/30/2021	8:40	49.3	20.9	0.0	0.0
A3b-350-SVMP	Inside	12/31/2021	8:24	407.7	20.9	0.0	0.0
A3b-350-SVMP	Inside	1/6/2022	9:07	380.8	20.9	0.0	0.0
A3b-350-SVMP	Inside	1/12/2022	9:21	401.4	20.9	0.0	0.0
A3b-350-SVMP	Inside	1/19/2022	10:55	450.3	20.9	0.0	0.0
A3b-350-SVMP	Inside	1/26/2022	9:15	367.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	2/2/2022	9:37	392.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	2/9/2022	9:05	399.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	2/18/2022	9:35	115.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	2/23/2022	9:26	157.0	20.3	0.0	0.0
A3b-350-SVMP	Inside	3/2/2022	8:55	245.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	3/16/2022	9:18	98.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	3/23/2022	9:03	100.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	3/30/2022	9:34	125.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	4/6/2022	9:28	120.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	4/13/2022	9:01	97.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	4/20/2022	8:57	98.0	20.6	0.0	0.0
A3b-350-SVMP	Inside	4/27/2022	8:43	104.0	20.7	0.0	0.0
A3b-350-SVMP	Inside	5/4/2022	12:26	86.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	5/9/2022	8:50	137.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	5/16/2022	8:53	76.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	5/23/2022	9:17	79.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	5/31/2022	10:32	70.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	6/6/2022	10:18	53.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	6/13/2022	8:57	80.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	6/20/2022	8:43	43.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	7/11/2022	8:54	149.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	8/8/2022	8:43	56.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	9/12/2022	9:08	132.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	11/7/2022	13:13	79.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	11/14/2022	10:22	91.3	20.9	0.0	0.0
A3b-350-SVMP	Inside	11/21/2022	11:54	14.7	20.9	0.0	0.0

Table App B-1. Periodic Soil Vapor Monitoring Results In Adit 3/Pearl Harbor Tunnel Locations

Location	Location of Probe	Date	Time	Organic Vapor (ppmv)	Oxygen (%)	Carbon Monoxide (%)	Methane (%)
A3b-350-SVMP	Inside	11/28/2022	10:23	38.7	20.9	0.0	0.0
A3b-350-SVMP	Inside	12/16/2022	9:10	63.4	20.4	0.1	0.0
A3b-350-SVMP	Inside	12/19/2022	9:48	54.7	20.9	0.0	0.0
A3b-350-SVMP	Inside	12/27/2022	11:37	50.0	20.9	0.0	0.0
A3b-350-SVMP	Inside	1/9/2023	9:17	21.9	20.2	0.0	0.0
A3b-350-SVMP	Inside	1/16/2023	12:35	11.2	21.1	0.1	0.0
A3b-375-SVMP	Inside	12/16/2021	10:23	92.3	NM	NM	NM
A3b-375-SVMP	Inside	12/20/2021	17:00	315.7	NM	NM	NM
A3b-375-SVMP	Inside	12/21/2021	NR	NM	NM	NM	NM

Notes:

Inside - Between the rail tracks
MNA - Measured, data collected not available
NF - No Flow
NM - Not Measured
NR - Not Recorded
Outside - Outside of the rail tracks
SVMP - Soil Vapor Monitoring Point

ppmv - parts per million by volume
% - Percent gas in air

Appendix C – Product Technical Evaluation

Appendix C.1 Forensics Laboratory Reports March 2022, Alpha Analytical

ANALYTICAL REPORT

Lab Number:	L2213568
Client:	GSI Environmental Inc. 1001 Bishop Street Suite 1600 Honolulu, HI 96813
ATTN:	[redacted] (b) (6)
Phone:	[redacted] (b) (6)
Project Name:	SITE CHAR, CUTOUT ADIT 3
Project Number:	CTO-22F0106
Report Date:	03/23/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: SITE CHAR, CUTOUT ADIT 3
Project Number: CTO-22F0106

Lab Number: L2213568
Report Date: 03/23/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2213568-01	A3000-PRN01-220310	WATER	RHBFS A3+00 SAMPLE LOCATION	03/10/22 14:50	03/16/22

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Case Narrative (continued)

Report Revision

March 23, 2022: L2213568-01 - The sample matrix was determined to be aqueous rather than oil. The aqueous volume was extracted and the results are reported.

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

L2213568-01: The collection date and time on the chain of custody was 10-MAR-22 14:50; however, the collection date/time on the container label was 10-MAR-22 14:10. The collection date/time is reported as 10-MAR-22 14:50.

Saturated Hydrocarbons

L2213568-01: The sample was extracted with the method required holding time exceeded.

L2213568-01: The sample was extracted and then analyzed using a gas chromatograph equipped with a flame ionization detector (GC/FID). The temperature program and associated experimental conditions were optimized to obtain maximum resolution in an eighty minute chromatographic run representative of hydrocarbons in the n-Octane (C8) to n-Tetracontane (C40) range. Qualitative evaluation of the sample was conducted by reviewing the sample chromatogram in conjunction with a chromatogram of a normal alkane series generated with the same chromatographic conditions. Chromatograms of hydrocarbon reference materials obtained from our library of 82 reference standards were also utilized to provide the best possible sample match. Quantitative determination of the sample's hydrocarbon concentration was performed in accordance with EPA Method 8015M. The sample's total hydrocarbon concentration and all associated quality control data are included in the report.

The following qualitative information is based on a tentative interpretation of chromatographic pattern recognition and boiling point ranges:

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Case Narrative (continued)

Total Petroleum Hydrocarbon Identification

L2213568-01 contains hydrocarbons eluting in the range of n-Nonane (C9) to after the elution of n-Octadecane (C18).

Based on the data generated, L2213568-01 contains material eluting in the low to mid weight ranges of the chromatogram which is similar to a JP-5 Jet Fuel / Kerosene type product.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: [redacted] (b) (6)

Title: Technical Director/Representative Date: 03/23/22

ORGANICS

PETROLEUM HYDROCARBONS

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

SAMPLE RESULTS

Lab ID: L2213568-01
Client ID: A3000-PRN01-220310
Sample Location: RHBFS A3+00 SAMPLE LOCATION

Date Collected: 03/10/22 14:50
Date Received: 03/16/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 03/22/22 22:28
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 03/22/22 05:01

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	0.009	J	mg/l	0.011	0.004	1
n-Decane (C10)	0.636		mg/l	0.011	0.001	1
n-Undecane (C11)	5.05	E	mg/l	0.011	0.001	1
n-Dodecane (C12)	8.13	E	mg/l	0.011	0.001	1
n-Tridecane (C13)	7.79	E	mg/l	0.056	0.010	1
2,6,10-Trimethyldodecane (1380)	1.64		mg/l	0.011	0.001	1
n-Tetradecane (C14)	4.65	E	mg/l	0.011	0.001	1
2,6,10-Trimethyltridecane (1470)	1.20		mg/l	0.011	0.002	1
n-Pentadecane (C15)	1.80		mg/l	0.011	0.002	1
n-Hexadecane (C16)	0.339		mg/l	0.011	0.002	1
Norpristane (1650)	0.099		mg/l	0.011	0.002	1
n-Heptadecane (C17)	0.077		mg/l	0.011	0.002	1
Pristane	0.114		mg/l	0.011	0.002	1
n-Octadecane (C18)	0.029		mg/l	0.011	0.001	1
Phytane	0.052		mg/l	0.011	0.001	1
n-Nonadecane (C19)	0.009	J	mg/l	0.011	0.002	1
n-Eicosane (C20)	0.006	J	mg/l	0.011	0.001	1
n-Heneicosane (C21)	0.003	J	mg/l	0.011	0.001	1
n-Docosane (C22)	0.001	J	mg/l	0.011	0.0005	1
n-Tricosane (C23)	ND		mg/l	0.011	0.001	1
n-Tetracosane (C24)	ND		mg/l	0.011	0.001	1
n-Pentacosane (C25)	ND		mg/l	0.056	0.007	1
n-Hexacosane (C26)	0.001	J	mg/l	0.011	0.001	1
n-Heptacosane (C27)	0.002	J	mg/l	0.011	0.001	1
n-Octacosane (C28)	ND		mg/l	0.011	0.002	1
n-Nonacosane (C29)	ND		mg/l	0.011	0.001	1
n-Triacontane (C30)	ND		mg/l	0.011	0.001	1
n-Hentriacontane (C31)	ND		mg/l	0.011	0.001	1

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

SAMPLE RESULTS

Lab ID: L2213568-01 Date Collected: 03/10/22 14:50

Client ID: A3000-PRN01-220310 Date Received: 03/16/22

Sample Location: RHBFS A3+00 SAMPLE LOCATION Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	ND		mg/l	0.011	0.001	1
n-Tritriacontane (C33)	ND		mg/l	0.011	0.001	1
n-Tetratriacontane (C34)	ND		mg/l	0.011	0.002	1
n-Pentatriacontane (C35)	ND		mg/l	0.011	0.002	1
n-Hexatriacontane (C36)	ND		mg/l	0.011	0.002	1
n-Heptatriacontane (C37)	ND		mg/l	0.011	0.002	1
n-Octatriacontane (C38)	ND		mg/l	0.011	0.002	1
n-Nonatriacontane (C39)	ND		mg/l	0.011	0.002	1
n-Tetracontane (C40)	ND		mg/l	0.011	0.002	1
C9-C44 Total Petroleu	182		mg/l	0.367	0.062	1
C10-C28 DRO	185		mg/l	0.233	0.040	1
C28-C40 ORO	0.171		mg/l	0.122	0.018	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	108		50-130
d50-Tetracosane	106		50-130

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

SAMPLE RESULTS

Lab ID: L2213568-01 D
Client ID: A3000-PRN01-220310
Sample Location: RHBFS A3+00 SAMPLE LOCATION

Date Collected: 03/10/22 14:50
Date Received: 03/16/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 03/23/22 12:49
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 03/22/22 05:01

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Undecane (C11)	4.92		mg/l	0.222	0.021	20
n-Dodecane (C12)	7.80		mg/l	0.222	0.029	20
n-Tridecane (C13)	6.66		mg/l	1.11	0.197	20
n-Tetradecane (C14)	4.23		mg/l	0.222	0.022	20
Total Saturated Hydrocarbons	29.6		mg/l	0.011	0.0005	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	105		50-130
d50-Tetracosane	103		50-130

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 03/22/22 16:43
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 03/22/22 05:01

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01 Batch: WG1618210-1					
n-Nonane (C9)	ND		mg/l	0.011	0.004
n-Decane (C10)	ND		mg/l	0.011	0.001
n-Undecane (C11)	ND		mg/l	0.011	0.001
n-Dodecane (C12)	ND		mg/l	0.011	0.001
n-Tridecane (C13)	ND		mg/l	0.056	0.010
2,6,10-Trimethyldodecane (1380)	ND		mg/l	0.011	0.001
n-Tetradecane (C14)	ND		mg/l	0.011	0.001
2,6,10-Trimethyltridecane (1470)	ND		mg/l	0.011	0.002
n-Pentadecane (C15)	ND		mg/l	0.011	0.002
n-Hexadecane (C16)	ND		mg/l	0.011	0.002
Norpristane (1650)	ND		mg/l	0.011	0.002
n-Heptadecane (C17)	ND		mg/l	0.011	0.002
Pristane	ND		mg/l	0.011	0.002
n-Octadecane (C18)	ND		mg/l	0.011	0.001
Phytane	ND		mg/l	0.011	0.001
n-Nonadecane (C19)	ND		mg/l	0.011	0.002
n-Eicosane (C20)	ND		mg/l	0.011	0.001
n-Heneicosane (C21)	ND		mg/l	0.011	0.001
n-Docosane (C22)	ND		mg/l	0.011	0.0005
n-Tricosane (C23)	ND		mg/l	0.011	0.001
n-Tetracosane (C24)	ND		mg/l	0.011	0.001
n-Pentacosane (C25)	ND		mg/l	0.056	0.007
n-Hexacosane (C26)	ND		mg/l	0.011	0.001
n-Heptacosane (C27)	ND		mg/l	0.011	0.001
n-Octacosane (C28)	ND		mg/l	0.011	0.002
n-Nonacosane (C29)	ND		mg/l	0.011	0.001
n-Triacontane (C30)	ND		mg/l	0.011	0.001
n-Hentriacontane (C31)	ND		mg/l	0.011	0.001
n-Dotriacontane (C32)	ND		mg/l	0.011	0.001

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 03/22/22 16:43
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 03/22/22 05:01

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01 Batch: WG1618210-1					
n-Tritriacontane (C33)	ND		mg/l	0.011	0.001
n-Tetratriacontane (C34)	ND		mg/l	0.011	0.002
n-Pentatriacontane (C35)	ND		mg/l	0.011	0.002
n-Hexatriacontane (C36)	ND		mg/l	0.011	0.002
n-Heptatriacontane (C37)	ND		mg/l	0.011	0.002
n-Octatriacontane (C38)	ND		mg/l	0.011	0.002
n-Nonatriacontane (C39)	ND		mg/l	0.011	0.002
n-Tetracontane (C40)	ND		mg/l	0.011	0.002
C9-C44 Total Petroleu	ND		mg/l	0.367	0.062
C10-C28 DRO	0.134	J	mg/l	0.233	0.040
C28-C40 ORO	ND		mg/l	0.122	0.018
Total Saturated Hydrocarbons	ND		mg/l	0.011	0.0005

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	110		50-130
d50-Tetracosane	108		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHAR, CUTOUT ADIT 3
Project Number: CTO-22F0106
Lab Number: L2213568
Report Date: 03/23/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01 Batch: WG1618210-2 WG1618210-3								
Nonane (C9)	84		82		50-130	2		30
n-Decane (C10)	89		87		50-130	2		30
n-Dodecane (C12)	91		92		50-130	1		30
n-Tetradecane (C14)	95		95		50-130	0		30
n-Hexadecane (C16)	103		105		50-130	2		30
n-Octadecane (C18)	112		113		50-130	1		30
n-Nonadecane (C19)	103		104		50-130	1		30
n-Eicosane (C20)	102		102		50-130	0		30
n-Docosane (C22)	101		102		50-130	1		30
n-Tetracosane (C24)	105		105		50-130	0		30
n-Hexacosane (C26)	104		104		50-130	0		30
n-Octacosane (C28)	103		102		50-130	1		30
n-Triacontane (C30)	103		102		50-130	1		30
n-Hexatriacontane (C36)	90		90		50-130	0		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	104		105		50-130
d50-Tetracosane	103		103		50-130

Project Name: SITE CHAR, CUTOUT ADIT 3
Project Number: CTO-22F0106

Lab Number: L2213568
Report Date: 03/23/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Present/Intact

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2213568-01A	Glass 250ml/8oz unpreserved	A	NA		3.6	Y	Present/Intact		A2-SHC(7)

*Values in parentheses indicate holding time in days

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Data Qualifiers

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL World Class Chemistry

320 FORBES BLVD MANSFIELD MA 02048

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 3/16/22

ALPHA Job #: L2213568

Project Information

Project Name: SITE CHAR, CUTOUT ADIT 3

Project Location: RHBFS A3+00 Sample Location

Project #: CTO-22F0106

Project Manager: [redacted] (b) (6)

ALPHA Quote #:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☒ Same as Client info PO #: 02.30

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

Client Information

Client: GSI -Rhodes for CTO 22F0106 (AECOM)

Address: 1001 Bishop Street,Suite 1600

Honolulu, HI 96813, United States

Phone: [redacted] (b) (6)

Fax: -

Email: [redacted] (b) (6) @aecom.com

☐ These samples have been Previously analyzed by Alpha

Turn-Around Time

☐ Standard ☒ Rush (ONLY IF PRE-APPROVED)

Due Date: 3/20/2022 Time:

ANALYSIS

Saturated Hydrocarbon Analysis

SAMPLE HANDLING
Filtration
☐ Done
☒ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

Sample Specific Comments

TOTAL # BOTTLES

Other Project Specific Requirements/Comments/Detection Limits:

Run Saturated Hydrocarbon analysis (SHC)
Send results to peggy.schuler@aecom.com, Alethea.ramos@aecom.com
llrhodes@gsi-net.com and hold sample for possible additional analysis
C/O Susan Neal Mansfield

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Saturated Hydrocarbon Analysis	Sample Specific Comments	TOTAL # BOTTLES
13568-01	A3000-PRN01-220310	03/10/22	1450	Product	JSH	☒	Product/waterJar	4

Container Type	-	-	-	-	-	-	-	-	-	-	-	-
Preservative	-	-	-	-	-	-	-	-	-	-	-	-

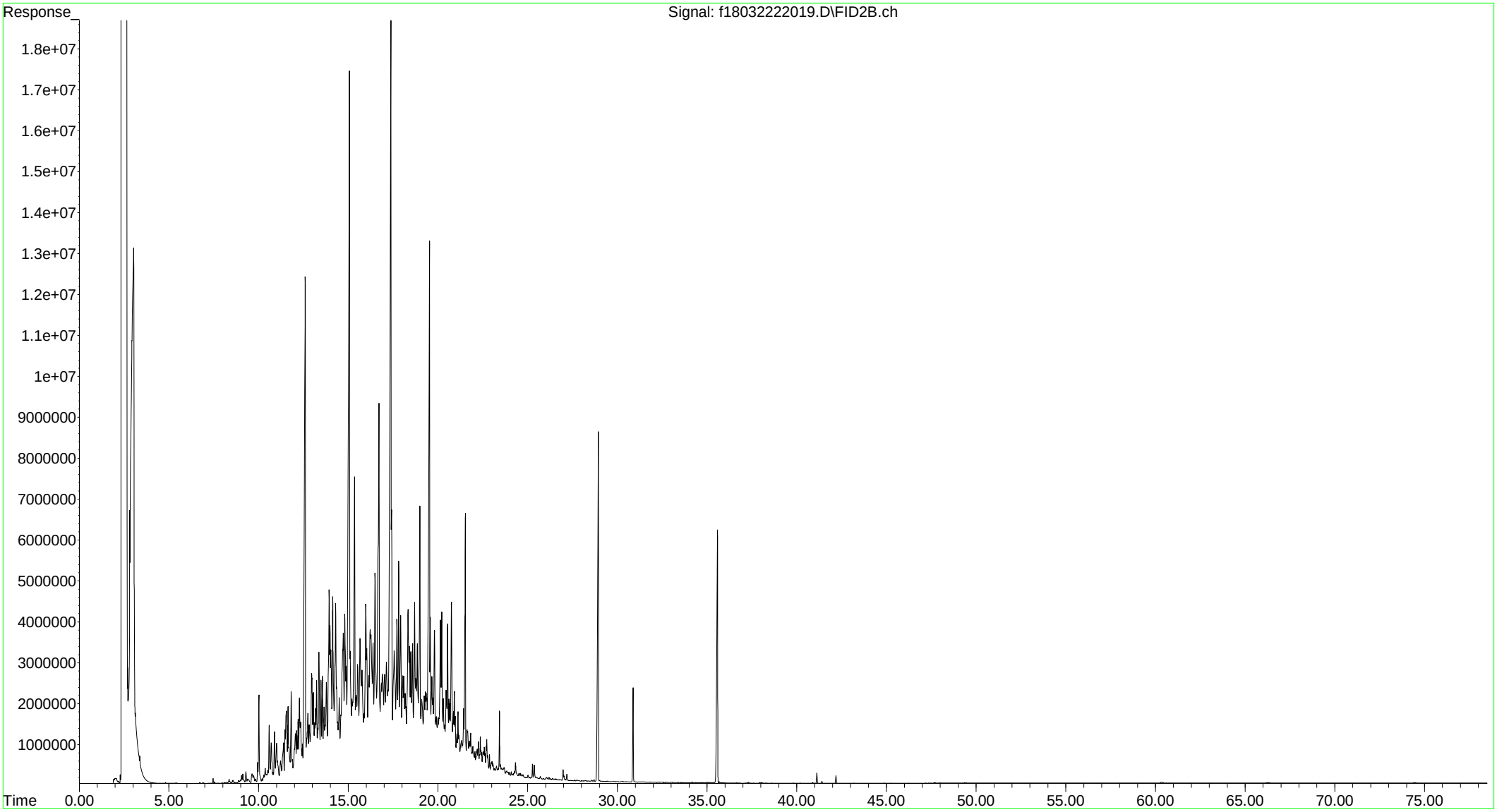
Relinquished By:	Date/Time	Received By:	Date/Time
[redacted] (b) (6)	Mar 11, 2022 1500	[redacted] (b) (6)	3/11/22 1500
	3/11/22 1531		
fedex	3/16/22 10:08		3/16/22 10:08

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

FORM NO: 01-01(I-NJ) (rev. 5-JAN-12)

GC-FID Chromatogram

```
File       :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222019.D
Operator   : FID18:WR
Acquired   : 22 Mar 2022  10:28 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: L2213568-01,42,,,R2C
Misc Info  : WG1618558,WG1618210,ICAL18676
Vial Number: 60
```



```
File        :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222029.D
Operator    : FID18:WR
Acquired    : 23 Mar 2022  12:49 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: l2213568-01d,42,20
Misc Info   : WG1618558,WG1618210,ICAL18676
Vial Number: 65
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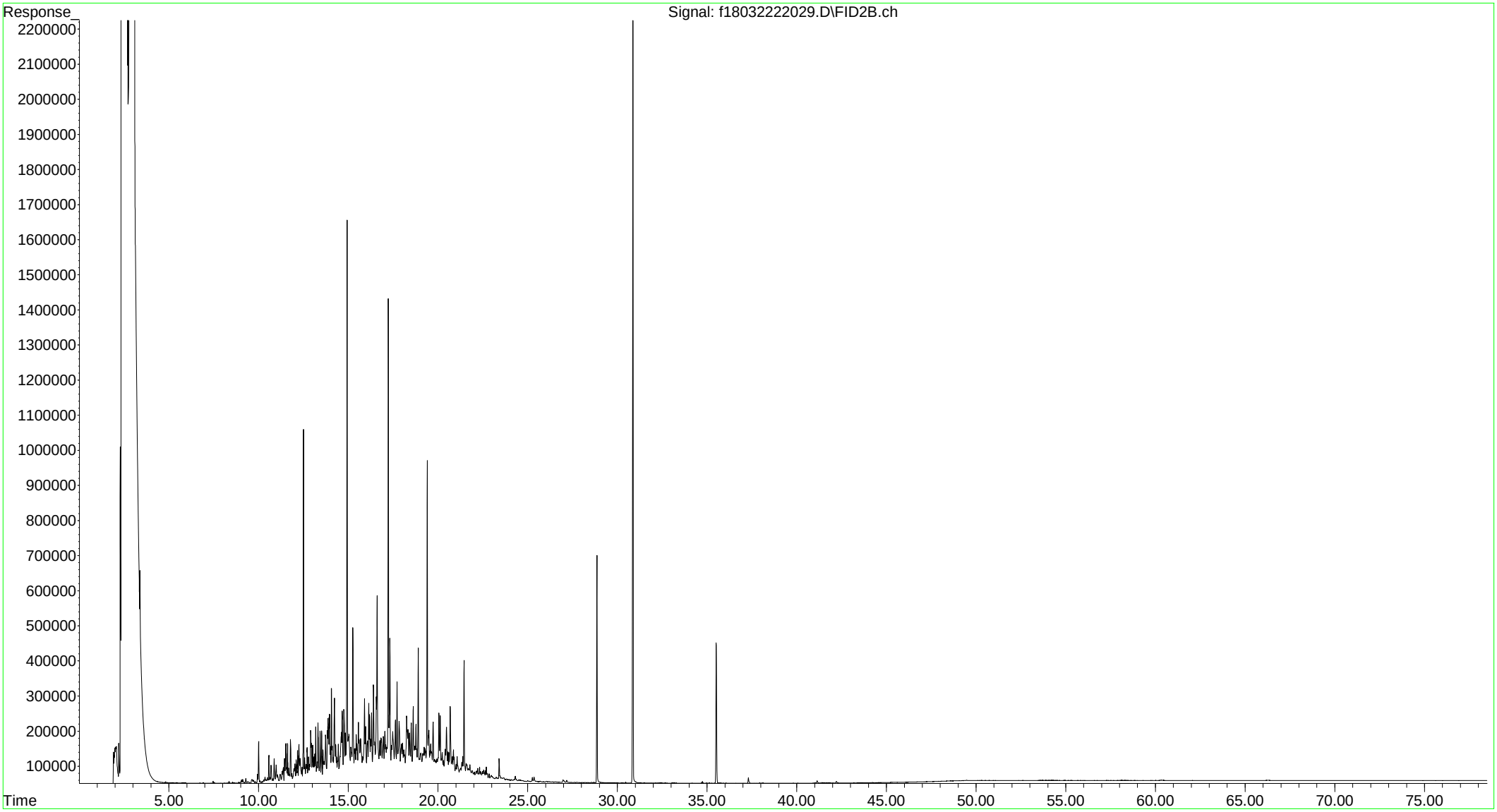

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File       :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222011.D
Operator   : FID18:WR
Acquired   : 22 Mar 2022  04:43 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: WG1618210-1
Misc Info  : WG1618558,WG1618210,ICAL18676
Vial Number: 56
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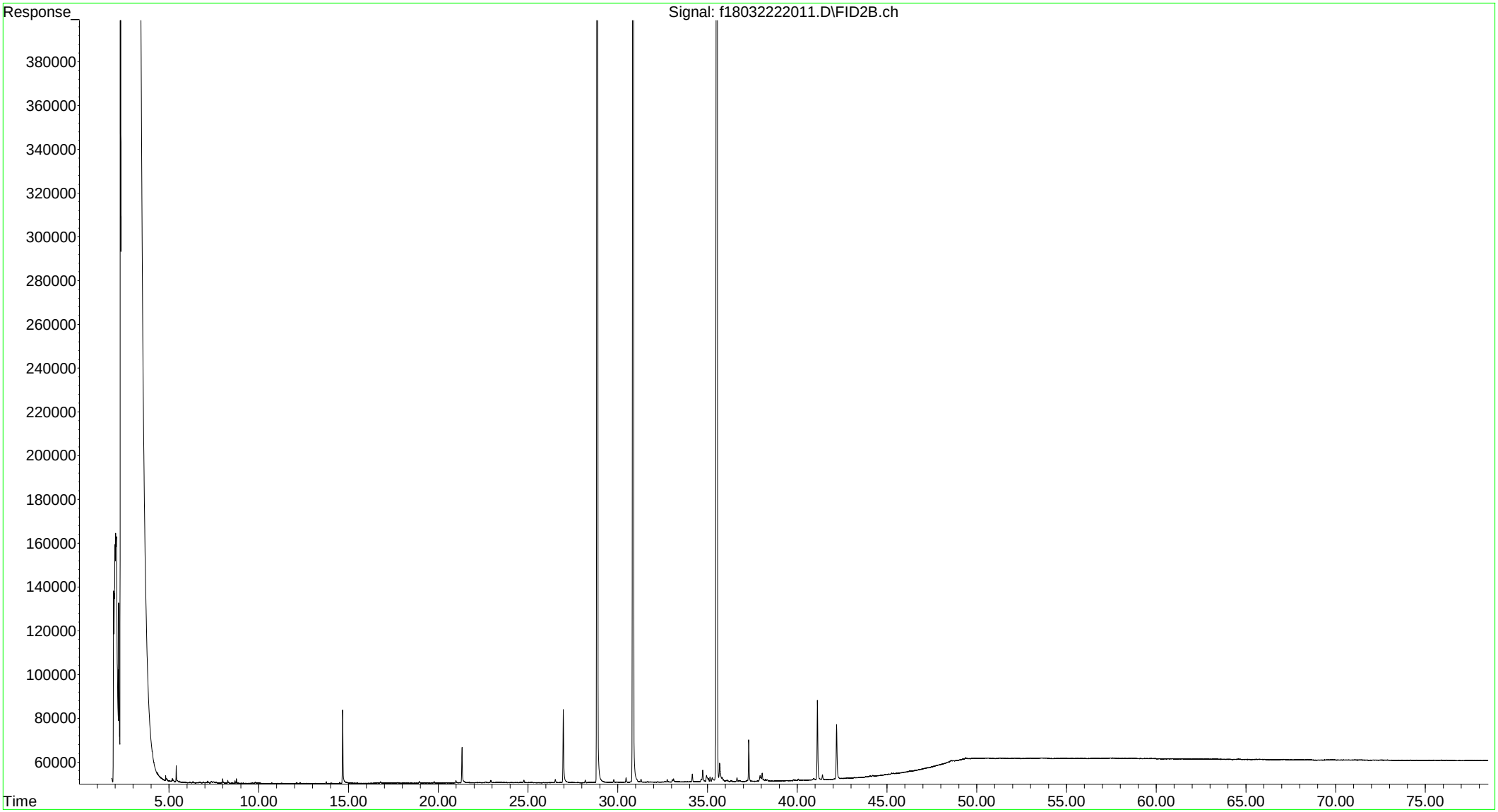

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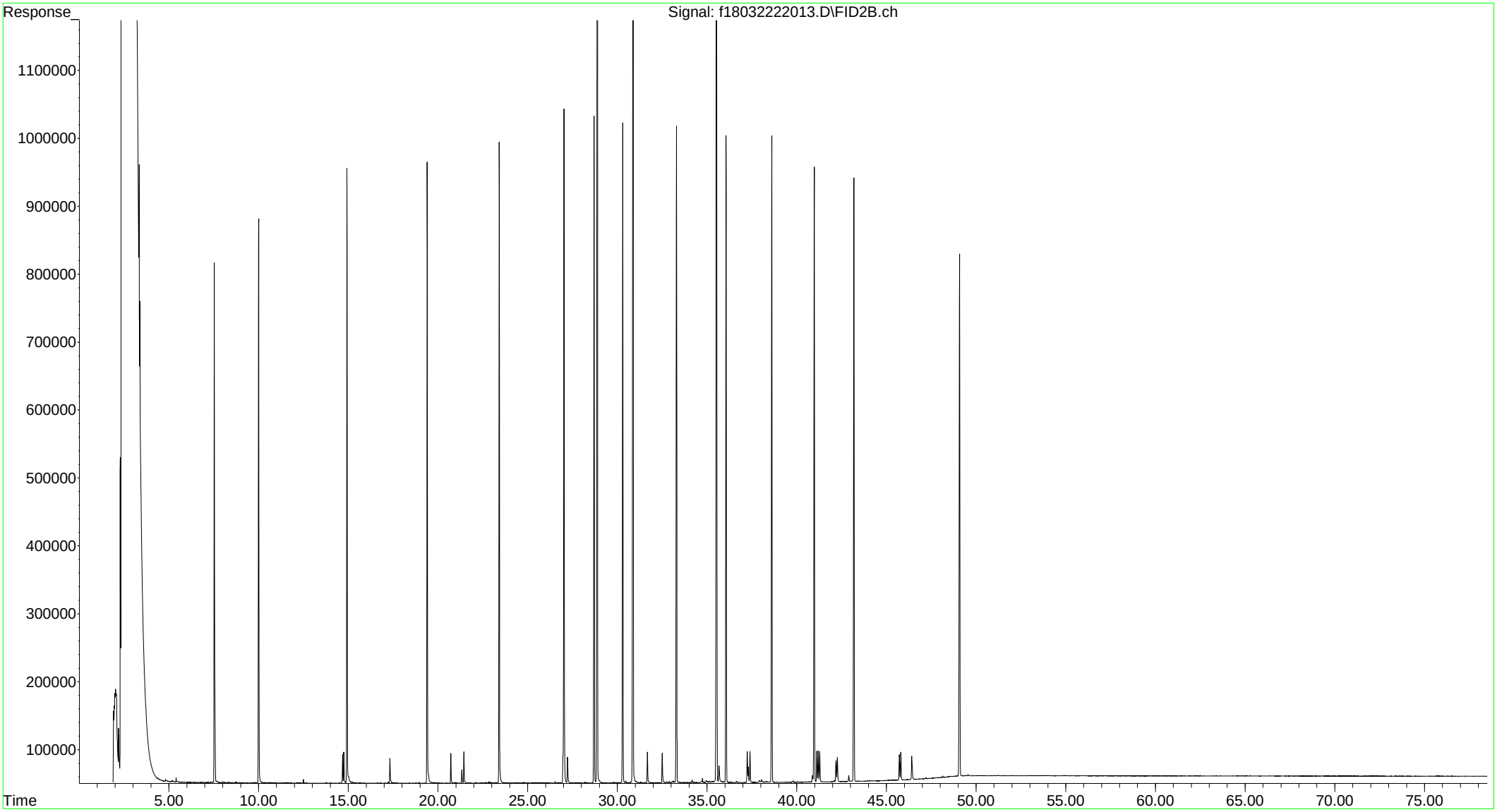
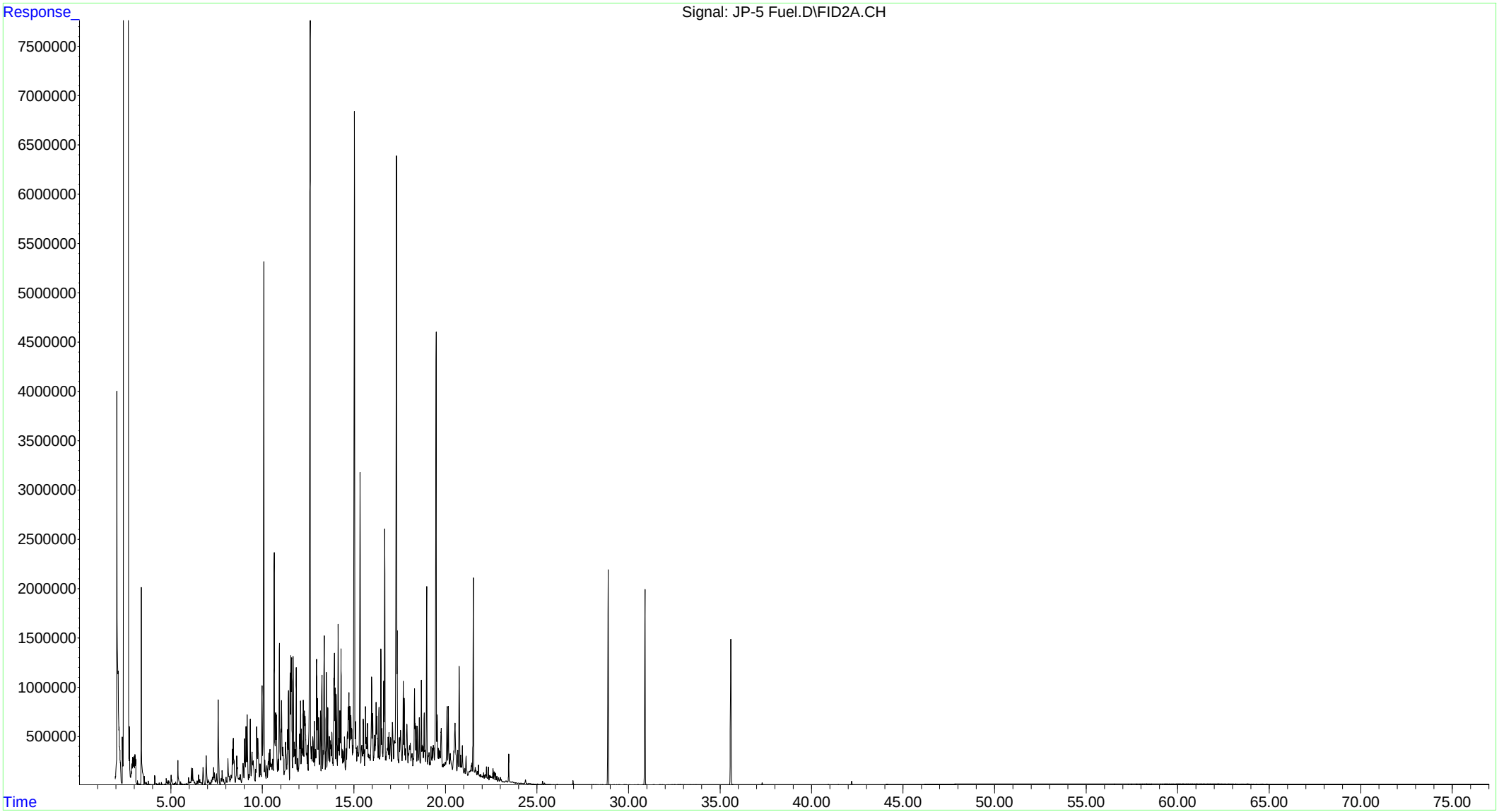
File        :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222013.D
Operator    : FID18:WR
Acquired    : 22 Mar 2022  06:09 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: WG1618210-2,42,,
Misc Info   : WG1618558,WG1618210,ICAL18676
Vial Number: 57
```



Petroleum Reference Standards

```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\JP-5 Fu
...         el.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 19 Nov 2011   4:22 pm using AcqMethod FRNC2AF.M
Sample    : JP-5 FUEL
Misc Info : F042710P
```



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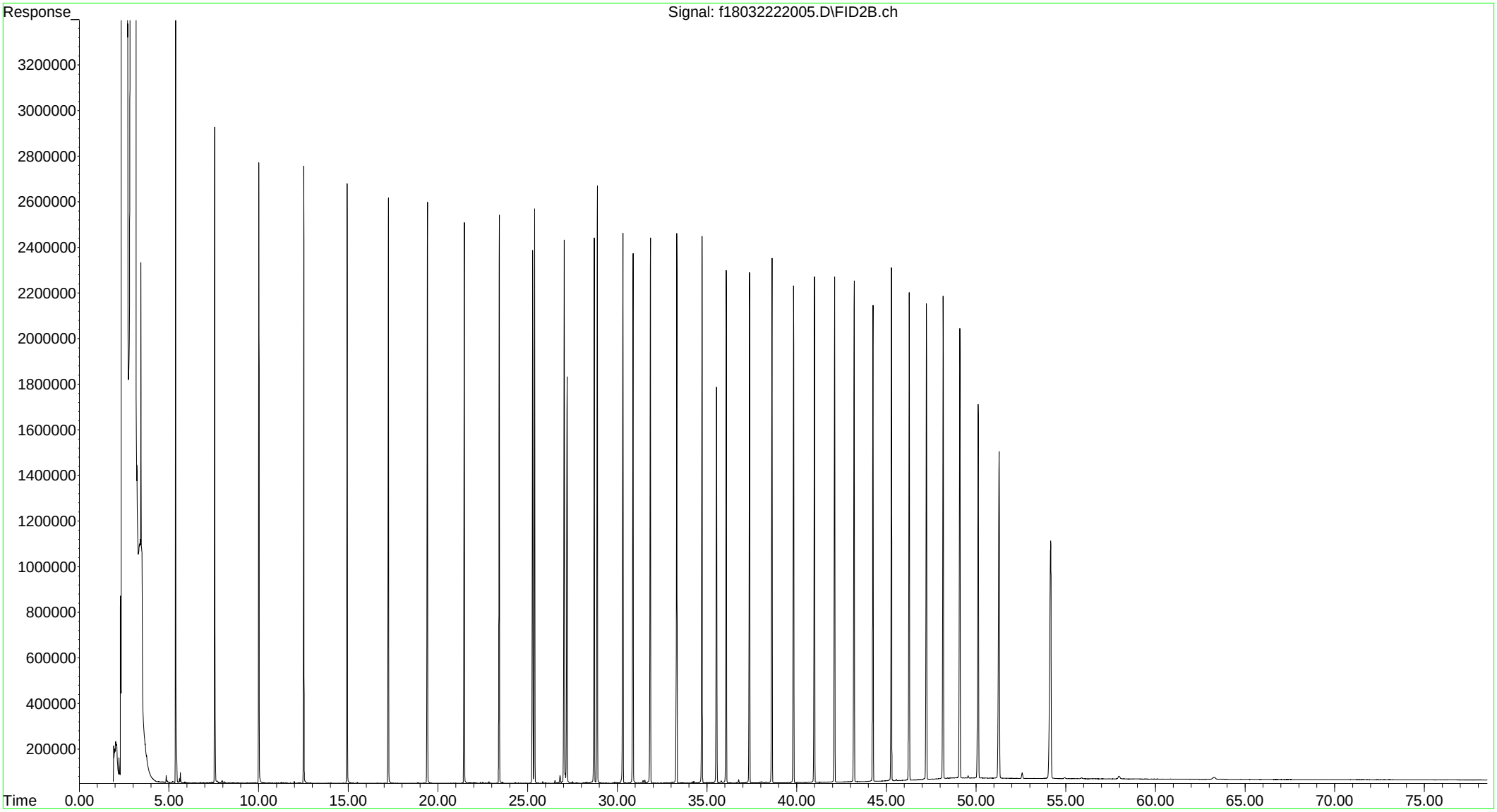
File        :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222005.D
Operator    : FID18:WR
Acquired    : 22 Mar 2022  12:16 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: WG1618558-1
Misc Info   : WG1618558,FRBE45,ICAL18676
Vial Number: 53
```



Total Saturated Hydrocarbons by GC/FID

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222019.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 10:28 pm
Operator : FID18:WR
Sample : L2213568-01,42,,,R2C
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 60 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

	Compound	R.T.	Response	Conc	Units	
	Internal Standards					
1) I	5-alpha-androstane	30.881	54723123	50.000	ug/mL	M4
	System Monitoring Compounds					
19) s	ortho-terphenyl	28.943	305984432	269.426	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	538.85%#
24) s	d50-Tetracosane	35.576	245518221	265.880	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	531.76%#
	Target Compounds					
2) t	n-Octane (C8)	0.000	0	N.D.	ug/mL	d
3) t	n-Nonane (C9)	7.529	778273	0.851	ug/mL	M4
4) t	n-Decane (C10)	10.017	54374551	57.200	ug/mL	M4
5) t	n-Undecane (C11)	12.595	434391544	454.690	ug/mL	M4
6) t	n-Dodecane (C12)	15.062f	708145884	731.890	ug/mL	M4
7) t	n-Tridecane (C13)	17.374f	683138568	701.132	ug/mL	M4
8) t	1380	18.993	148440109	148.010	ug/mL	M4
9) t	n-Tetradecane (C14)	19.529f	419776072	418.559	ug/mL	M4
10) t	1470	20.751	109294236	108.071	ug/mL	M4
11) t	n-Pentadecane (C15)	21.527	163490824	161.661	ug/mL	M4
12) t	n-Hexadecane (C16)	23.426	30896263	30.507	ug/mL	M4
13) t	1650	24.322	9212448	8.935	ug/mL	M4
14) t	n-Heptadecane (C17)	25.263	7134056	6.919	ug/mL	M4
15) t	Pristane	25.361	10695163	10.227	ug/mL	M4
16) t	n-Octadecane (C18)	27.017	2707523	2.597	ug/mL	M4
17) t	Phytane	27.179	4470790	4.636	ug/mL	M4
18) t	n-Nonadecane (C19)	28.702	888827	0.849	ug/mL	M4
20) t	n-Eicosane (C20)	30.295	594114	0.563	ug/mL	M4
21) t	n-Heneicosane (C21)	31.821	260006	0.244	ug/mL	M4
22) t	n-Docosane (C22)	33.290	111888	0.105	ug/mL	M4
23) t	n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d
25) t	n-Tetracosane (C24)	0.000	0	N.D.	ug/mL	d
26) t	n-Pentacosane (C25)	0.000	0	N.D.	ug/mL	d
27) t	n-Hexacosane (C26)	38.593	129376	0.120	ug/mL	M4
28) t	n-Heptacosane (C27)	39.805	164966	0.153	ug/mL	M4
29) t	n-Octacosane (C28)	40.967	154111	0.140	ug/mL	M4
30) t	n-Nonacosane (C29)	42.090	118681	0.108	ug/mL	M4
31) t	n-Triacontane (C30)	43.180	118231	0.107	ug/mL	M4
32) t	n-Hentriacontane (C31)	44.226	110925	0.104	ug/mL	M4
33) t	n-Dotriacontane (C32)	45.250	105556	0.094	ug/mL	M4
34) t	n-Tritriacontane (C33)	46.241	70678	0.065	ug/mL	M4
35) t	n-tetratriacontane (C34)	47.199	61959	0.057	ug/mL	M4
36) t	n-Pentatriacontane (C35)	48.134	55991	0.054	ug/mL	M4
37) t	n-Hexatriacontane (C36)	49.063	46807	0.038	ug/mL	M4
38) t	n-Heptatriacontane (C37)	50.086	36674	0.033	ug/mL	M4
39) t	n-Octatriacontane (C38)	51.245	23231	0.020	ug/mL	M4
40) t	n-Nonatriacontane (C39)	0.000	0	N.D.	ug/mL	
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL	
42) h	C9-C44 Total Petroleu...	35.451	17400771744	16524.367	ug/mL	m
42) h	C9-C44 Total Petroleu BS	35.451	17204088188	16337.590	ug/mL	m
43) h	C9-C40 Total Petroleu...	0.000	0	N.D.	ug/ml	d

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222019.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 10:28 pm
Operator : FID18:WR
Sample : L2213568-01,42,,,R2C
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 60 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

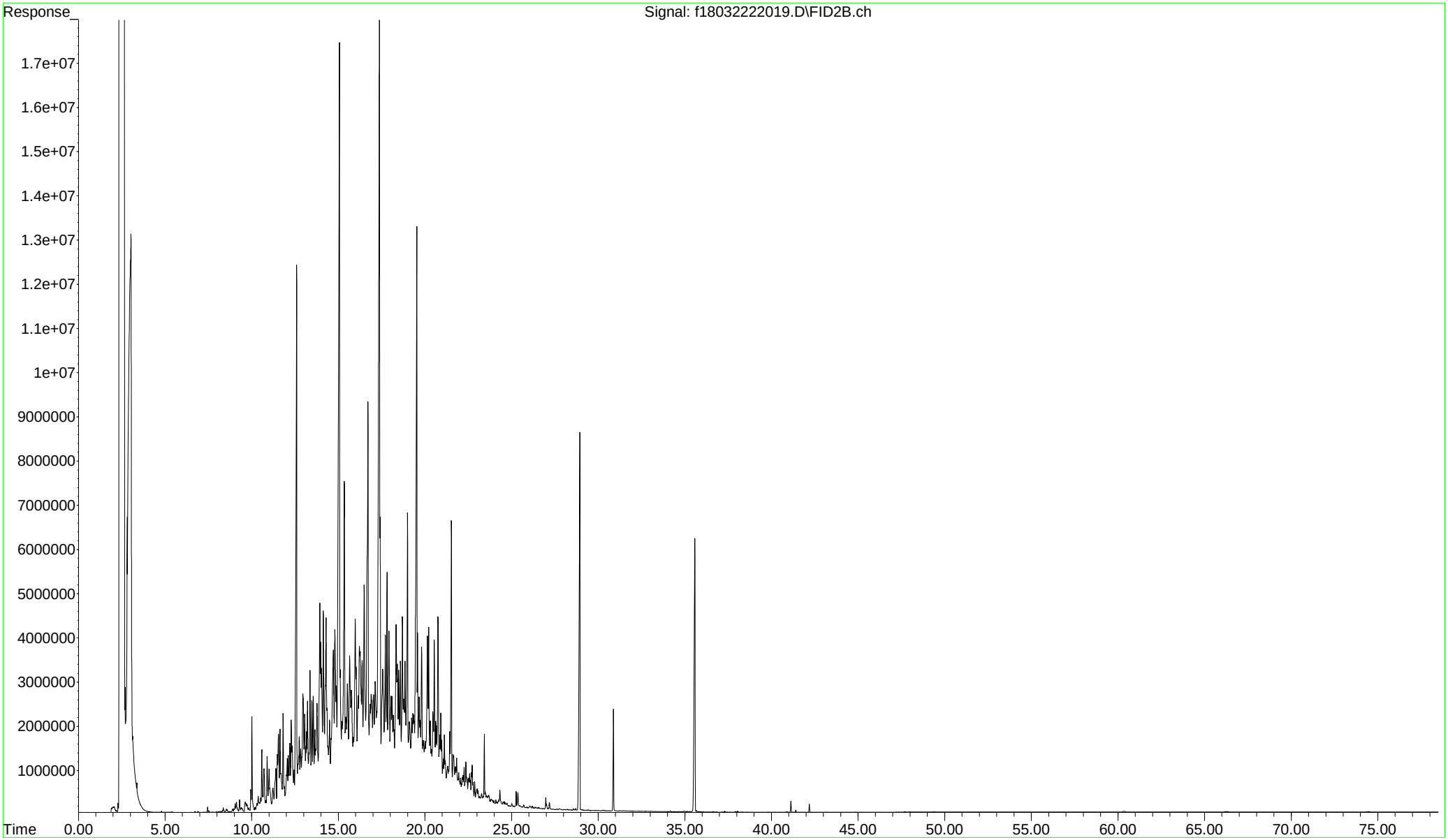
	Compound	R.T.	Response	Conc Units
44) h	C10-C28 DRO	25.502	17173074061	16640.141 ug/mL m
44) h	C10-C28 DRO BS	25.502	17147050936	16614.926 ug/mLm
45) h	C28-C40 ORO	47.557	102111105	93.392 ug/mL m
45) h	C28-C40 ORO BS	47.557	16865606	15.425 ug/mLm
46) h	Total Resolved Hydroc...	37.870	9656555327	9170.195 ug/mL m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222019.D
Operator : FID18:WR
Acquired : 22 Mar 2022 10:28 pm using AcqMethod FID18.M
Sample Name: L2213568-01,42,,,R2C
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 60
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222029.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 12:49 pm
Operator : FID18:WR
Sample : l2213568-01d,42,20
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 65 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 14:19:49 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222202R
Blank File : f18032222025.D

Sub List : Default - All compounds listed

	Compound	R.T.	Response	Conc	Units	
	Internal Standards					
1) I	5-alpha-androstane	30.872	48454780	50.000	ug/mL	M4
	System Monitoring Compounds					
19) s	ortho-terphenyl	28.861	13184900	13.111	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	26.22%#
24) s	d50-Tetracosane	35.505	10567047	12.924	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	25.85%#
	Target Compounds					
2) t	n-Octane (C8)	0.000	0	N.D.	ug/mL	
3) t	n-Nonane (C9)	0.000	0	N.D.	ug/mL	d
4) t	n-Decane (C10)	0.000	0	N.D.	ug/mL	d
5) t	n-Undecane (C11)	12.507	18724495	22.135	ug/mL	M4
6) t	n-Dodecane (C12)	14.931	30069697	35.098	ug/mL	M4
7) t	n-Tridecane (C13)	17.229	25848589	29.961	ug/mL	M4
8) t	1380	0.000	0	N.D.	ug/mL	d
9) t	n-Tetradecane (C14)	19.402	16917955	19.051	ug/mL	M4
10) t	1470	0.000	0	N.D.	ug/mL	d
11) t	n-Pentadecane (C15)	0.000	0	N.D.	ug/mL	d
12) t	n-Hexadecane (C16)	0.000	0	N.D.	ug/mL	d
13) t	1650	0.000	0	N.D.	ug/mL	d
14) t	n-Heptadecane (C17)	0.000	0	N.D.	ug/mL	d
15) t	Pristane	0.000	0	N.D.	ug/mL	d
16) t	n-Octadecane (C18)	0.000	0	N.D.	ug/mL	d
17) t	Phytane	0.000	0	N.D.	ug/mL	d
18) t	n-Nonadecane (C19)	0.000	0	N.D.	ug/mL	d
20) t	n-Eicosane (C20)	0.000	0	N.D.	ug/mL	d
21) t	n-Heneicosane (C21)	0.000	0	N.D.	ug/mL	d
22) t	n-Docosane (C22)	0.000	0	N.D.	ug/mL	d
23) t	n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d
25) t	n-Tetracosane (C24)	0.000	0	N.D.	ug/mL	d
26) t	n-Pentacosane (C25)	0.000	0	N.D.	ug/mL	d
27) t	n-Hexacosane (C26)	0.000	0	N.D.	ug/mL	d
28) t	n-Heptacosane (C27)	0.000	0	N.D.	ug/mL	d
29) t	n-Octacosane (C28)	0.000	0	N.D.	ug/mL	d
30) t	n-Nonacosane (C29)	0.000	0	N.D.	ug/mL	d
31) t	n-Triacontane (C30)	0.000	0	N.D.	ug/mL	
32) t	n-Hentriacontane (C31)	0.000	0	N.D.	ug/mL	
33) t	n-Dotriacontane (C32)	0.000	0	N.D.	ug/mL	
34) t	n-Tritriacontane (C33)	0.000	0	N.D.	ug/mL	
35) t	n-tetratriacontane (C34)	0.000	0	N.D.	ug/mL	
36) t	n-Pentatriacontane (C35)	0.000	0	N.D.	ug/mL	
37) t	n-Hexatriacontane (C36)	0.000	0	N.D.	ug/mL	
38) t	n-Heptatriacontane (C37)	0.000	0	N.D.	ug/mL	
39) t	n-Octatriacontane (C38)	0.000	0	N.D.	ug/mL	
40) t	n-Nonatriacontane (C39)	0.000	0	N.D.	ug/mL	
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL	
42) h	C9-C44 Total Petroleu...	35.451	899042042	964.208	ug/mL	m
42) h	C9-C44 Total Petroleu BS	35.451	752747758	807.309	ug/mLm	
43) h	C9-C40 Total Petroleu...	0.000	0	N.D.	ug/ml	d

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222029.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 12:49 pm
Operator : FID18:WR
Sample : l2213568-01d,42,20
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 65 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 14:19:49 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222202R
Blank File : f18032222025.D

Sub List : Default - All compounds listed

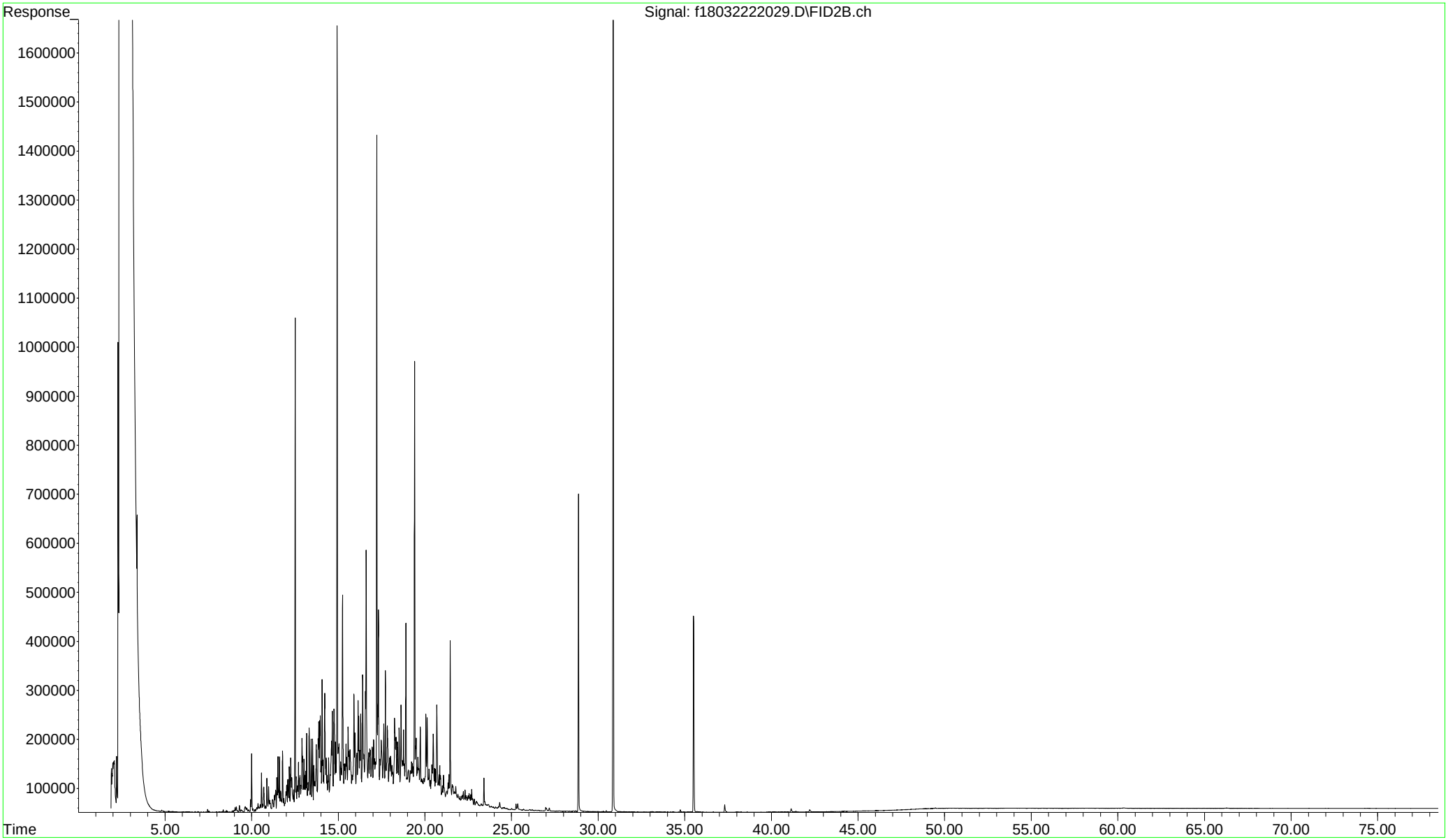
	Compound	R.T.	Response	Conc	Units	
44) h	C10-C28 DRO	25.502	779652031	853.187	ug/mL	m
44) h	C10-C28 DRO BS	25.502	747174476	817.646	ug/mL	m
45) h	C28-C40 ORO	47.557	55585714	57.416	ug/mL	m
45) h	C28-C40 ORO BS	47.557	1125726	1.163	ug/mL	m
46) h	Total Resolved Hydroc...	37.870	473710064	508.046	ug/mL	m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222029.D
Operator : FID18:WR
Acquired : 23 Mar 2022 12:49 pm using AcqMethod FID18.M
Sample Name: l2213568-01d,42,20
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 65
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222011.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 04:43 pm
Operator : FID18:WR
Sample : WG1618210-1
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 56 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:34 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

	Compound	R.T.	Response	Conc	Units	
	Internal Standards					
1) I	5-alpha-androstane	30.868	50483982	50.000	ug/mL	M4
	System Monitoring Compounds					
19) s	ortho-terphenyl	28.875	57421538	54.807	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	109.61%
24) s	d50-Tetracosane	35.518	45953855	53.944	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	107.89%
	Target Compounds					
2) t	n-Octane (C8)	0.000	0	N.D.	ug/mL	d
3) t	n-Nonane (C9)	0.000	0	N.D.	ug/mL	
4) t	n-Decane (C10)	0.000	0	N.D.	ug/mL	
5) t	n-Undecane (C11)	0.000	0	N.D.	ug/mL	
6) t	n-Dodecane (C12)	0.000	0	N.D.	ug/mL	
7) t	n-Tridecane (C13)	0.000	0	N.D.	ug/mL	
8) t	1380	0.000	0	N.D.	ug/mL	
9) t	n-Tetradecane (C14)	0.000	0	N.D.	ug/mL	
10) t	1470	0.000	0	N.D.	ug/mL	
11) t	n-Pentadecane (C15)	0.000	0	N.D.	ug/mL	
12) t	n-Hexadecane (C16)	0.000	0	N.D.	ug/mL	
13) t	1650	0.000	0	N.D.	ug/mL	
14) t	n-Heptadecane (C17)	0.000	0	N.D.	ug/mL	
15) t	Pristane	0.000	0	N.D.	ug/mL	
16) t	n-Octadecane (C18)	0.000	0	N.D.	ug/mL	d
17) t	Phytane	0.000	0	N.D.	ug/mL	
18) t	n-Nonadecane (C19)	0.000	0	N.D.	ug/mL	
20) t	n-Eicosane (C20)	0.000	0	N.D.	ug/mL	
21) t	n-Heneicosane (C21)	0.000	0	N.D.	ug/mL	
22) t	n-Docosane (C22)	0.000	0	N.D.	ug/mL	
23) t	n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d
25) t	n-Tetracosane (C24)	0.000	0	N.D.	ug/mL	
26) t	n-Pentacosane (C25)	0.000	0	N.D.	ug/mL	d
27) t	n-Hexacosane (C26)	0.000	0	N.D.	ug/mL	
28) t	n-Heptacosane (C27)	0.000	0	N.D.	ug/mL	
29) t	n-Octacosane (C28)	0.000	0	N.D.	ug/mL	d
30) t	n-Nonacosane (C29)	0.000	0	N.D.	ug/mL	d
31) t	n-Triacontane (C30)	0.000	0	N.D.	ug/mL	
32) t	n-Hentriacontane (C31)	0.000	0	N.D.	ug/mL	
33) t	n-Dotriacontane (C32)	0.000	0	N.D.	ug/mL	
34) t	n-Tritriacontane (C33)	0.000	0	N.D.	ug/mL	
35) t	n-tetratriacontane (C34)	0.000	0	N.D.	ug/mL	
36) t	n-Pentatriacontane (C35)	0.000	0	N.D.	ug/mL	
37) t	n-Hexatriacontane (C36)	0.000	0	N.D.	ug/mL	
38) t	n-Heptatriacontane (C37)	0.000	0	N.D.	ug/mL	
39) t	n-Octatriacontane (C38)	0.000	0	N.D.	ug/mL	
40) t	n-Nonatriacontane (C39)	0.000	0	N.D.	ug/mL	
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL	
42) h	C9-C44 Total Petroleu...	35.451	175432930	180.586	ug/mL	m
42) h	C9-C44 Total Petroleu BS	35.451	-21250626	N.D.	ug/mLm	
43) h	C9-C40 Total Petroleu...	0.000	0	N.D.	ug/ml	d

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222011.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 04:43 pm
Operator : FID18:WR
Sample : WG1618210-1
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 56 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:34 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

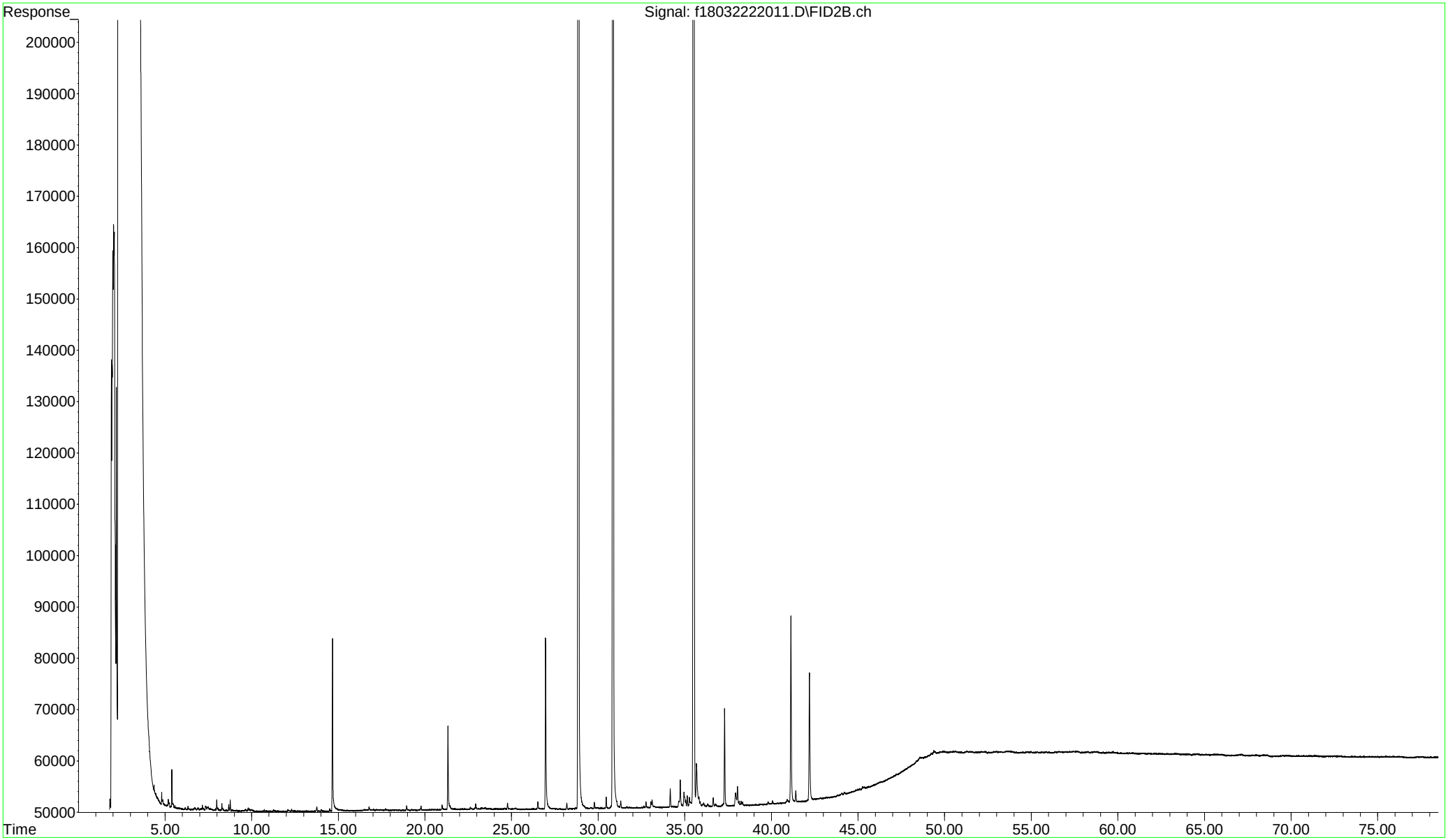
	Compound	R.T.	Response	Conc	Units	
44) h	C10-C28 DRO	25.502	37483589	39.370	ug/mL	m
44) h	C10-C28 DRO BS	25.502	11460464	12.037	ug/mL	m
45) h	C28-C40 ORO	47.557	67950383	67.367	ug/mL	m
45) h	C28-C40 ORO BS	47.557	-17295116	N.D.	ug/mL	m
46) h	Total Resolved Hydroc...	37.870	11300121	11.632	ug/mL	m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222011.D
Operator : FID18:WR
Acquired : 22 Mar 2022 04:43 pm using AcqMethod FID18.M
Sample Name: WG1618210-1
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 56
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222013.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 06:09 pm
Operator : FID18:WR
Sample : WG1618210-2,42,,
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 57 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:35 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

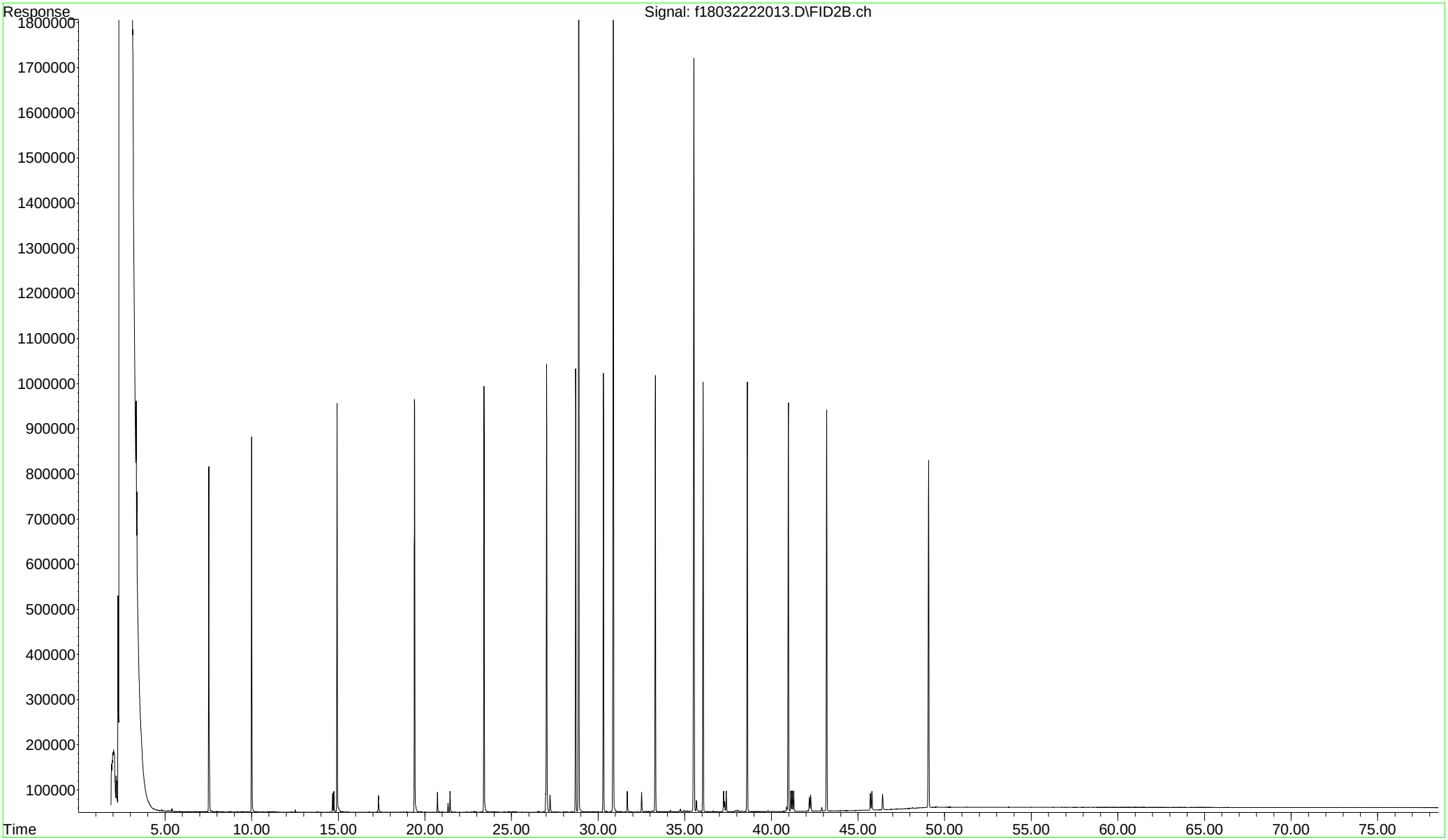
Sub List : SHC_QC_Samples - SHC_QC_Samples

	Compound	R.T.	Response	Conc Units
	Internal Standards			
1) I	5-alpha-androstane	30.877	52029457	50.000 ug/mL M4
	System Monitoring Compounds			
19) s	ortho-terphenyl	28.882	55885531	51.756 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery	= 103.51%
24) s	d50-Tetracosane	35.526	45301463	51.598 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery	= 103.20%
	Target Compounds			
3) t	n-Nonane (C9)	7.528	14657467	16.854 ug/mL M4
4) t	n-Decane (C10)	10.003	16054725	17.763 ug/mL M4
6) t	n-Dodecane (C12)	14.925	16834167	18.299 ug/mL M4
9) t	n-Tetradecane (C14)	19.401	18077201	18.958 ug/mL M4
12) t	n-Hexadecane (C16)	23.411	19899046	20.665 ug/mL M4
16) t	n-Octadecane (C18)	27.023	22105365	22.301 ug/mL M4
18) t	n-Nonadecane (C19)	28.703	20447630	20.537 ug/mL M4
20) t	n-Eicosane (C20)	30.303	20392307	20.313 ug/mL M4
22) t	n-Docosane (C22)	33.299	20565456	20.236 ug/mL M4
25) t	n-Tetracosane (C24)	36.057	21090469	21.010 ug/mL M4
27) t	n-Hexacosane (C26)	38.606	21271120	20.752 ug/mL M4
29) t	n-Octacosane (C28)	40.979	21462311	20.527 ug/mL M4
31) t	n-Triacontane (C30)	43.188	21558343	20.571 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.074	20881086	17.946 ug/mL M4
42) h	C9-C44 Total Petroleu...	35.451	476735217	476.162 ug/mL m
42) h	C9-C44 Total Petroleu BS	35.451	280051661	279.715 ug/mLm
46) h	Total Resolved Hydroc...	37.870	300840580	300.479 ug/mL m
	SemiQuant Compounds - Not Calibrated on this Instrument			

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222013.D
Operator : FID18:WR
Acquired : 22 Mar 2022 06:09 pm using AcqMethod FID18.M
Sample Name: WG1618210-2,42,,
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 57
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222015.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 07:36 pm
Operator : FID18:WR
Sample : WG1618210-3,42,,
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 58 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : SHC_QC_Samples - SHC_QC_Samples

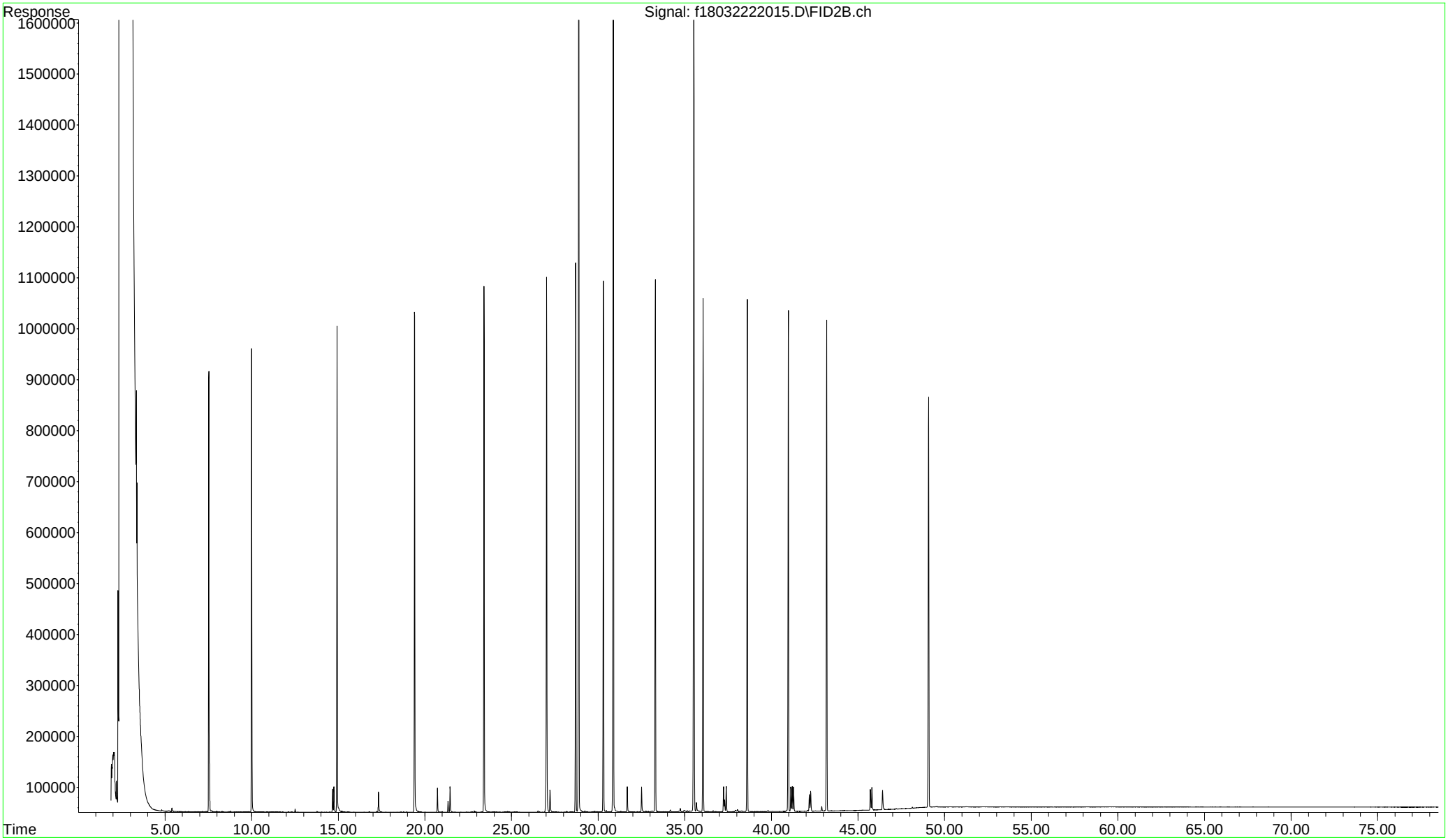
	Compound	R.T.	Response	Conc Units
	Internal Standards			
1) I	5-alpha-androstane	30.879	55914396	50.000 ug/mL M4
	System Monitoring Compounds			
19) s	ortho-terphenyl	28.884	60973999	52.545 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery	= 105.09%
24) s	d50-Tetracosane	35.524	48763918	51.683 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery	= 103.37%
	Target Compounds			
3) t	n-Nonane (C9)	7.528	15415319	16.494 ug/mL M4
4) t	n-Decane (C10)	10.003	16975049	17.477 ug/mL M4
6) t	n-Dodecane (C12)	14.925	18193680	18.403 ug/mL M4
9) t	n-Tetradecane (C14)	19.401	19438053	18.969 ug/mL M4
12) t	n-Hexadecane (C16)	23.410	21712928	20.982 ug/mL M4
16) t	n-Octadecane (C18)	27.023	24005428	22.535 ug/mL M4
18) t	n-Nonadecane (C19)	28.702	22156669	20.707 ug/mL M4
20) t	n-Eicosane (C20)	30.302	22119116	20.502 ug/mL M4
22) t	n-Docosane (C22)	33.300	22356256	20.469 ug/mL M4
25) t	n-Tetracosane (C24)	36.057	22761330	21.099 ug/mL M4
27) t	n-Hexacosane (C26)	38.607	22832341	20.727 ug/mL M4
29) t	n-Octacosane (C28)	40.979	22925515	20.403 ug/mL M4
31) t	n-Triacontane (C30)	43.193	22927943	20.358 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.076	22387734	17.904 ug/mL M4
42) h	C9-C44 Total Petroleu...	35.451	505845870	470.134 ug/mL m
42) h	C9-C44 Total Petroleu BS	35.451	309162314	287.336 ug/mLm
46) h	Total Resolved Hydroc...	37.870	323016486	300.212 ug/mL m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222015.D
Operator : FID18:WR
Acquired : 22 Mar 2022 07:36 pm using AcqMethod FID18.M
Sample Name: WG1618210-3,42,,
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 58
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



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Client: GSI Environmental Inc.

ATTN: [redacted] (b) (6)

Project Name: SITE CHAR, CUTOUT ADIT 3

Project Number: CTO-22F0106

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Sample Delivery Group Information

Sample Delivery Group Summary

Alpha Job Number : L2213568

Received : 16-MAR-2022
Reviewer : (b) (6)

Account Name : GSI Environmental Inc.
Project Number : CTO-22F0106
Project Name : SITE CHAR, CUTOUT ADIT 3

Delivery Information

Samples Delivered By : Express Ship
FedEx (270782039870)

Chain of Custody : Present

Cooler Information

Cooler	Seal/Seal#	Preservation	Temperature(°C)	Additional Information
A	Present/Intact/NA	Ice	3.6	

Condition Information

1) All samples on COC received? **YES**

2) Extra samples received? **NO**

3) Are there any sample container discrepancies? **NO**

4) Are there any discrepancies between sample labels & COC? **YES**
L2213568-01: 10-MAR-22 14:50 vs. 10-MAR-22 14:10

5) Are samples in appropriate containers for requested analysis? **YES**

6) Are samples properly preserved for requested analysis? **YES**

7) Are samples within holding time for requested analysis? **YES**

8) All sampling equipment returned? **NA**

Volatile Organics/VPH

1) Reagent Water Vials Frozen by Client? **NA**

LIMS Chain of Custody

ALPHA ANALYTICAL LABORATORIES, INC.
LOGIN CHAIN OF CUSTODY REPORT
Mar 23 2022, 05:07 pm

Login Number: L2213568
Account: GSI GSI Environmental Inc.Project: CTO-22F0106
Received: 16MAR22 Due Date: 23MAR22

Sample #	Client ID	Mat	PR	Collected
L2213568-01	A3000-PRN01-220310	1	2C	10MAR22 14:50

SHC and TPH DRO/ORO no clean up - report list made - include SHC quant report and PHI narrative OK to extract OOH A2-DPKG-FULL Package Due Date: 03/23/22

A2-DPKG-FULL,A2-SHC

Page 1

Logged By: [redacted] (b) (6)

Container Tracking

ALPHA ANALYTICAL LABORATORIES
Container Tracking Report

Container ID	Type	Status	Transaction Date	From Response	From Location	From Operator	To Response	To Location	To Operator
L2213568-01A	Glass-A.25	EMPTY	22-MAR-22	A2-CUSTODY-REFRIDGE	A2-ORGANIC PREP	[redacted]	A2-CUSTODY-REFRIDGE	A2-CUSTODY-REFRIDGE	[redacted]
L2213568-01A	Glass-A.25	INTACT	22-MAR-22	A2-CUSTODY-REFRIDGE	A2-CUSTODY-REFRIG-E1-S2	[redacted]	A2-ORGANIC PREP	A2-ORGANIC PREP	[redacted]
L2213568-01A	Glass-A.25	INTACT	17-MAR-22	A2-CUSTODY-REFRIDGE	A2-ORGANIC PREP	[redacted]	A2-CUSTODY-REFRIG-E1-S2	A2-CUSTODY-REFRIG-E1-S2	[redacted]
L2213568-01A	Glass-A.25	INTACT	17-MAR-22	A2-CUSTODY-REFRIDGE	A2-CUSTODY-REFRIG-E1-S2	[redacted]	A2-ORGANIC PREP	A2-ORGANIC PREP	[redacted]
L2213568-01A	Glass-A.25	INTACT	17-MAR-22	A2-CUSTODY-REFRIDGE	A2-CUSTODY-REFRIDGE	[redacted]	A2-CUSTODY-REFRIG-E1-S2	A2-CUSTODY-REFRIG-E1-S2	[redacted]
L2213568-01A	Glass-A.25	INTACT	17-MAR-22	A2-LOGIN	A2-LOGIN	[redacted]	A2-CUSTODY-REFRIDGE	A2-CUSTODY-REFRIDGE	[redacted]

Chain of Custody

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL — World Class Chemistry

320 FORBES BLVD
MANSFIELD MA
02048

Westborough, MA
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA
TEL: 508-822-9300
FAX: 508-822-3288

Date Rec'd in Lab: 3/16/22

ALPHA Job #: L2213568

Client Information

Client: GSI -Rhodes for CTO 22F0106 (AECOM)

Address: 1001 Bishop Street,Suite 1600

Honolulu, HI 96813, United States

Phone: [redacted] (b) (6)

Fax: -

Email: [redacted] (b) (6) @aecom.com

☐ These samples have been Previously analyzed by Alpha

Project Information

Project Name: SITE CHAR, CUTOUT ADIT 3

Project Location: RHBFS A3+00 Sample Location

Project #: CTO-22F0106

Project Manager: [redacted] (b) (6)

ALPHA Quote #:

Turn-Around Time

☐ Standard ☒ Rush (ONLY IF PRE-APPROVED)

Due Date: 3/20/2022 Time:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☒ Same as Client info PO #: 02.30

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

Run Saturated Hydrocarbon analysis (SHC)
Send results to peggy.schuler@aecom.com, Alethea.ramos@aecom.com
llrhodes@gsi-net.com and hold sample for possible additional analysis
C/O Susan Neal Mansfield

ANALYSIS

SAMPLE HANDLING
Filtration
☐ Done
☒ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

Saturated Hydrocarbon Analysis

Sample Specific Comments

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Saturated Hydrocarbon Analysis	Sample Specific Comments	TOTAL # BOTTLES
13568-01	A3000-PRN01-220310	03/10/22	1450	Product	JSH	☒	Product/waterJar	4

Container Type	-	-	-	-	-	-	-	-	-	-	-	-
Preservative	-	-	-	-	-	-	-	-	-	-	-	-

Relinquished By:	Date/Time	Received By:	Date/Time
[redacted] (b) (6)	March 11, 2022 1500	[redacted] (b) (6)	3/11/22 1500
	3/11/22 1531		
fedex	3/16/22 10:08		3/16/22 10:08

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

FORM NO: 01-01(I-NJ)
(rev. 5-JAN-12)

Organics

Saturated Hydrocarbon Analysis

Initial Calibration

Response Factor Report FID 18

Method Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Method File : HC18011822R_DRO.M
Title : FID Forensics
Last Update : Fri Jan 21 10:24:18 2022
Response Via : Initial Calibration

Calibration Files
1 =f18011822011.D 10 =f18011822013.D 50 =f18011822015.D 100 =f18011822017.D 200 =f18011822019.D
500 =f18011822021.D

		Compound	1	10	50	100	200	500	Avg	%RSD
1)	I	5-alpha-androstane	----------ISTD----------							
2)	t	n-Octane (C8)	0.786	0.832	0.850	0.792	0.775		0.807	4.00
3)	t	n-Nonane (C9)	0.813	0.855	0.886	0.824	0.801		0.836	4.13
4)	t	n-Decane (C10)	0.838	0.887	0.917	0.866	0.835		0.869	4.00
5)	t	n-Undecane (C11)	0.836	0.888	0.934	0.871	0.836		0.873	4.71
6)	t	n-Dodecane (C12)	0.852	0.902	0.936	0.883	0.846		0.884	4.18
7)	t	n-Tridecane (...	0.862	0.909	0.944	0.886	0.850		0.890	4.25
8)	t	1380	0.897	0.939	0.962	0.910	0.874		0.916	3.80
9)	t	n-Tetradecane...	0.897	0.939	0.962	0.910	0.874		0.916	3.80
10)	t	1470	0.916	0.949	0.957	0.916	0.881		0.924	3.27
11)	t	n-Pentadecane...	0.916	0.949	0.957	0.916	0.881		0.924	3.27
12)	t	n-Hexadecane ...	0.917	0.946	0.975	0.911	0.877		0.925	4.02
13)	t	1650	0.934	0.963	0.994	0.925	0.895		0.942	4.00
14)	t	n-Heptadecane...	0.934	0.963	0.994	0.925	0.895		0.942	4.00
15)	t	Pristane	0.953	0.983	0.996	0.943	0.903		0.955	3.82
16)	t	n-Octadecane ...	0.945	0.974	1.000	0.936	0.907		0.953	3.78
17)	t	Phytane	0.877	0.905	0.920	0.868	0.836		0.881	3.72
18)	t	n-Nonadecane ...	0.956	0.982	0.989	0.944	0.914		0.957	3.15
19)	s	ortho-terphenyl	1.057	1.037	1.070	1.018	0.983	1.062	1.038	3.15
20)	t	n-Eicosane (C20)	0.966	0.990	1.002	0.951	0.914		0.965	3.58
21)	t	n-Heneicosane...	0.985	0.996	1.000	0.957	0.922		0.972	3.36
22)	t	n-Docosane (C22)	0.989	0.996	1.018	0.957	0.923		0.977	3.78
23)	t	n-Tricosane (...	0.974	0.995	1.020	0.959	0.925		0.974	3.67
24)	s	d50-Tetracosane	0.856	0.838	0.871	0.827	0.801	0.870	0.844	3.24
25)	t	n-Tetracosane...	0.977	0.994	0.972	0.957	0.923		0.965	2.77
26)	t	n-Pentacosane...	0.959	0.976	1.009	0.938	0.909		0.958	3.95
27)	t	n-Hexacosane ...	0.981	1.003	1.043	0.964	0.934		0.985	4.15
28)	t	n-Heptacosane...	0.999	1.005	1.008	0.965	0.935		0.983	3.21
29)	t	n-Octacosane ...	1.004	1.025	1.051	0.986	0.957		1.005	3.60
30)	t	n-Nonacosane ...	0.998	1.022	1.052	0.984	0.954		1.002	3.72
31)	t	n-Triacontane...	0.999	1.027	1.059	0.990	0.960		1.007	3.74

Response Factor Report FID 18

Method Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Method File : HC18011822R_DRO.M
Title : FID Forensics
Last Update : Fri Jan 21 10:24:18 2022
Response Via : Initial Calibration

Calibration Files
1 =f18011822011.D 10 =f18011822013.D 50 =f18011822015.D 100 =f18011822017.D 200 =f18011822019.D
500 =f18011822021.D

	Compound	1	10	50	100	200	500	Avg	%RSD
32) t	n-Hentriacont...	0.979	0.993	1.031	0.958	0.929		0.978	3.93
33) t	n-Dotriaconta...	1.010	1.041	1.084	1.009	0.979		1.025	3.91
34) t	n-Tritriacont...	0.979	1.012	1.051	0.984	0.954		0.996	3.70
35) t	n-tetratriaco...	0.969	1.008	1.051	0.983	0.954		0.993	3.84
36) t	n-Pentatriaco...	0.916	0.944	1.065	0.920	0.894		0.948	7.13
37) t	n-Hexatriacon...	1.102	1.141	1.150	1.114	1.084		1.118	2.42
38) t	n-Heptatriaco...	1.003	1.040	1.062	1.015	0.990		1.022	2.84
39) t	n-Octatriacon...	1.006	1.058	1.101	1.029	1.005		1.040	3.87
40) t	n-Nonatriacon...	0.994	1.052	1.110	1.018	0.996		1.034	4.69
41) t	n-Tetracontan...	0.994	1.052	1.110	1.018	0.996		1.034	4.69
42) h	C9-C44 Total ...	0.951	0.982	1.011	0.949	0.918		0.962	3.66
43) h	C9-C40 Total ...	0.951	0.982	1.011	0.949	0.918		0.962	3.66
44) h	C10-C28 DRO	0.936	0.964	0.986	0.931	0.898		0.943	3.57
45) h	C28-C40 ORO	0.997	1.030	1.072	0.999	0.897		0.999	6.49
46) h	Total Resolve...	0.951	0.982	1.011	0.949	0.918		0.962	3.66

(#) = Out of Range

rfupdate

RSF Update Summary Report

Method Path.....: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Method File.....: HC18011822R_DRO.M
Method Title.....: FID Forensics
Last Update.....: Thu Jan 20 18:02:18 2022

Generating Average Response Factor For: C9-C44 Total Petroleum Hydrocarbons

No	Compound	Level	Conc	Response
1	n-Nonane (C9)	1	1.00000	895933.475
2	n-Decane (C10)	1	1.00000	923091.355
3	n-Undecane (C11)	1	1.00000	920914.238
4	n-Dodecane (C12)	1	1.00000	939441.500
5	n-Tridecane (C13)	1	1.00000	949813.256
6	n-Tetradecane (C14)	1	1.00000	988901.639
7	n-Pentadecane (C15)	1	1.00000	1009771.272
8	n-Hexadecane (C16)	1	1.00000	1011109.147
9	n-Heptadecane (C17)	1	1.00000	1029031.956
10	Pristane	1	1.00000	1050493.329
11	n-Octadecane (C18)	1	1.00000	1041746.968
12	Phytane	1	1.00000	966333.894
13	n-Nonadecane (C19)	1	1.00000	1053814.767
14	n-Eicosane (C20)	1	1.00000	1064632.978
15	n-Heneicosane (C21)	1	1.00000	1085187.042
16	n-Docosane (C22)	1	1.00000	1090323.588
17	n-Tricosane (C23)	1	1.00000	1072926.716
18	n-Tetracosane (C24)	1	1.00000	1076479.490
19	n-Pentacosane (C25)	1	1.00000	1057029.120
20	n-Hexacosane (C26)	1	1.00000	1081149.036
21	n-Heptacosane (C27)	1	1.00000	1100740.312
22	n-Octacosane (C28)	1	1.00000	1106850.109
23	n-Nonacosane (C29)	1	1.00000	1099321.431
24	n-Triacontane (C30)	1	1.00000	1101248.120
25	n-Hentriacontane (C31)	1	1.00000	1078623.055
26	n-Dotriacontane (C32)	1	1.00000	1112640.264
27	n-Tritriacontane (C33)	1	1.00000	1079259.240
28	n-tetratriacontane (C34)	1	1.00000	1068400.066
29	n-Pentatriacontane (C35)	1	1.00000	1009786.541
30	n-Hexatriacontane (C36)	1	1.00000	1214714.760
31	n-Heptatriacontane (C37)	1	1.00000	1104806.977
32	n-Octatriacontane (C38)	1	1.00000	1108798.109
33	n-Tetracontane (C40)	1	1.00000	1095432.102
Avg RSF For: C9-C44 Total Petroleum			1.00000	1048143.814
1	n-Nonane (C9)	2	10.00000	9268185.194
2	n-Decane (C10)	2	10.00000	9620848.361
3	n-Undecane (C11)	2	10.00000	9630531.203
4	n-Dodecane (C12)	2	10.00000	9784935.119
5	n-Tridecane (C13)	2	10.00000	9861610.819
6	n-Tetradecane (C14)	2	10.00000	10183320.040
7	n-Pentadecane (C15)	2	10.00000	10295105.764
8	n-Hexadecane (C16)	2	10.00000	10263407.098
9	n-Heptadecane (C17)	2	10.00000	10448544.779

10	Pristane	2	10.00000	10658211.331
11	n-Octadecane (C18)	2	10.00000	10568301.453
12	Phytane	2	10.00000	9813548.082
13	n-Nonadecane (C19)	2	10.00000	10646945.200
14	n-Eicosane (C20)	2	10.00000	10735933.846
15	n-Heneicosane (C21)	2	10.00000	10802696.192
16	n-Docosane (C22)	2	10.00000	10804730.250
17	n-Tricosane (C23)	2	10.00000	10787869.286
18	n-Tetracosane (C24)	2	10.00000	10784045.280
19	n-Pentacosane (C25)	2	10.00000	10586659.745
20	n-Hexacosane (C26)	2	10.00000	10882528.485
21	n-Heptacosane (C27)	2	10.00000	10903135.848
22	n-Octacosane (C28)	2	10.00000	11118253.312
23	n-Nonacosane (C29)	2	10.00000	11086634.143
24	n-Triacontane (C30)	2	10.00000	11136045.990
25	n-Hentriacontane (C31)	2	10.00000	10770872.290
26	n-Dotriacontane (C32)	2	10.00000	11290579.376
27	n-Tritriacontane (C33)	2	10.00000	10971220.978
28	n-tetratriacontane (C34)	2	10.00000	10934090.152
29	n-Pentatriacontane (C35)	2	10.00000	10238200.990
30	n-Hexatriacontane (C36)	2	10.00000	12373785.519
31	n-Heptatriacontane (C37)	2	10.00000	11282737.099
32	n-Octatriacontane (C38)	2	10.00000	11473679.371
33	n-Tetracontane (C40)	2	10.00000	11405007.832
Avg RSF For: C9-C44 Total Petroleum			10.00000	10648854.558

1	n-Nonane (C9)	3	50.00000	50815884.826
2	n-Decane (C10)	3	50.00000	52589176.721
3	n-Undecane (C11)	3	50.00000	53562361.461
4	n-Dodecane (C12)	3	50.00000	53665105.904
5	n-Tridecane (C13)	3	50.00000	54132242.465
6	n-Tetradecane (C14)	3	50.00000	55163958.177
7	n-Pentadecane (C15)	3	50.00000	54868685.477
8	n-Hexadecane (C16)	3	50.00000	55916063.078
9	n-Heptadecane (C17)	3	50.00000	56964559.309
10	Pristane	3	50.00000	57106261.020
11	n-Octadecane (C18)	3	50.00000	57358796.560
12	Phytane	3	50.00000	52750587.194
13	n-Nonadecane (C19)	3	50.00000	56677032.248
14	n-Eicosane (C20)	3	50.00000	57469858.714
15	n-Heneicosane (C21)	3	50.00000	57346014.442
16	n-Docosane (C22)	3	50.00000	58341705.699
17	n-Tricosane (C23)	3	50.00000	58468244.334
18	n-Tetracosane (C24)	3	50.00000	55727825.080
19	n-Pentacosane (C25)	3	50.00000	57834702.076
20	n-Hexacosane (C26)	3	50.00000	59769840.989
21	n-Heptacosane (C27)	3	50.00000	57808919.202
22	n-Octacosane (C28)	3	50.00000	60281562.202
23	n-Nonacosane (C29)	3	50.00000	60338340.804
24	n-Triacontane (C30)	3	50.00000	60735594.914
25	n-Hentriacontane (C31)	3	50.00000	59137471.041
26	n-Dotriacontane (C32)	3	50.00000	62175918.622
27	n-Tritriacontane (C33)	3	50.00000	60232569.198
28	n-tetratriacontane (C34)	3	50.00000	60274958.598
29	n-Pentatriacontane (C35)	3	50.00000	61045645.062
30	n-Hexatriacontane (C36)	3	50.00000	65914563.606
31	n-Heptatriacontane (C37)	3	50.00000	60864270.422
32	n-Octatriacontane (C38)	3	50.00000	63094898.524
33	n-Tetracontane (C40)	3	50.00000	63634368.821
Avg RSF For: C9-C44 Total Petroleum			50.00000	57941454.145

1	n-Nonane (C9)	4	100.00000	90584779.004
2	n-Decane (C10)	4	100.00000	95258298.604
3	n-Undecane (C11)	4	100.00000	95791387.563
4	n-Dodecane (C12)	4	100.00000	97140803.174
5	n-Tridecane (C13)	4	100.00000	97423175.350
6	n-Tetradecane (C14)	4	100.00000	100032168.934
7	n-Pentadecane (C15)	4	100.00000	100754079.833
8	n-Hexadecane (C16)	4	100.00000	100135990.750
9	n-Heptadecane (C17)	4	100.00000	101664003.456
10	Pristane	4	100.00000	103657945.406
11	n-Octadecane (C18)	4	100.00000	102890371.160
12	Phytane	4	100.00000	95474669.064
13	n-Nonadecane (C19)	4	100.00000	103753694.510
14	n-Eicosane (C20)	4	100.00000	104571094.570
15	n-Heneicosane (C21)	4	100.00000	105213663.883
16	n-Docosane (C22)	4	100.00000	105218373.680
17	n-Tricosane (C23)	4	100.00000	105474745.457
18	n-Tetracosane (C24)	4	100.00000	105244490.442
19	n-Pentacosane (C25)	4	100.00000	103184050.243
20	n-Hexacosane (C26)	4	100.00000	106026794.105
21	n-Heptacosane (C27)	4	100.00000	106111319.254
22	n-Octacosane (C28)	4	100.00000	108434600.335
23	n-Nonacosane (C29)	4	100.00000	108227125.566
24	n-Triacontane (C30)	4	100.00000	108872476.756
25	n-Hentriacontane (C31)	4	100.00000	105352086.810
26	n-Dotriacontane (C32)	4	100.00000	110971728.020
27	n-Tritriacontane (C33)	4	100.00000	108183788.505
28	n-tetratriacontane (C34)	4	100.00000	108075012.930
29	n-Pentatriacontane (C35)	4	100.00000	101186552.101
30	n-Hexatriacontane (C36)	4	100.00000	122465287.837
31	n-Heptatriacontane (C37)	4	100.00000	111645028.746
32	n-Octatriacontane (C38)	4	100.00000	113204373.700
33	n-Tetracontane (C40)	4	100.00000	111953370.887

Avg RSF For: C9-C44 Total Petroleum 100.00000 104369010.019

1	n-Nonane (C9)	5	200.00000	189233153.066
2	n-Decane (C10)	5	200.00000	197105402.492
3	n-Undecane (C11)	5	200.00000	197342507.309
4	n-Dodecane (C12)	5	200.00000	199851913.480
5	n-Tridecane (C13)	5	200.00000	200742267.136
6	n-Tetradecane (C14)	5	200.00000	206335317.851
7	n-Pentadecane (C15)	5	200.00000	208167158.144
8	n-Hexadecane (C16)	5	200.00000	207154802.479
9	n-Heptadecane (C17)	5	200.00000	211459942.089
10	Pristane	5	200.00000	213225490.252
11	n-Octadecane (C18)	5	200.00000	214214000.526
12	Phytane	5	200.00000	197460642.779
13	n-Nonadecane (C19)	5	200.00000	215897372.999
14	n-Eicosane (C20)	5	200.00000	215981423.520
15	n-Heneicosane (C21)	5	200.00000	217732708.361
16	n-Docosane (C22)	5	200.00000	218063296.548
17	n-Tricosane (C23)	5	200.00000	218508256.508
18	n-Tetracosane (C24)	5	200.00000	218055777.230
19	n-Pentacosane (C25)	5	200.00000	214603392.285
20	n-Hexacosane (C26)	5	200.00000	220616562.629
21	n-Heptacosane (C27)	5	200.00000	220936904.420
22	n-Octacosane (C28)	5	200.00000	226021784.292
23	n-Nonacosane (C29)	5	200.00000	225374201.986
24	n-Triacontane (C30)	5	200.00000	226750620.902

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25	n-Hentriacontane (C31)	5	200.00000	219370680.620
26	n-Dotriacontane (C32)	5	200.00000	231130445.434
27	n-Tritriacontane (C33)	5	200.00000	225257819.420
28	n-tetratriacontane (C34)	5	200.00000	225263411.274
29	n-Pentatriacontane (C35)	5	200.00000	211257814.298
30	n-Hexatriacontane (C36)	5	200.00000	256128437.049
31	n-Heptatriacontane (C37)	5	200.00000	233721984.391
32	n-Octatriacontane (C38)	5	200.00000	237329688.769
33	n-Tetracontane (C40)	5	200.00000	235168758.473
Avg RSF For: C9-C44 Total Petroleum			200.00000	216832240.576

Generating Average Response Factor For: C10-C28 DRO

No	Compound	Level	Conc	Response
1	n-Decane (C10)	1	1.00000	923091.355
2	n-Undecane (C11)	1	1.00000	920914.238
3	n-Dodecane (C12)	1	1.00000	939441.500
4	n-Tridecane (C13)	1	1.00000	949813.256
5	n-Tetradecane (C14)	1	1.00000	988901.639
6	n-Pentadecane (C15)	1	1.00000	1009771.272
7	n-Hexadecane (C16)	1	1.00000	1011109.147
8	n-Heptadecane (C17)	1	1.00000	1029031.956
9	n-Octadecane (C18)	1	1.00000	1041746.968
10	n-Nonadecane (C19)	1	1.00000	1053814.767
11	n-Eicosane (C20)	1	1.00000	1064632.978
12	n-Heneicosane (C21)	1	1.00000	1085187.042
13	n-Docosane (C22)	1	1.00000	1090323.588
14	n-Tricosane (C23)	1	1.00000	1072926.716
15	n-Tetracosane (C24)	1	1.00000	1076479.490
16	n-Pentacosane (C25)	1	1.00000	1057029.120
17	n-Hexacosane (C26)	1	1.00000	1081149.036
18	n-Heptacosane (C27)	1	1.00000	1100740.312
19	n-Octacosane (C28)	1	1.00000	1106850.109
Avg RSF For: C10-C28 DRO			1.00000	1031734.447
1	n-Decane (C10)	2	10.00000	9620848.361
2	n-Undecane (C11)	2	10.00000	9630531.203
3	n-Dodecane (C12)	2	10.00000	9784935.119
4	n-Tridecane (C13)	2	10.00000	9861610.819
5	n-Tetradecane (C14)	2	10.00000	10183320.040
6	n-Pentadecane (C15)	2	10.00000	10295105.764
7	n-Hexadecane (C16)	2	10.00000	10263407.098
8	n-Heptadecane (C17)	2	10.00000	10448544.779
9	n-Octadecane (C18)	2	10.00000	10568301.453
10	n-Nonadecane (C19)	2	10.00000	10646945.200
11	n-Eicosane (C20)	2	10.00000	10735933.846
12	n-Heneicosane (C21)	2	10.00000	10802696.192
13	n-Docosane (C22)	2	10.00000	10804730.250
14	n-Tricosane (C23)	2	10.00000	10787869.286
15	n-Tetracosane (C24)	2	10.00000	10784045.280
16	n-Pentacosane (C25)	2	10.00000	10586659.745
17	n-Hexacosane (C26)	2	10.00000	10882528.485
18	n-Heptacosane (C27)	2	10.00000	10903135.848
19	n-Octacosane (C28)	2	10.00000	11118253.312
Avg RSF For: C10-C28 DRO			10.00000	10458389.583

1	n-Decane (C10)	3	50.00000	52589176.721
2	n-Undecane (C11)	3	50.00000	53562361.461
3	n-Dodecane (C12)	3	50.00000	53665105.904
4	n-Tridecane (C13)	3	50.00000	54132242.465
5	n-Tetradecane (C14)	3	50.00000	55163958.177
6	n-Pentadecane (C15)	3	50.00000	54868685.477
7	n-Hexadecane (C16)	3	50.00000	55916063.078
8	n-Heptadecane (C17)	3	50.00000	56964559.309
9	n-Octadecane (C18)	3	50.00000	57358796.560
10	n-Nonadecane (C19)	3	50.00000	56677032.248
11	n-Eicosane (C20)	3	50.00000	57469858.714
12	n-Heneicosane (C21)	3	50.00000	57346014.442
13	n-Docosane (C22)	3	50.00000	58341705.699
14	n-Tricosane (C23)	3	50.00000	58468244.334
15	n-Tetracosane (C24)	3	50.00000	55727825.080
16	n-Pentacosane (C25)	3	50.00000	57834702.076
17	n-Hexacosane (C26)	3	50.00000	59769840.989
18	n-Heptacosane (C27)	3	50.00000	57808919.202
19	n-Octacosane (C28)	3	50.00000	60281562.202
Avg RSF For: C10-C28 DRO			50.00000	56523508.113

1	n-Decane (C10)	4	100.00000	95258298.604
2	n-Undecane (C11)	4	100.00000	95791387.563
3	n-Dodecane (C12)	4	100.00000	97140803.174
4	n-Tridecane (C13)	4	100.00000	97423175.350
5	n-Tetradecane (C14)	4	100.00000	100032168.934
6	n-Pentadecane (C15)	4	100.00000	100754079.833
7	n-Hexadecane (C16)	4	100.00000	100135990.750
8	n-Heptadecane (C17)	4	100.00000	101664003.456
9	n-Octadecane (C18)	4	100.00000	102890371.160
10	n-Nonadecane (C19)	4	100.00000	103753694.510
11	n-Eicosane (C20)	4	100.00000	104571094.570
12	n-Heneicosane (C21)	4	100.00000	105213663.883
13	n-Docosane (C22)	4	100.00000	105218373.680
14	n-Tricosane (C23)	4	100.00000	105474745.457
15	n-Tetracosane (C24)	4	100.00000	105244490.442
16	n-Pentacosane (C25)	4	100.00000	103184050.243
17	n-Hexacosane (C26)	4	100.00000	106026794.105
18	n-Heptacosane (C27)	4	100.00000	106111319.254
19	n-Octacosane (C28)	4	100.00000	108434600.335
Avg RSF For: C10-C28 DRO			100.00000	102332795.016

1	n-Decane (C10)	5	200.00000	197105402.492
2	n-Undecane (C11)	5	200.00000	197342507.309
3	n-Dodecane (C12)	5	200.00000	199851913.480
4	n-Tridecane (C13)	5	200.00000	200742267.136
5	n-Tetradecane (C14)	5	200.00000	206335317.851
6	n-Pentadecane (C15)	5	200.00000	208167158.144
7	n-Hexadecane (C16)	5	200.00000	207154802.479
8	n-Heptadecane (C17)	5	200.00000	211459942.089
9	n-Octadecane (C18)	5	200.00000	214214000.526
10	n-Nonadecane (C19)	5	200.00000	215897372.999
11	n-Eicosane (C20)	5	200.00000	215981423.520
12	n-Heneicosane (C21)	5	200.00000	217732708.361
13	n-Docosane (C22)	5	200.00000	218063296.548
14	n-Tricosane (C23)	5	200.00000	218508256.508
15	n-Tetracosane (C24)	5	200.00000	218055777.230

16	n-Pentacosane (C25)	5	200.00000	214603392.285
17	n-Hexacosane (C26)	5	200.00000	220616562.629
18	n-Heptacosane (C27)	5	200.00000	220936904.420
19	n-Octacosane (C28)	5	200.00000	226021784.292
Avg RSF For: C10-C28 DRO			200.00000	212041620.542

Generating Average Response Factor For: C28-C40 ORO

No	Compound	Level	Conc	Response
1	n-Octacosane (C28)	1	1.00000	1106850.109
2	n-Nonacosane (C29)	1	1.00000	1099321.431
3	n-Triacontane (C30)	1	1.00000	1101248.120
4	n-Hentriacontane (C31)	1	1.00000	1078623.055
5	n-Dotriacontane (C32)	1	1.00000	1112640.264
6	n-Tritriacontane (C33)	1	1.00000	1079259.240
7	n-tetratriacontane (C34)	1	1.00000	1068400.066
8	n-Pentatriacontane (C35)	1	1.00000	1009786.541
9	n-Hexatriacontane (C36)	1	1.00000	1214714.760
10	n-Heptatriacontane (C37)	1	1.00000	1104806.977
11	n-Octatriacontane (C38)	1	1.00000	1108798.109
12	n-Tetracontane (C40)	1	1.00000	1095432.102
Avg RSF For: C28-C40 ORO			1.00000	1098323.398
1	n-Octacosane (C28)	2	10.00000	11118253.312
2	n-Nonacosane (C29)	2	10.00000	11086634.143
3	n-Triacontane (C30)	2	10.00000	11136045.990
4	n-Hentriacontane (C31)	2	10.00000	10770872.290
5	n-Dotriacontane (C32)	2	10.00000	11290579.376
6	n-Tritriacontane (C33)	2	10.00000	10971220.978
7	n-tetratriacontane (C34)	2	10.00000	10934090.152
8	n-Pentatriacontane (C35)	2	10.00000	10238200.990
9	n-Hexatriacontane (C36)	2	10.00000	12373785.519
10	n-Heptatriacontane (C37)	2	10.00000	11282737.099
11	n-Octatriacontane (C38)	2	10.00000	11473679.371
12	n-Tetracontane (C40)	2	10.00000	11405007.832
Avg RSF For: C28-C40 ORO			10.00000	11173425.588
1	n-Octacosane (C28)	3	50.00000	60281562.202
2	n-Nonacosane (C29)	3	50.00000	60338340.804
3	n-Triacontane (C30)	3	50.00000	60735594.914
4	n-Hentriacontane (C31)	3	50.00000	59137471.041
5	n-Dotriacontane (C32)	3	50.00000	62175918.622
6	n-Tritriacontane (C33)	3	50.00000	60232569.198
7	n-tetratriacontane (C34)	3	50.00000	60274958.598
8	n-Pentatriacontane (C35)	3	50.00000	61045645.062
9	n-Hexatriacontane (C36)	3	50.00000	65914563.606
10	n-Heptatriacontane (C37)	3	50.00000	60864270.422
11	n-Octatriacontane (C38)	3	50.00000	63094898.524
12	n-Tetracontane (C40)	3	50.00000	63634368.821
Avg RSF For: C28-C40 ORO			50.00000	61477513.485
1	n-Octacosane (C28)	4	100.00000	108434600.335

		rfupdate		
2	n-Nonacosane (C29)	4	100.00000	108227125.566
3	n-Triacontane (C30)	4	100.00000	108872476.756
4	n-Hentriacontane (C31)	4	100.00000	105352086.810
5	n-Dotriacontane (C32)	4	100.00000	110971728.020
6	n-Tritriacontane (C33)	4	100.00000	108183788.505
7	n-tetratriacontane (C34)	4	100.00000	108075012.930
8	n-Pentatriacontane (C35)	4	100.00000	101186552.101
9	n-Hexatriacontane (C36)	4	100.00000	122465287.837
10	n-Heptatriacontane (C37)	4	100.00000	111645028.746
11	n-Octatriacontane (C38)	4	100.00000	113204373.700
12	n-Tetracontane (C40)	4	100.00000	111953370.887
Avg RSF For: C28-C40 ORO			100.00000	109880952.683

1	n-Octacosane (C28)	5	200.00000	226021784.292
2	n-Nonacosane (C29)	5	200.00000	225374201.986
3	n-Triacontane (C30)	5	200.00000	226750620.902
4	n-Hentriacontane (C31)	5	200.00000	219370680.620
5	n-Dotriacontane (C32)	5	200.00000	231130445.434
6	n-Tritriacontane (C33)	5	200.00000	225257819.420
7	n-tetratriacontane (C34)	5	200.00000	225263411.274
8	n-Pentatriacontane (C35)	5	200.00000	211257814.298
9	n-Hexatriacontane (C36)	5	200.00000	256128437.049
10	n-Heptatriacontane (C37)	5	200.00000	233721984.391
11	n-Octatriacontane (C38)	5	200.00000	237329688.769
12	n-Nonatriacontane (C39)	5	200.00000	111942.897
13	n-Tetracontane (C40)	5	200.00000	235168758.473
Avg RSF For: C28-C40 ORO			200.00000	211760583.831

Generating Reference Response Factors

No	Compound	No	Refrence Compound
8	1380	9	n-Tetradecane (C14)
10	1470	11	n-Pentadecane (C15)
13	1650	14	n-Heptadecane (C17)
40	n-Nonatriacontane (C39)	41	n-Tetracontane (C40)
43	C9-C40 Total Petroleum Hydrocarbons	42	C9-C44 Total Petroleum Hydrocarbons
46	Total Resolved Hydrocarbons	42	C9-C44 Total Petroleum Hydrocarbons

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Abacus Response Factor Update Macro Ver. 1.0

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822011.D
Signal(s) : FID2B.ch
Acq On : 18 Jan 2022 07:48 pm
Operator : FID18:WR
Sample : I1801182201R
Misc : WG1596727,FRBE49,1ug/ml
ALS Vial : 56 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 17:33:32 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:28:17 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	31.195	55102097	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	29.164	1164658	0.988 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery =	1.98%#
24) s d50-Tetracosane	35.792	943573	0.983 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery =	1.97%#
Target Compounds			
2) t n-Octane (C8)	5.544	866103	0.924 ug/mL M4
3) t n-Nonane (C9)	7.764	895933	0.917 ug/mL M4
4) t n-Decane (C10)	10.253	923091	0.913 ug/mL M4
5) t n-Undecane (C11)	12.762	920914	0.894 ug/mL M4
6) t n-Dodecane (C12)	15.186	939442	0.911 ug/mL M4
7) t n-Tridecane (C13)	17.489	949813	0.913 ug/mL M4
9) t n-Tetradecane (C14)	19.668	988902	0.933 ug/mL M4
11) t n-Pentadecane (C15)	21.728	1009771	0.957 ug/mL M4
12) t n-Hexadecane (C16)	23.681	1011109	0.941 ug/mL M4
14) t n-Heptadecane (C17)	25.533	1029032	0.940 ug/mL M4
15) t Pristane	25.644	1050493	0.957 ug/mL M4
16) t n-Octadecane (C18)	27.296	1041747	0.945 ug/mL M4
17) t Phytane	27.459	966334	0.953 ug/mL M4
18) t n-Nonadecane (C19)	28.977	1053815	0.967 ug/mL M4
20) t n-Eicosane (C20)	30.578	1064633	0.964 ug/mL M4
21) t n-Heneicosane (C21)	32.110	1085187	0.984 ug/mL M4
22) t n-Docosane (C22)	33.577	1090324	0.972 ug/mL M4
23) t n-Tricosane (C23)	34.985	1072927	0.955 ug/mL M4
25) t n-Tetracosane (C24)	36.336	1076479	1.005 ug/mL M4
26) t n-Pentacosane (C25)	37.637	1057029	0.951 ug/mL M4
27) t n-Hexacosane (C26)	38.887	1081149	0.941 ug/mL M4
28) t n-Heptacosane (C27)	40.093	1100740	0.991 ug/mL M4
29) t n-Octacosane (C28)	41.258	1106850	0.955 ug/mL M4
30) t n-Nonacosane (C29)	42.385	1099321	0.948 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822011.D
Signal(s) : FID2B.ch
Acq On : 18 Jan 2022 07:48 pm
Operator : FID18:WR
Sample : I1801182201R
Misc : WG1596727,FRBE49,1ug/ml
ALS Vial : 56 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 17:33:32 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:28:17 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

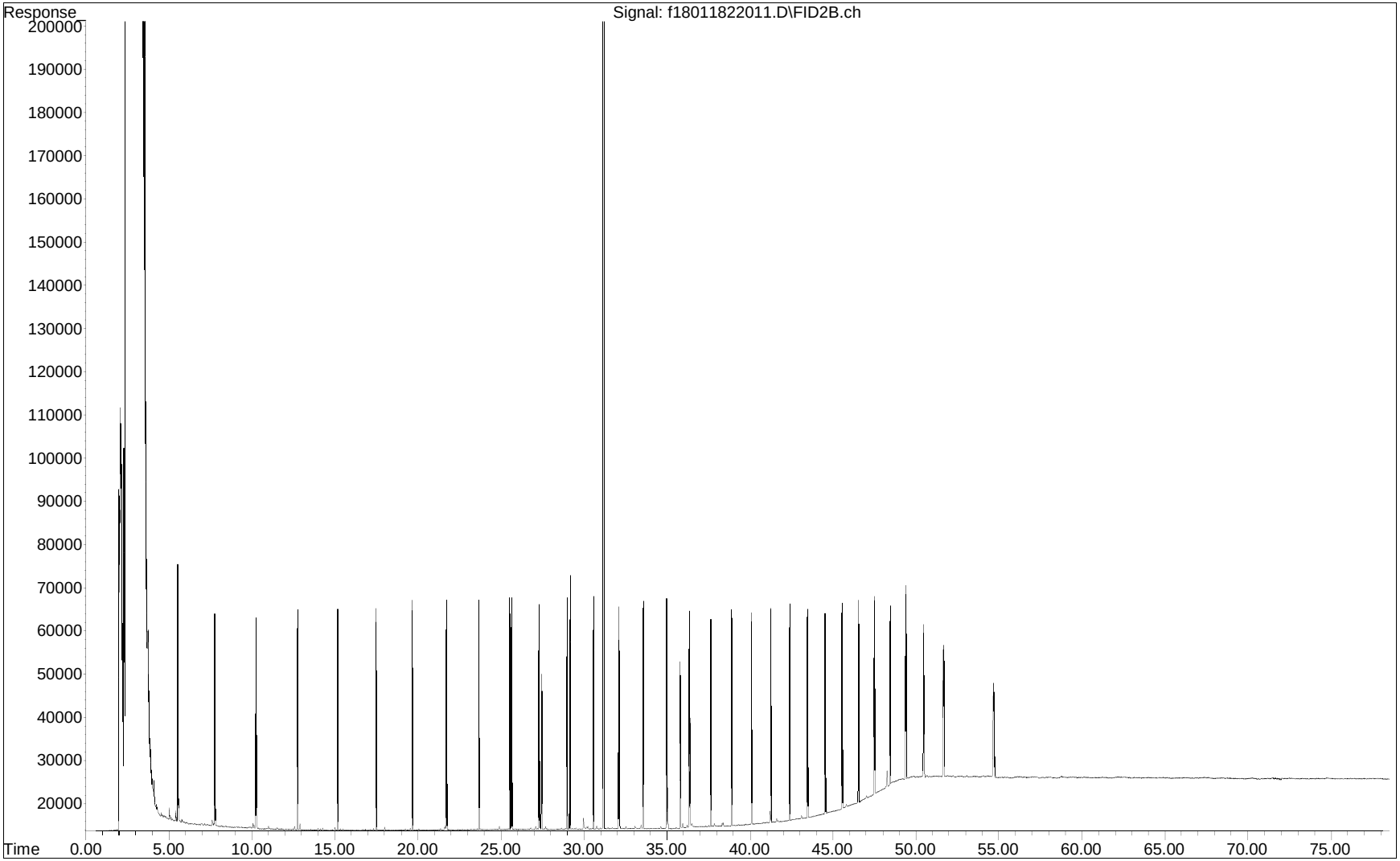
	Compound	R.T.	Response	Conc Units
31) t	n-Triacontane (C30)	43.472	1101248	0.943 ug/mL M4
32) t	n-Hentriacontane (C31)	44.527	1078623	0.949 ug/mL M4
33) t	n-Dotriacontane (C32)	45.547	1112640	0.931 ug/mL M4
34) t	n-Tritriacontane (C33)	46.538	1079259	0.932 ug/mL M4
35) t	n-tetratriacontane (C34)	47.500	1068400	0.922 ug/mL M4
36) t	n-Pentatriacontane (C35)	48.432	1009787	0.861 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.388	1214715	0.959 ug/mL M4
38) t	n-Heptatriacontane (C37)	50.456	1104807	0.944 ug/mL M4
39) t	n-Octatriacontane (C38)	51.671	1108798	0.914 ug/mL M4
41) t	n-Tetracontane (C40)	54.669	1095432	0.896 ug/mL M4

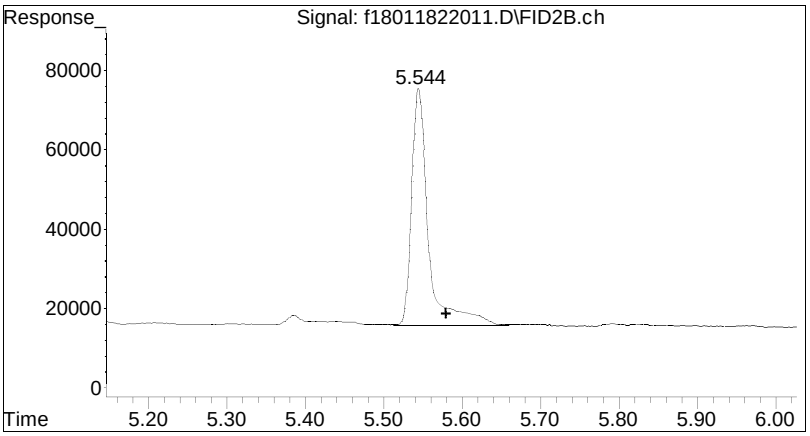
SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

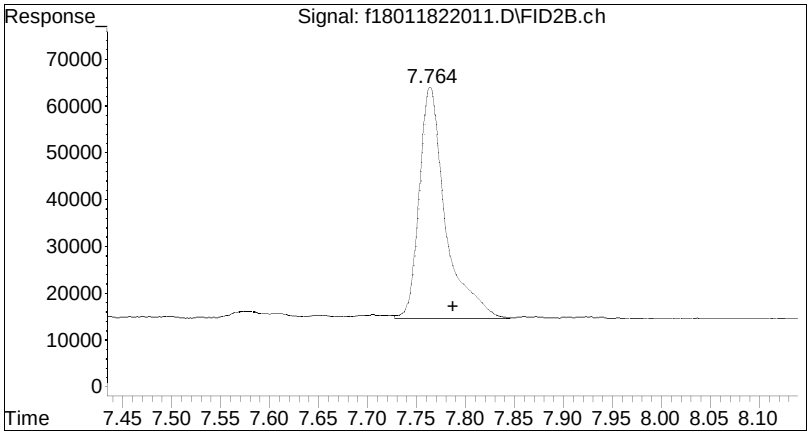
File :O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\f18011822011.D
Operator : FID18:WR
Acquired : 18 Jan 2022 07:48 pm using AcqMethod FID18.M
Sample Name: I1801182201R
Instrument: FID 18
Misc Info : WG1596727,FRBE49,1ug/ml
Vial Number: 56
CurrentMeth: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M





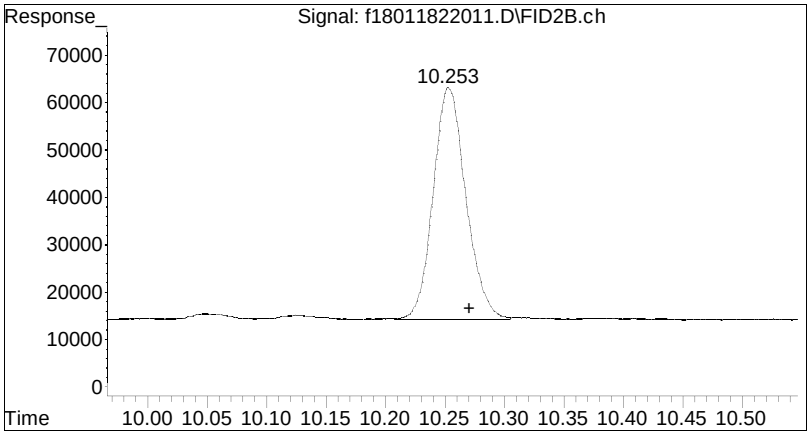
#2 n-Octane (C8)

R.T.: 5.544 min
Delta R.T.: -0.035 min
Response: 866103
Conc: 0.92 ug/mL M4



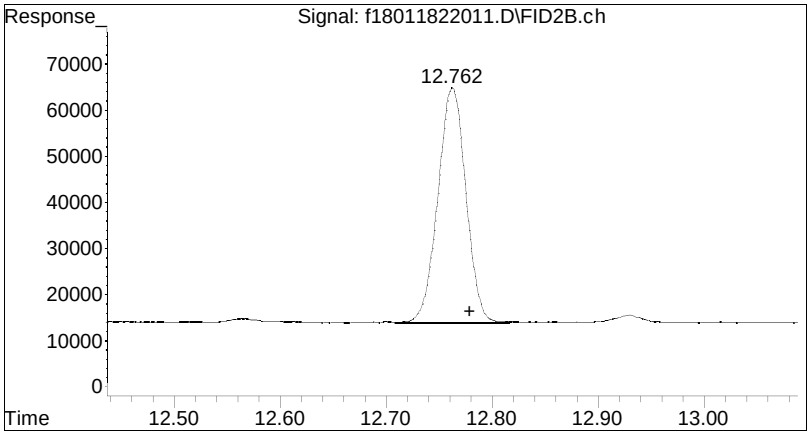
#3 n-Nonane (C9)

R.T.:	7.764 min
Delta R.T.:	-0.024 min
Response:	895933
Conc:	0.92 ug/mL M4



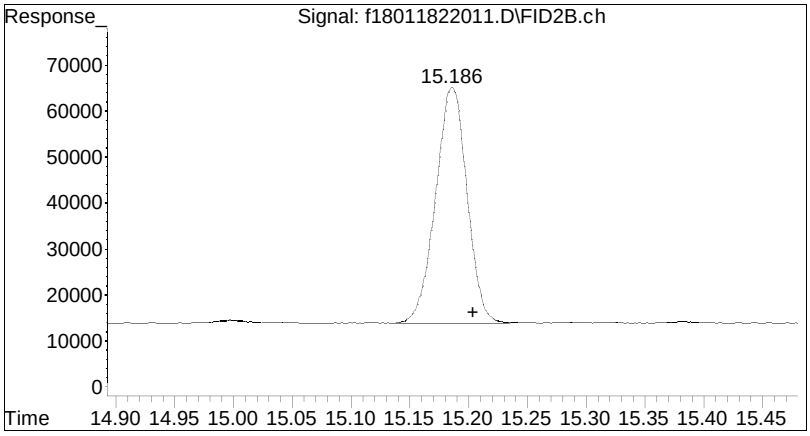
#4 n-Decane (C10)

R.T.:	10.253 min
Delta R.T.:	-0.018 min
Response:	923091
Conc:	0.91 ug/mL M4



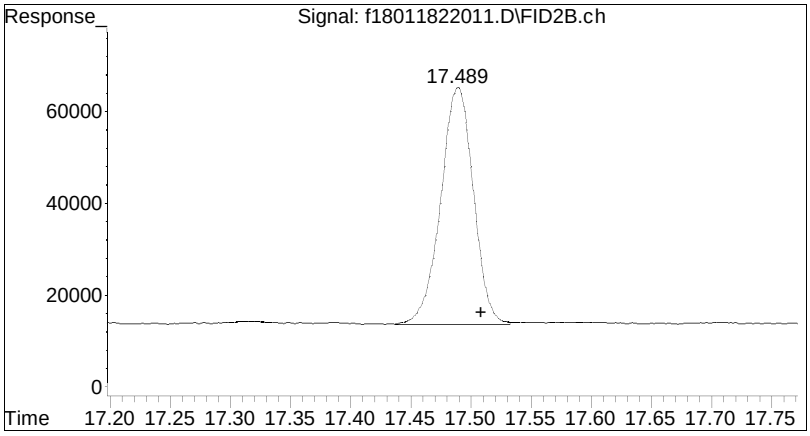
#5 n-Undecane (C11)

R.T.:	12.762 min
Delta R.T.:	-0.016 min
Response:	920914
Conc:	0.89 ug/mL M4



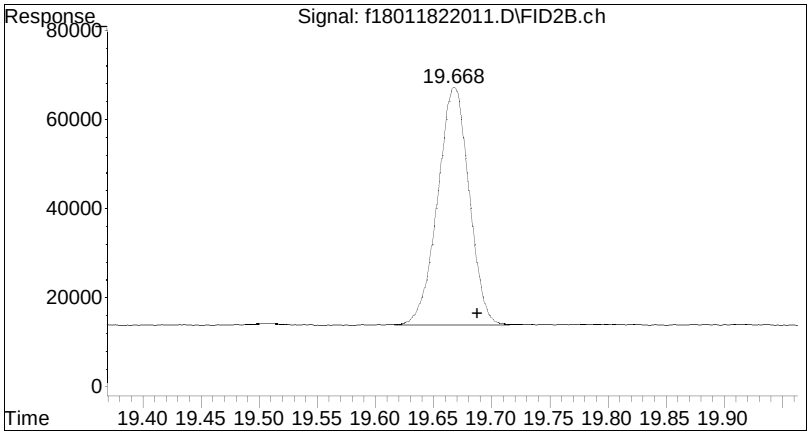
#6 n-Dodecane (C12)

R.T.:	15.186 min
Delta R.T.:	-0.018 min
Response:	939442
Conc:	0.91 ug/mL M4



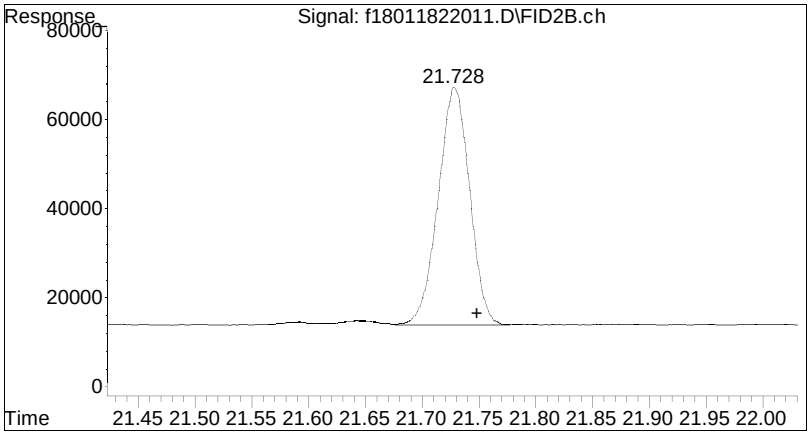
#7 n-Tridecane (C13)

R.T.:	17.489 min
Delta R.T.:	-0.019 min
Response:	949813
Conc:	0.91 ug/mL M4



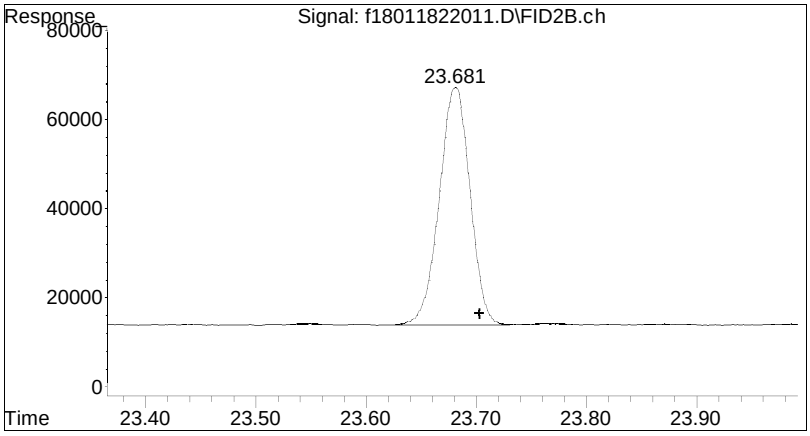
#9 n-Tetradecane (C14)

R.T.:	19.668 min
Delta R.T.:	-0.020 min
Response:	988902
Conc:	0.93 ug/mL M4



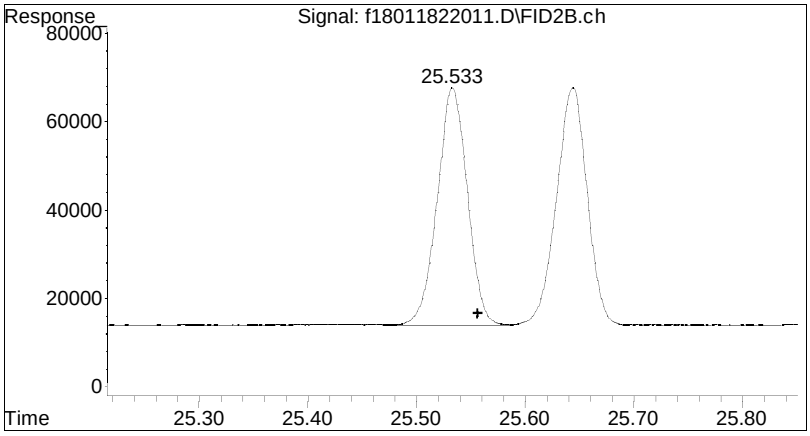
#11 n-Pentadecane (C15)

R.T.:	21.728 min
Delta R.T.:	-0.021 min
Response:	1009771
Conc:	0.96 ug/mL M4



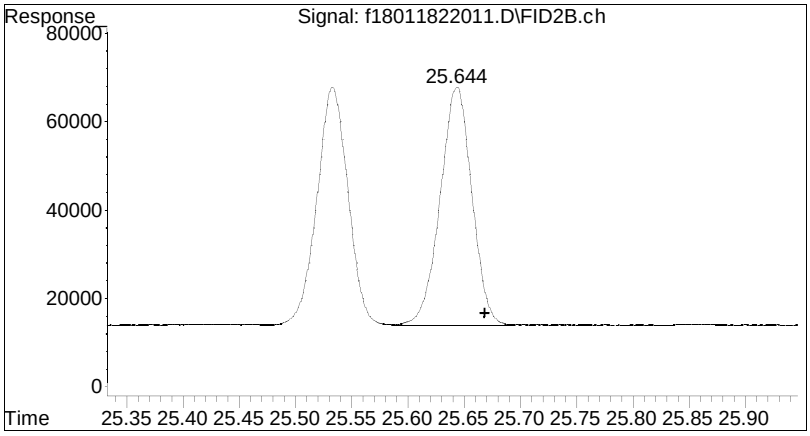
#12 n-Hexadecane (C16)

R.T.:	23.681 min
Delta R.T.:	-0.022 min
Response:	1011109
Conc:	0.94 ug/mL M4



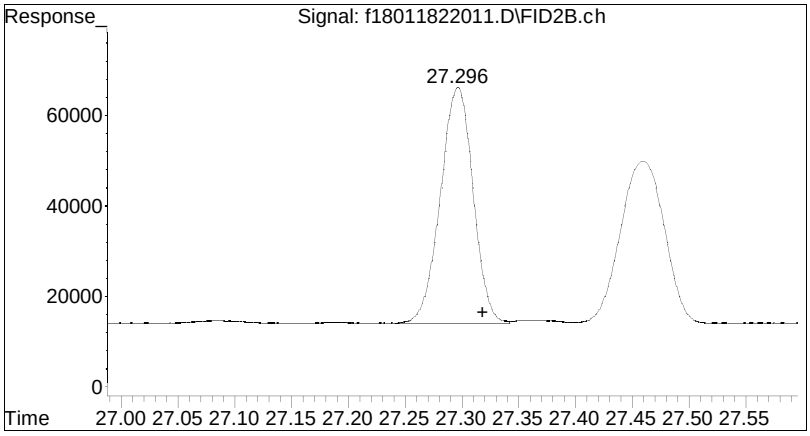
#14 n-Heptadecane (C17)

R.T.:	25.533 min
Delta R.T.:	-0.024 min
Response:	1029032
Conc:	0.94 ug/mL M4



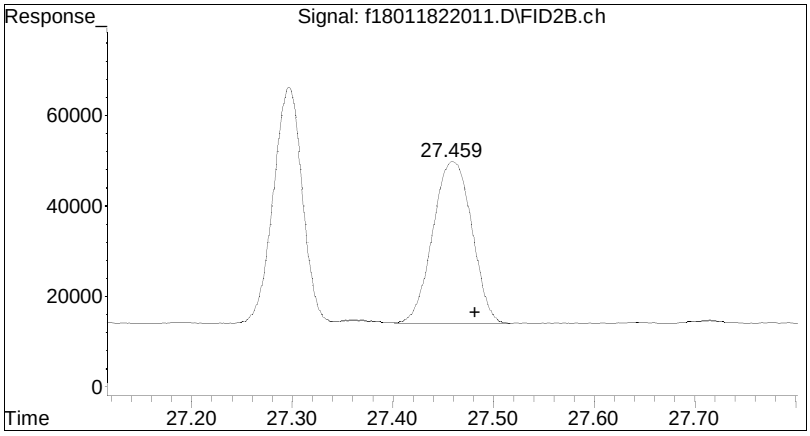
#15 Pristane

R.T.: 25.644 min
Delta R.T.: -0.024 min
Response: 1050493
Conc: 0.96 ug/mL M4



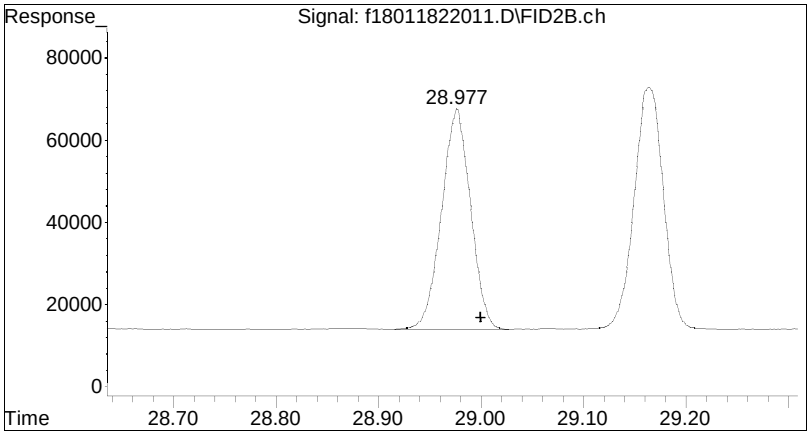
#16 n-Octadecane (C18)

R.T.:	27.296 min
Delta R.T.:	-0.022 min
Response:	1041747
Conc:	0.94 ug/mL M4



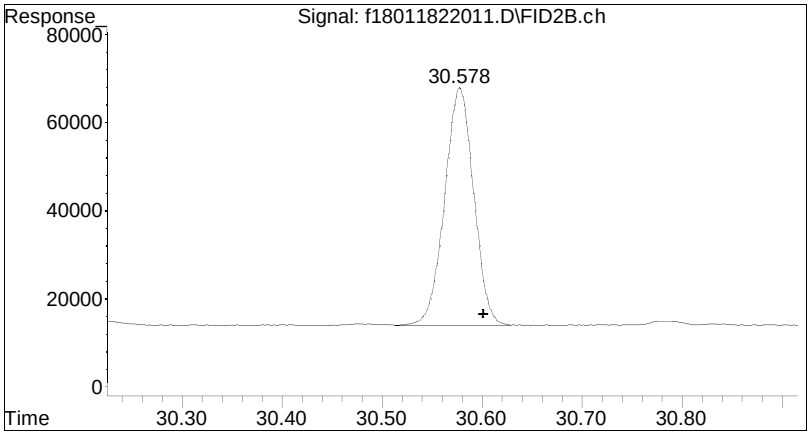
#17 Phytane

R.T.: 27.459 min
Delta R.T.: -0.023 min
Response: 966334
Conc: 0.95 ug/mL M4



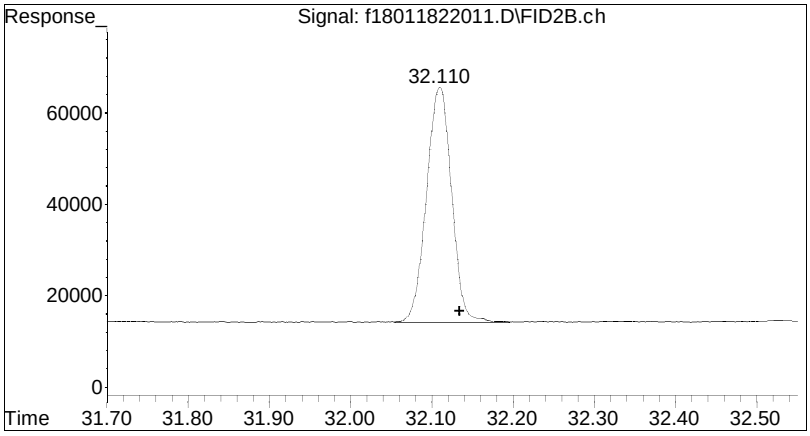
#18 n-Nonadecane (C19)

R.T.:	28.977 min
Delta R.T.:	-0.023 min
Response:	1053815
Conc:	0.97 ug/mL M4



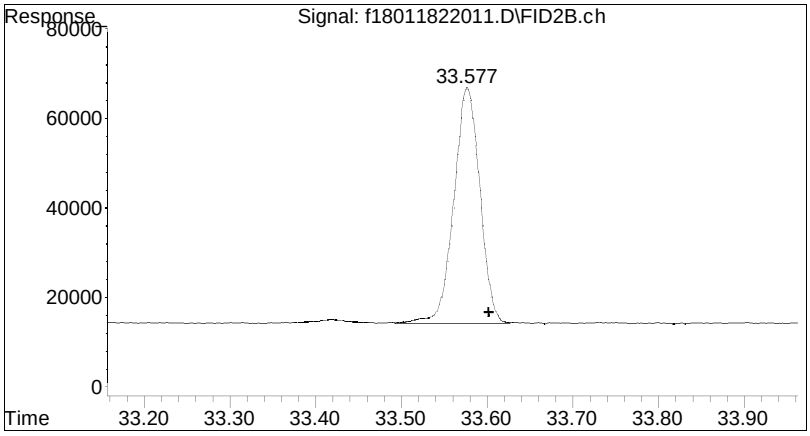
#20 n-Eicosane (C20)

R.T.:	30.578 min
Delta R.T.:	-0.023 min
Response:	1064633
Conc:	0.96 ug/mL M4



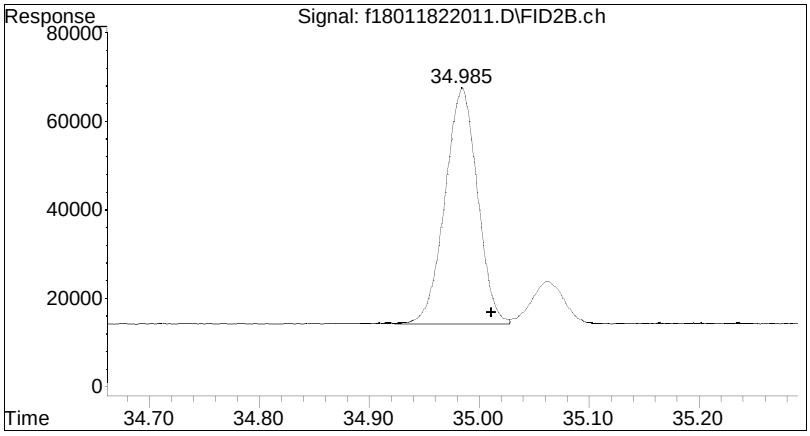
#21 n-Heneicosane (C21)

R.T.:	32.110 min
Delta R.T.:	-0.025 min
Response:	1085187
Conc:	0.98 ug/mL M4



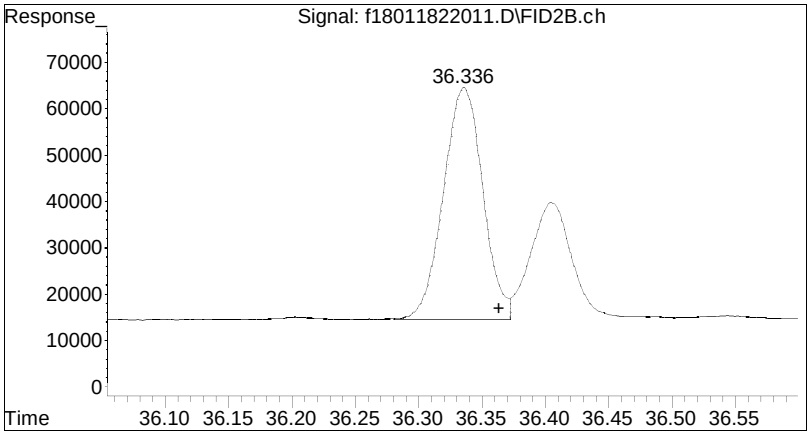
#22 n-Docosane (C22)

R.T.:	33.577 min
Delta R.T.:	-0.025 min
Response:	1090324
Conc:	0.97 ug/mL M4



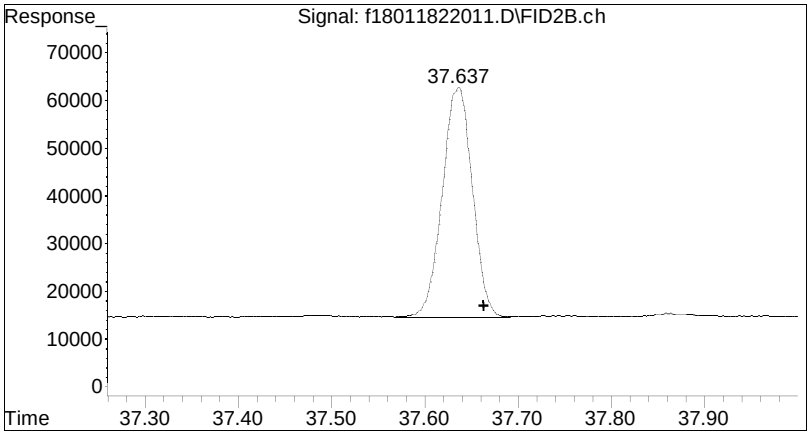
#23 n-Tricosane (C23)

R.T.:	34.985 min
Delta R.T.:	-0.027 min
Response:	1072927
Conc:	0.95 ug/mL M4



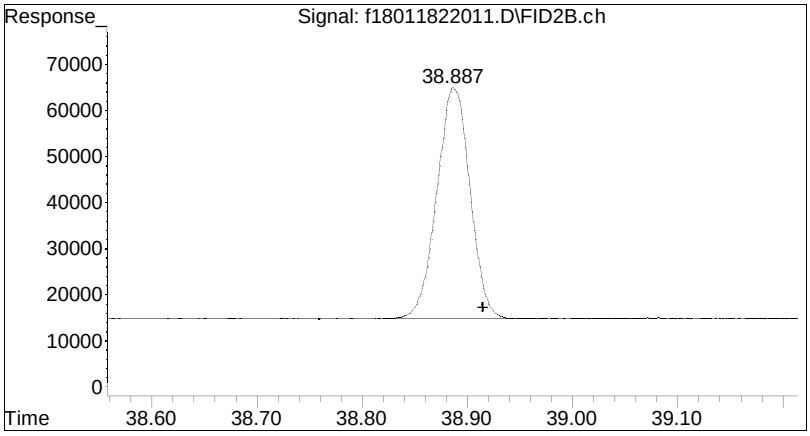
#25 n-Tetracosane (C24)

R.T.:	36.336 min
Delta R.T.:	-0.028 min
Response:	1076479
Conc:	1.00 ug/mL M4



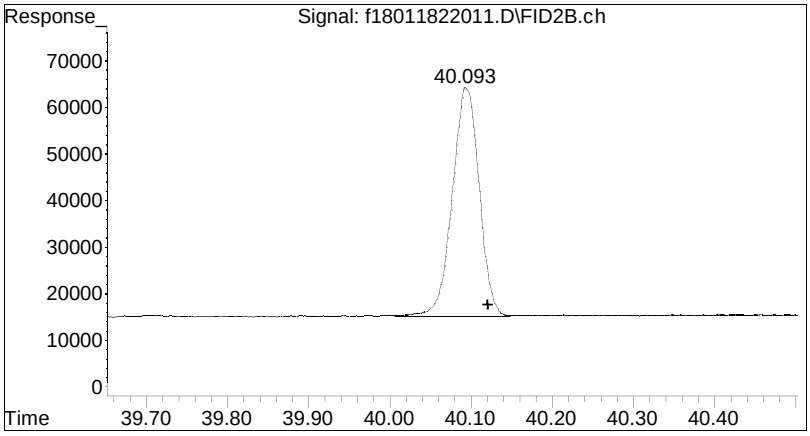
#26 n-Pentacosane (C25)

R.T.:	37.637 min
Delta R.T.:	-0.026 min
Response:	1057029
Conc:	0.95 ug/mL M4



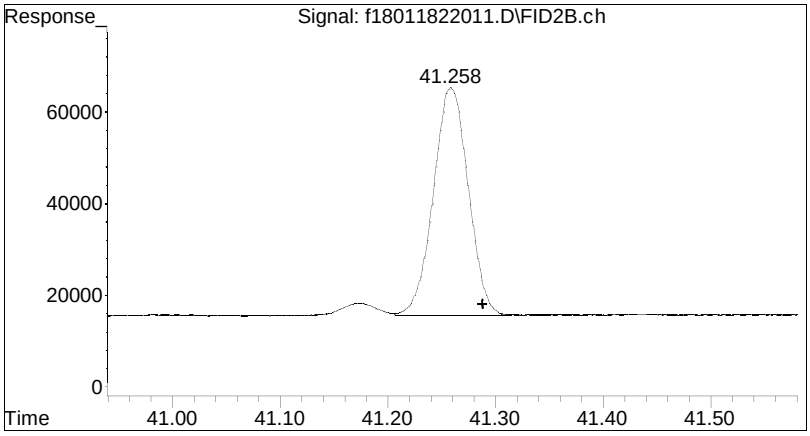
#27 n-Hexacosane (C26)

R.T.:	38.887 min
Delta R.T.:	-0.028 min
Response:	1081149
Conc:	0.94 ug/mL M4



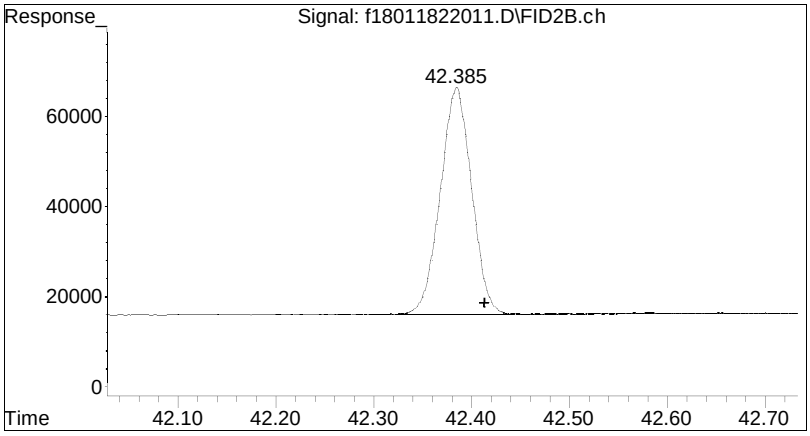
#28 n-Heptacosane (C27)

R.T.: 40.093 min
Delta R.T.: -0.027 min
Response: 1100740
Conc: 0.99 ug/mL M4



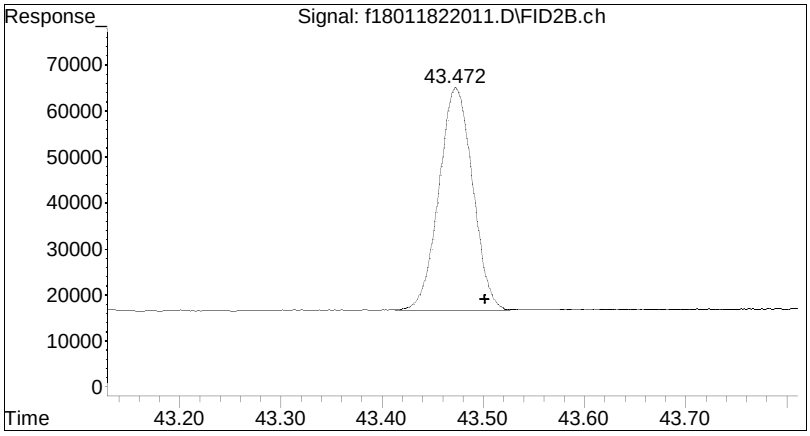
#29 n-Octacosane (C28)

R.T.: 41.258 min
Delta R.T.: -0.030 min
Response: 1106850
Conc: 0.96 ug/mL M4



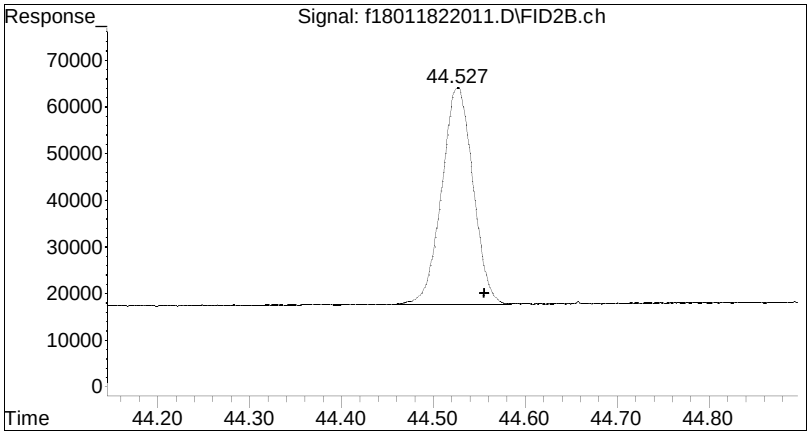
#30 n-Nonacosane (C29)

R.T.: 42.385 min
Delta R.T.: -0.029 min
Response: 1099321
Conc: 0.95 ug/mL M4



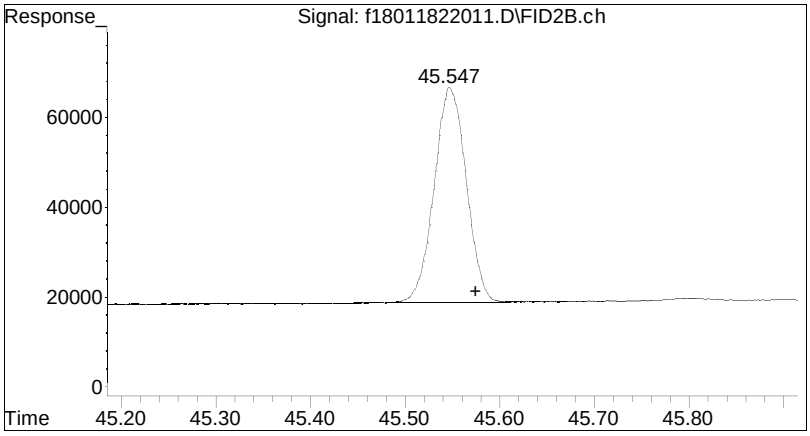
#31 n-Triacontane (C30)

R.T.:	43.472 min
Delta R.T.:	-0.029 min
Response:	1101248
Conc:	0.94 ug/mL M4



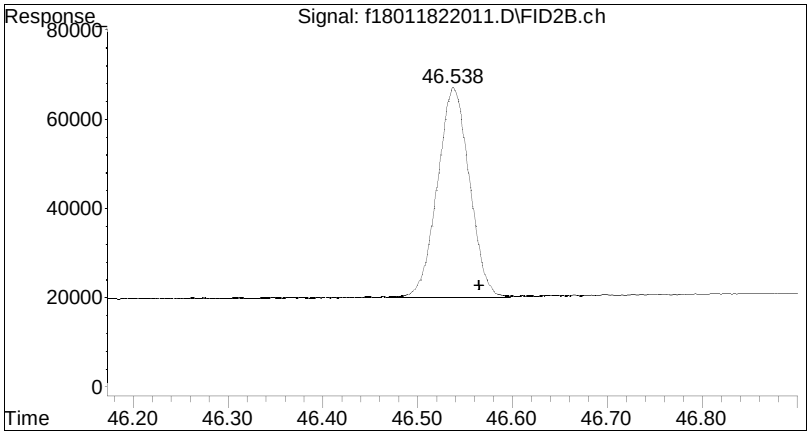
#32 n-Hentriacontane (C31)

R.T.:	44.527 min
Delta R.T.:	-0.028 min
Response:	1078623
Conc:	0.95 ug/mL M4



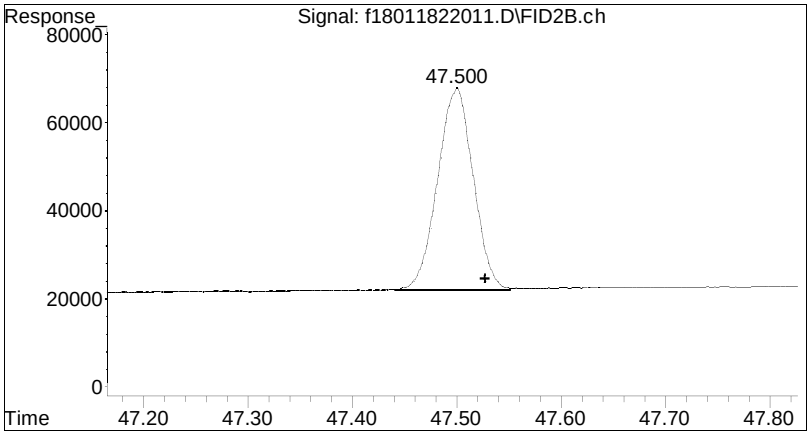
#33 n-Dotriacontane (C32)

R.T.:	45.547 min
Delta R.T.:	-0.028 min
Response:	1112640
Conc:	0.93 ug/mL M4



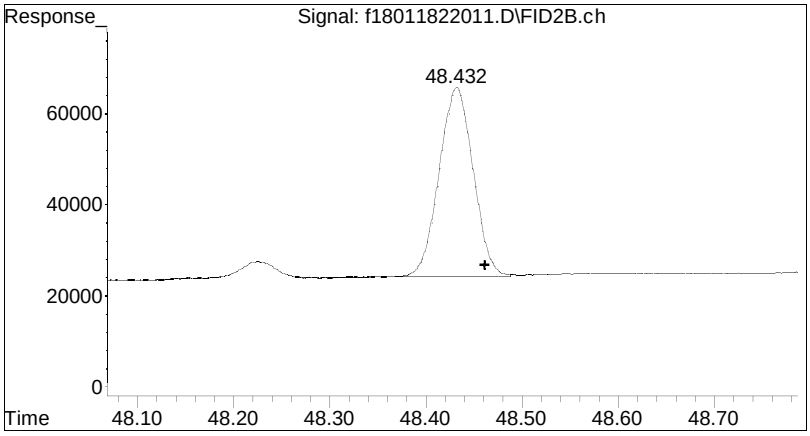
#34 n-Tritriacontane (C33)

R.T.:	46.538 min
Delta R.T.:	-0.027 min
Response:	1079259
Conc:	0.93 ug/mL M4



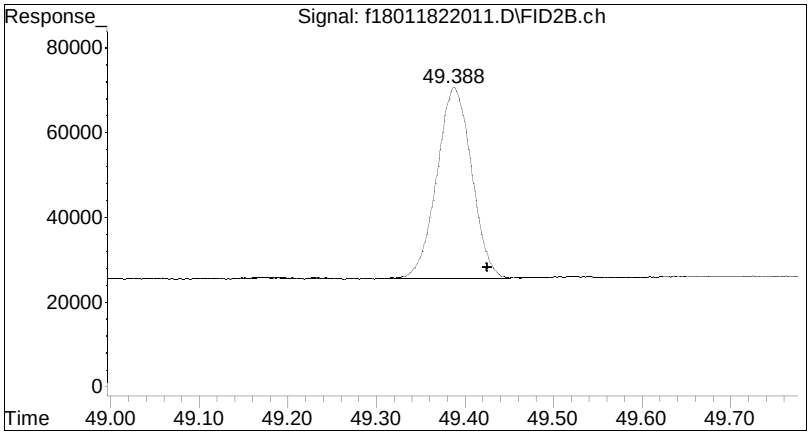
#35 n-tetratriacontane (C34)

R.T.:	47.500 min
Delta R.T.:	-0.027 min
Response:	1068400
Conc:	0.92 ug/mL M4



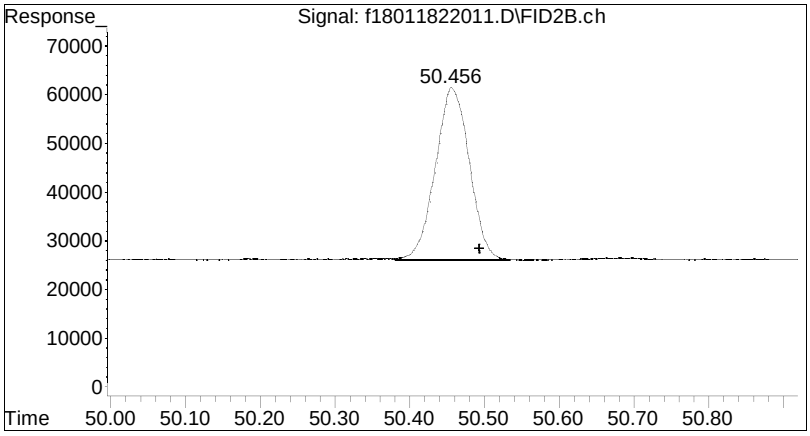
#36 n-Pentatriacontane (C35)

R.T.:	48.432 min
Delta R.T.:	-0.029 min
Response:	1009787
Conc:	0.86 ug/mL M4



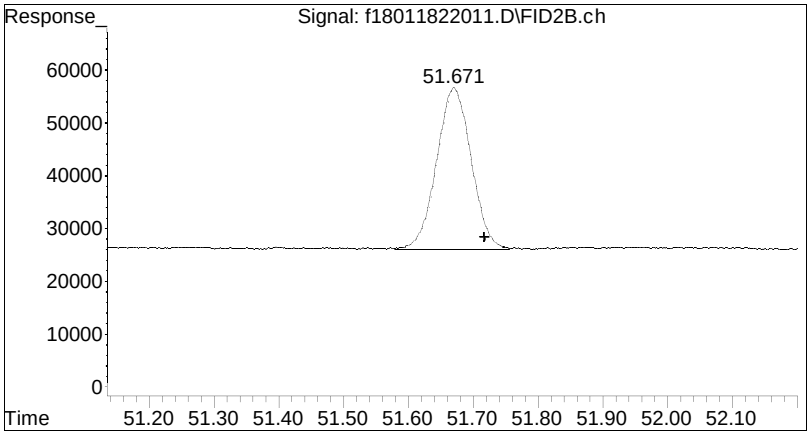
#37 n-Hexatriacontane (C36)

R.T.:	49.388 min
Delta R.T.:	-0.037 min
Response:	1214715
Conc:	0.96 ug/mL M4



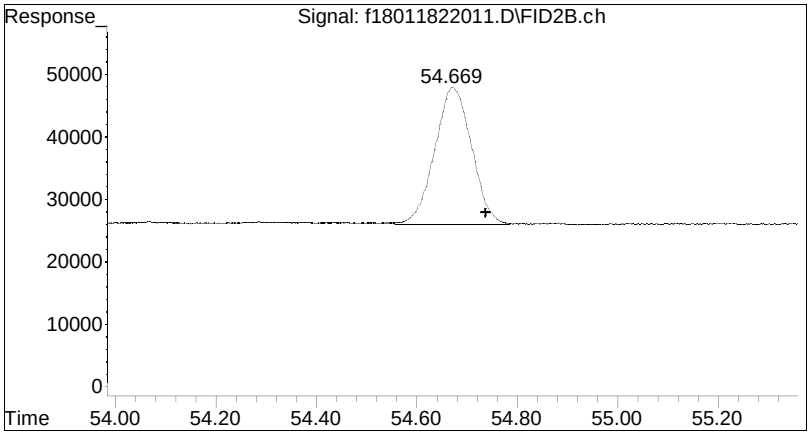
#38 n-Heptatriacontane (C37)

R.T.:	50.456 min
Delta R.T.:	-0.037 min
Response:	1104807
Conc:	0.94 ug/mL M4



#39 n-Octatriacontane (C38)

R.T.:	51.671 min
Delta R.T.:	-0.047 min
Response:	1108798
Conc:	0.91 ug/mL M4



#41 n-Tetracontane (C40)

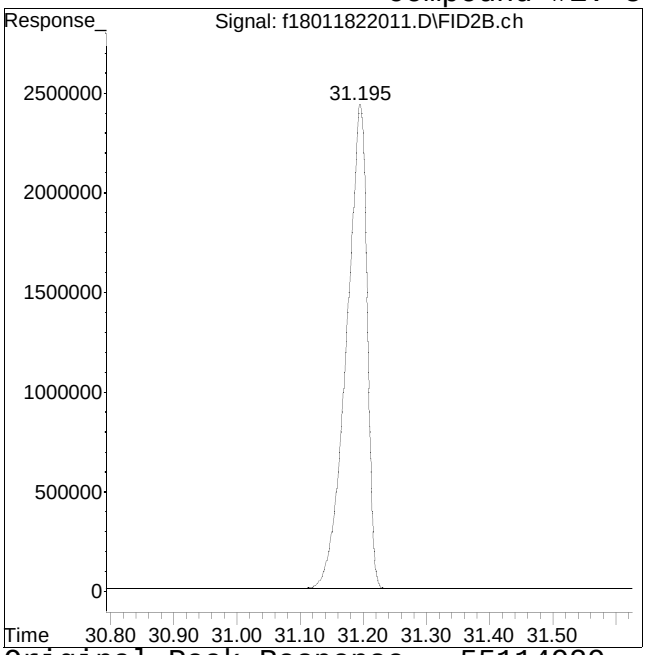
R.T.:	54.669 min
Delta R.T.:	-0.067 min
Response:	1095432
Conc:	0.90 ug/mL M4

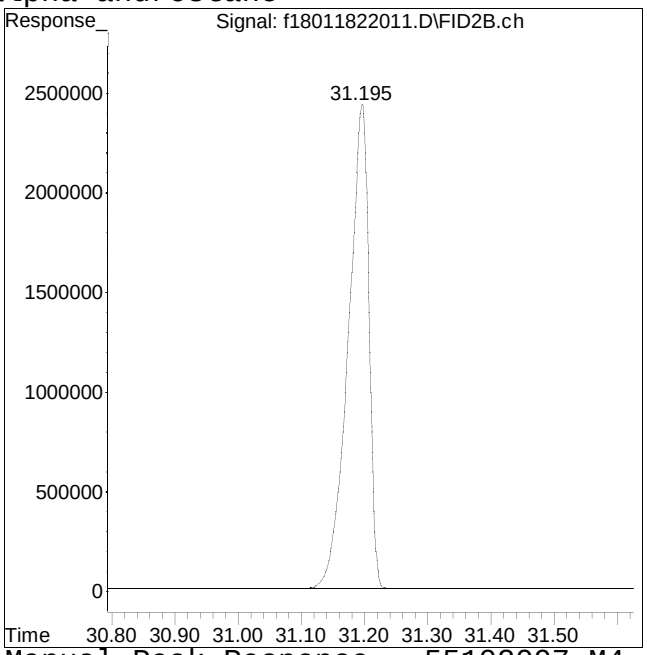
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #1: 5-alpha-androstane





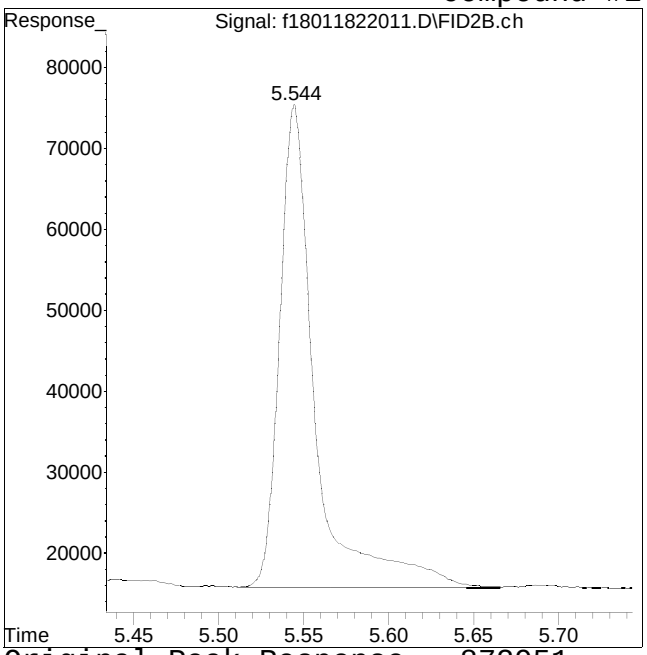
Original Peak Response = 55114929 Manual Peak Response = 55102097 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

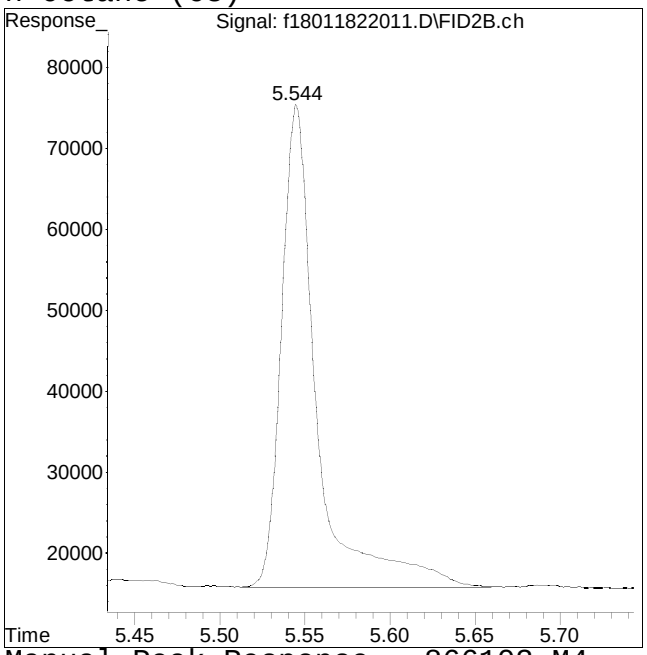
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #2: n-Octane (C8)



Original Peak Response = 872951



Manual Peak Response = 866103 M4

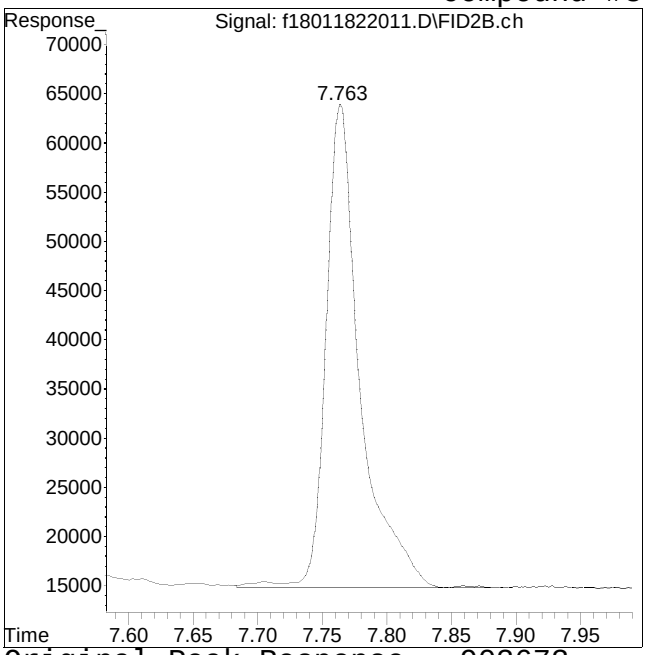
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

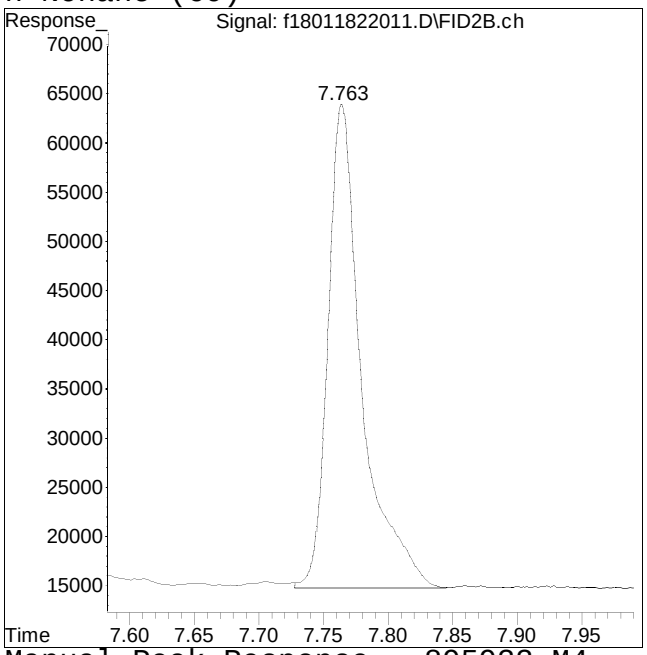
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #3: n-Nonane (C9)



Original Peak Response = 903673



Manual Peak Response = 895933 M4

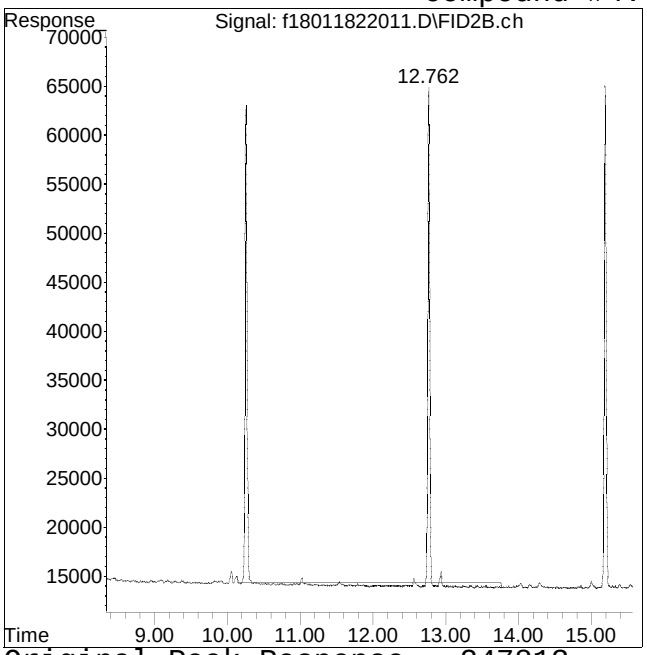
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

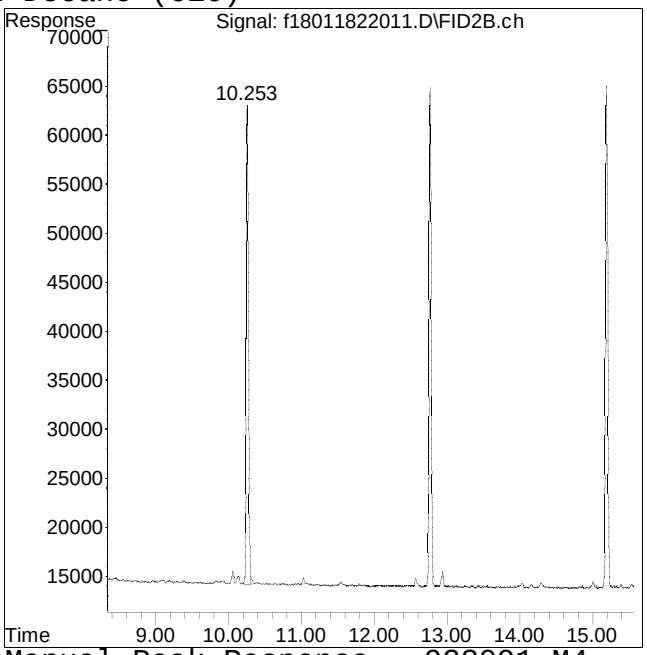
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #4: n-Decane (C10)



Original Peak Response = 247813



Manual Peak Response = 923091 M4

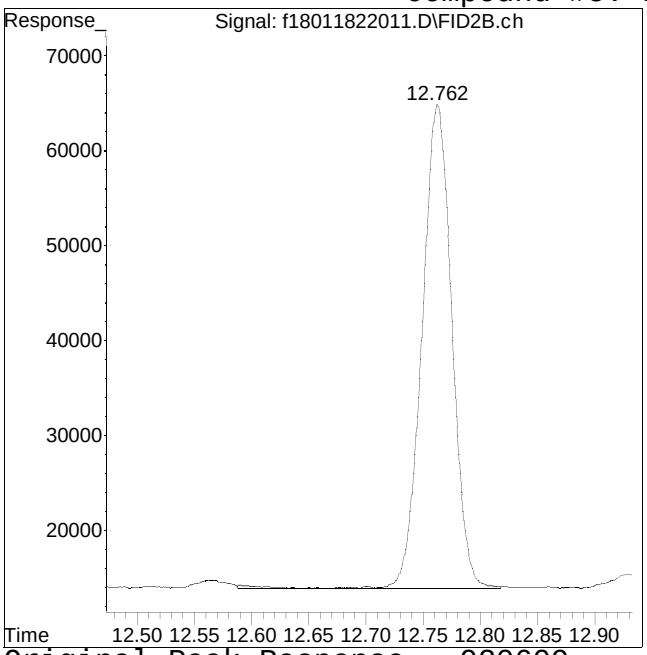
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

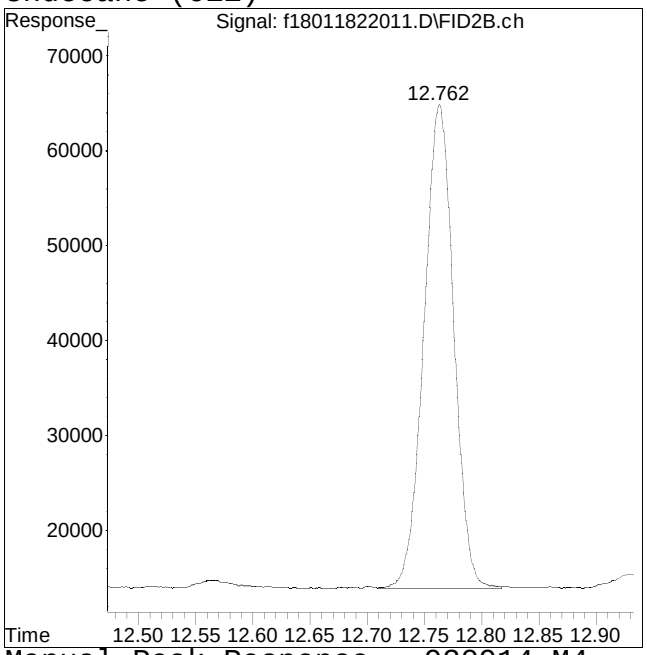
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #5: n-Undecane (C11)



Original Peak Response = 920609



Manual Peak Response = 920914 M4

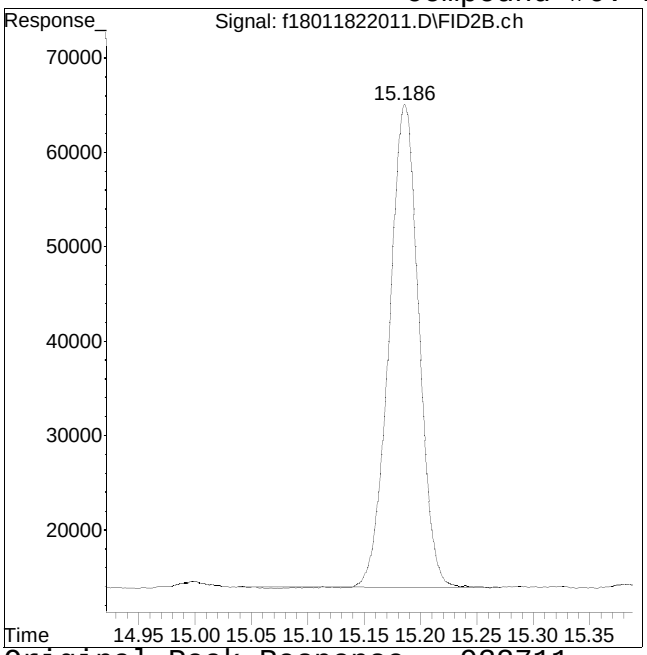
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

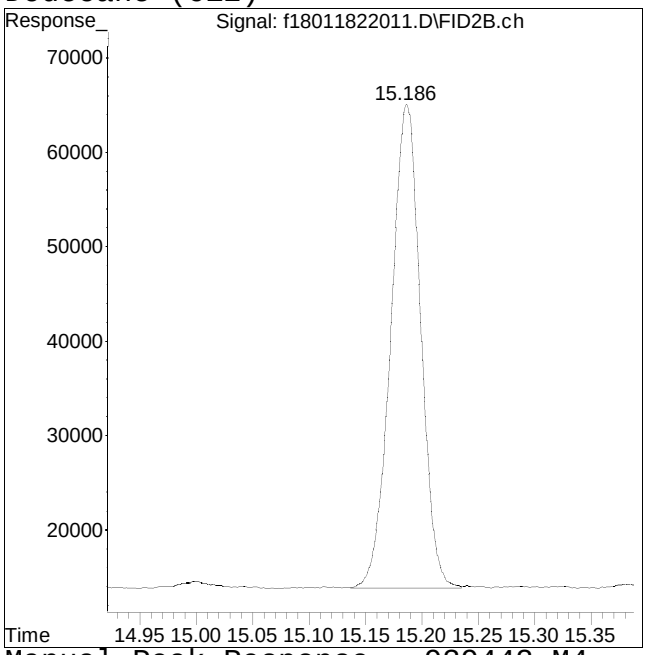
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #6: n-Dodecane (C12)



Original Peak Response = 932711



Manual Peak Response = 939442 M4

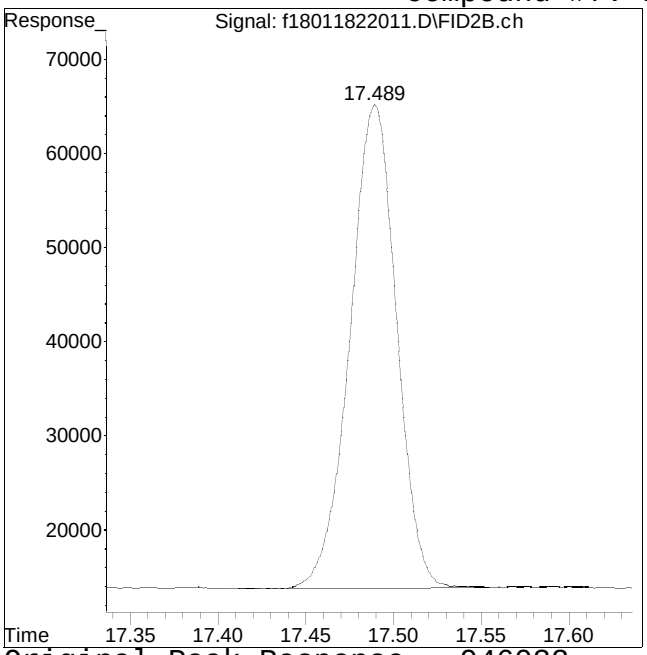
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

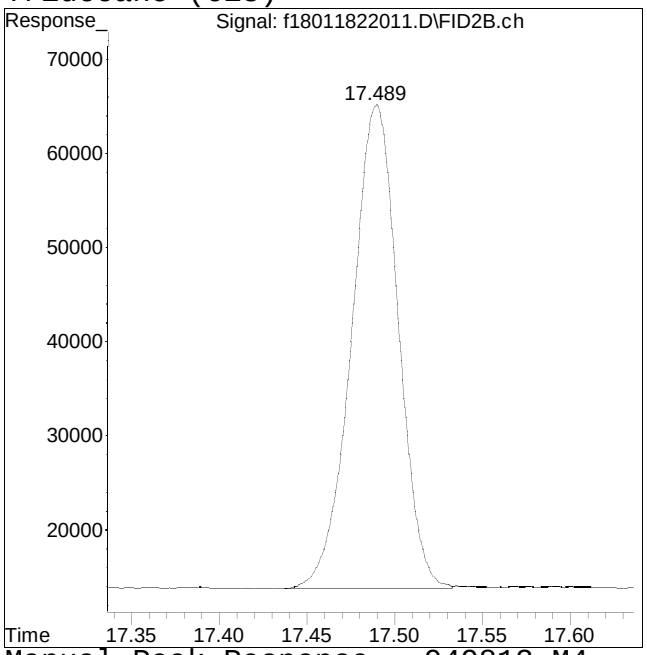
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #7: n-Tridecane (C13)



Original Peak Response = 946032



Manual Peak Response = 949813 M4

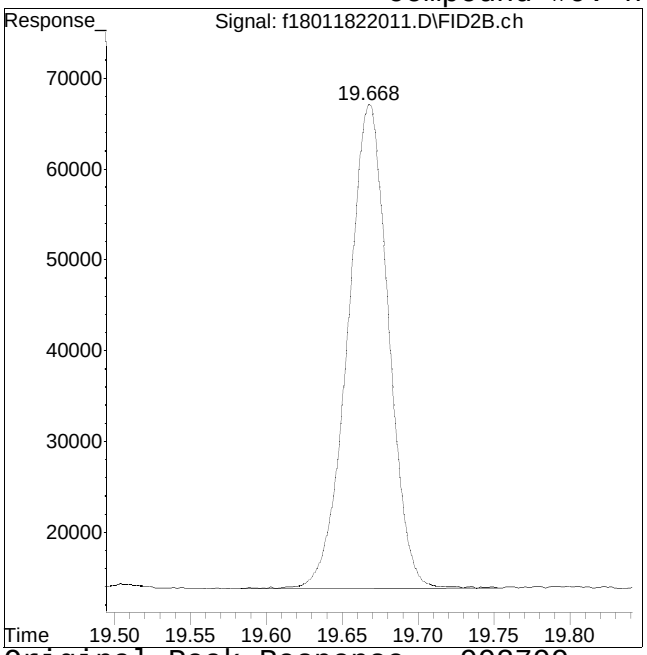
M4 = Poor automated baseline construction.

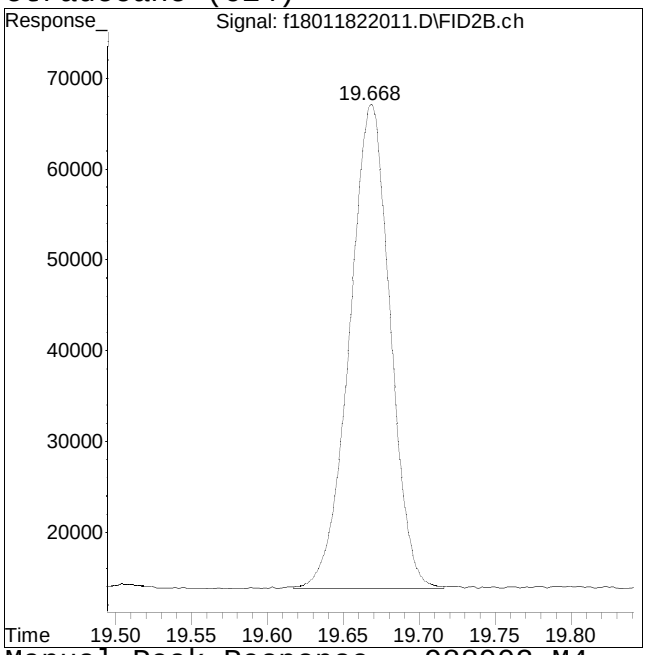
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #9: n-Tetradecane (C14)





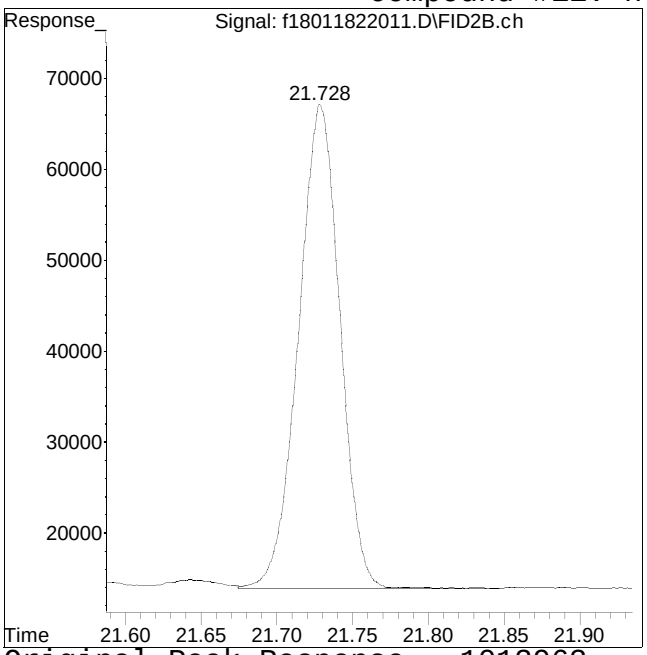
Original Peak Response = 992799 Manual Peak Response = 988902 M4
M4 = Poor automated baseline construction.

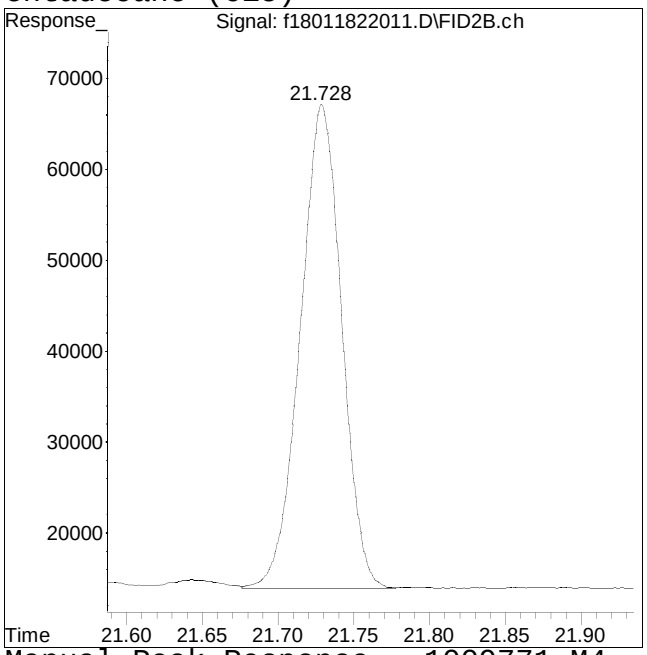
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #11: n-Pentadecane (C15)





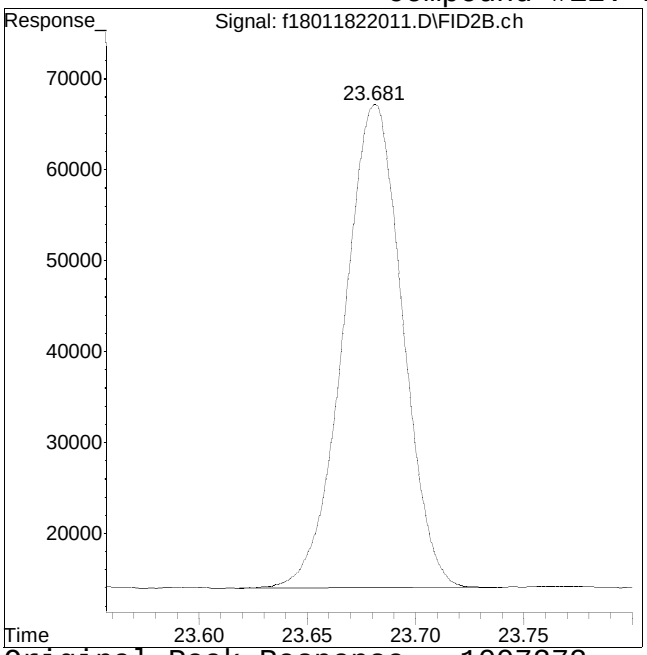
Original Peak Response = 1013963 Manual Peak Response = 1009771 M4
M4 = Poor automated baseline construction.

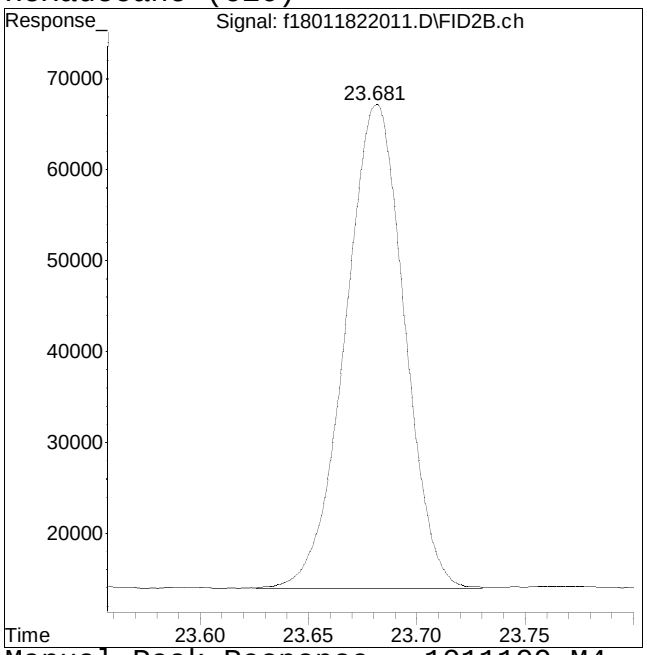
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #12: n-Hexadecane (C16)





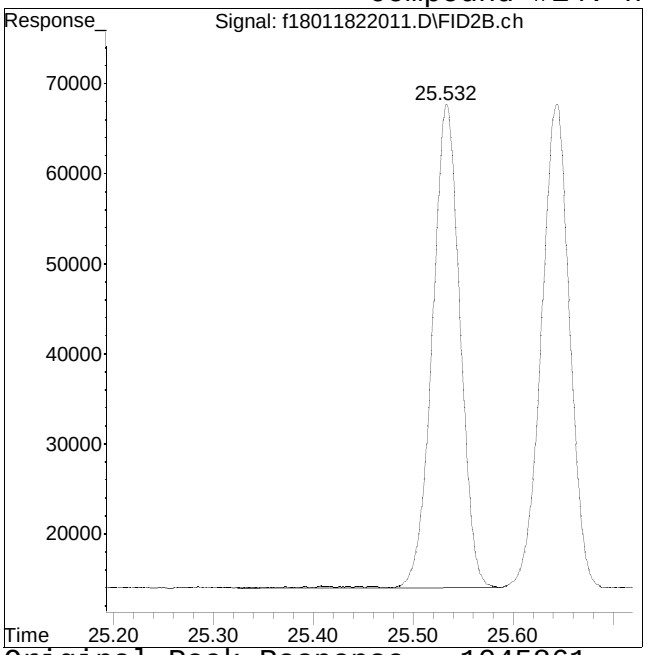
Original Peak Response = 1007272 Manual Peak Response = 1011109 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

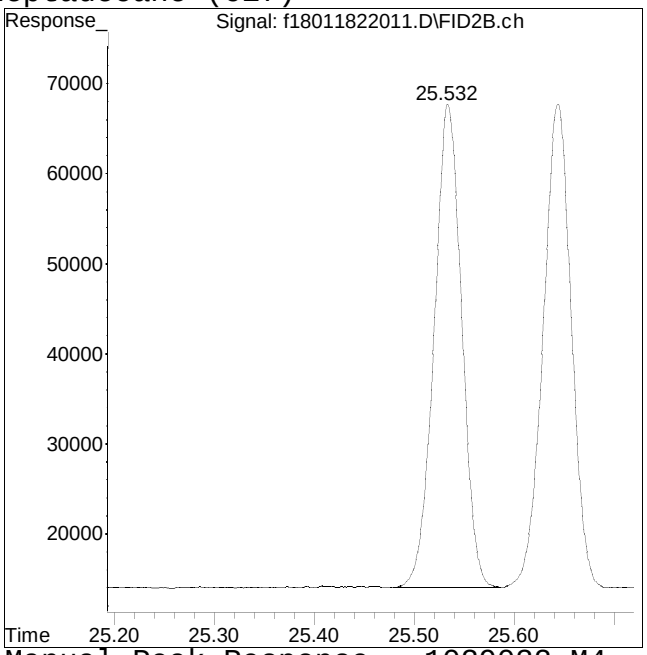
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #14: n-Heptadecane (C17)



Original Peak Response = 1045861



Manual Peak Response = 1029032 M4

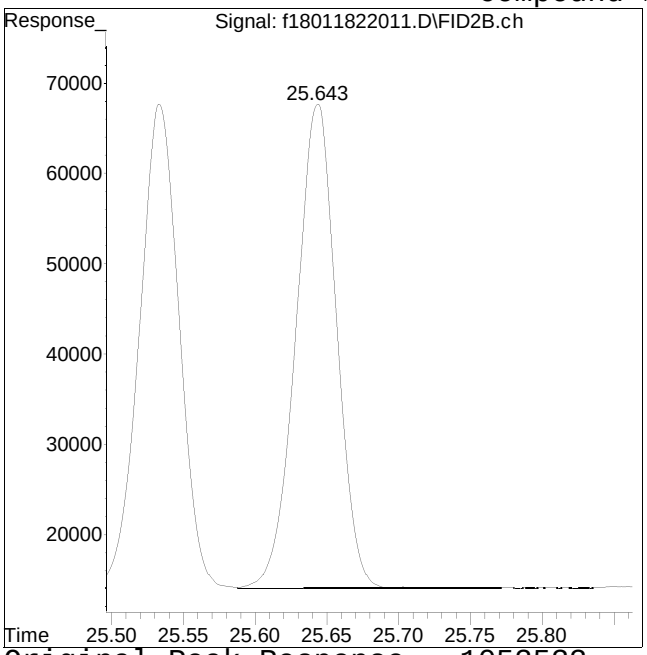
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

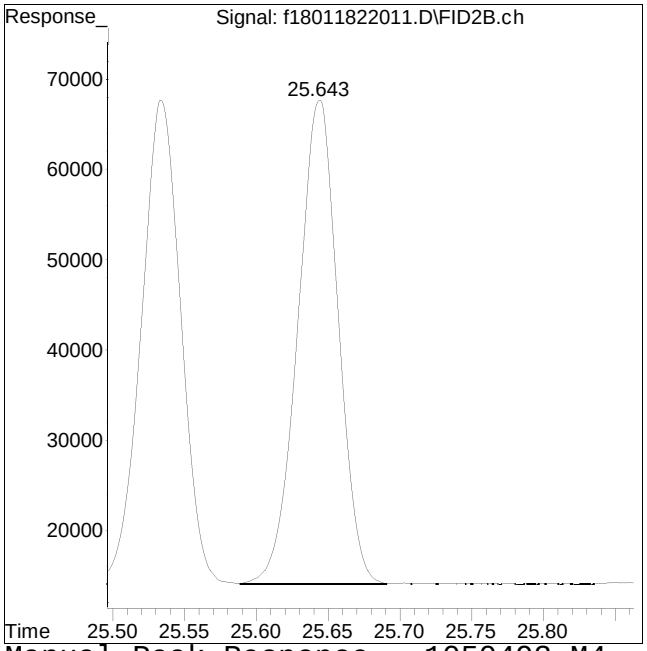
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #15: Pristane



Original Peak Response = 1053533



Manual Peak Response = 1050493 M4

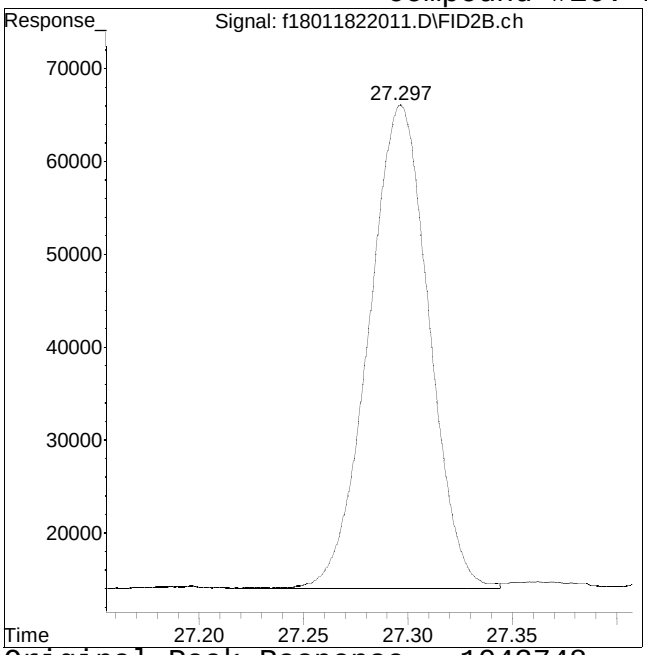
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

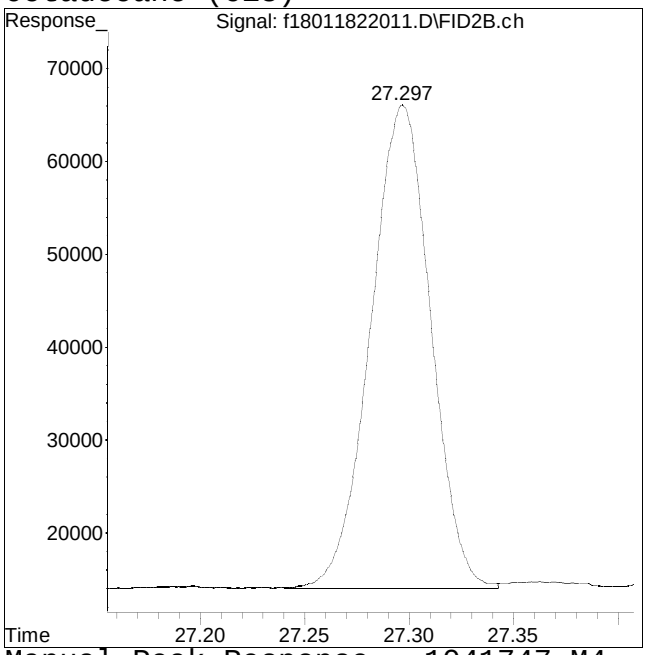
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #16: n-Octadecane (C18)



Original Peak Response = 1043748



Manual Peak Response = 1041747 M4

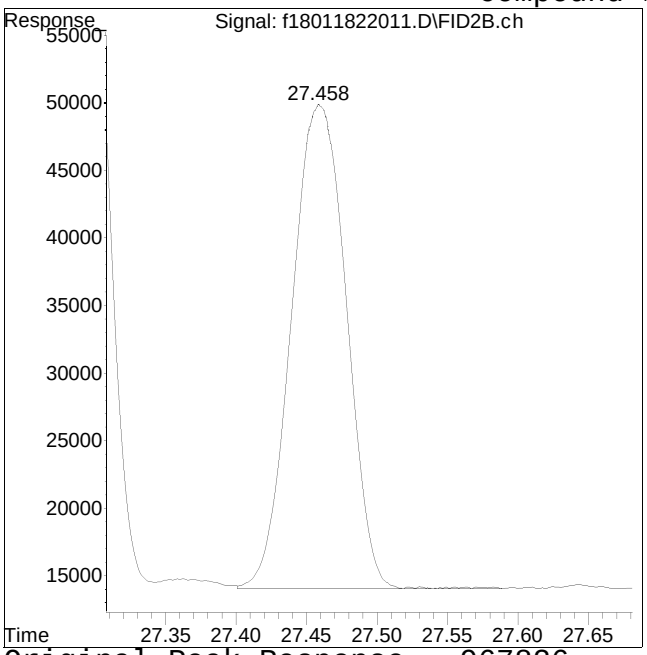
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

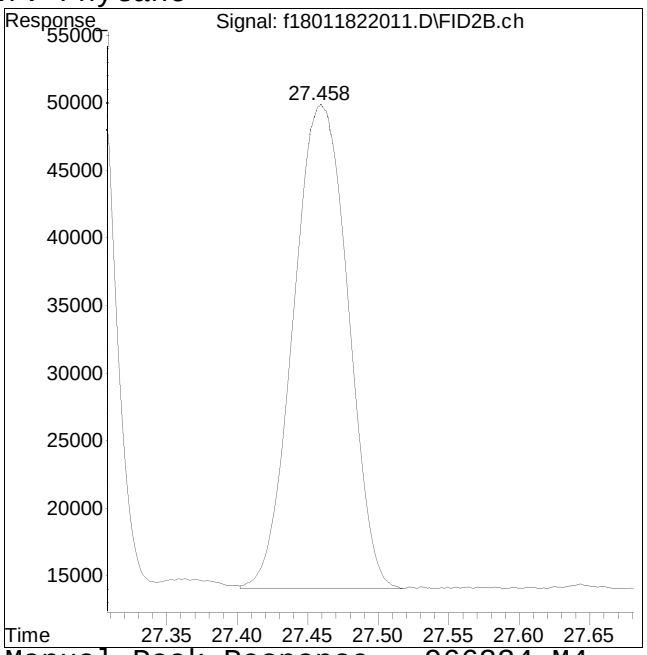
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #17: Phytane



Original Peak Response = 967826



Manual Peak Response = 966334 M4

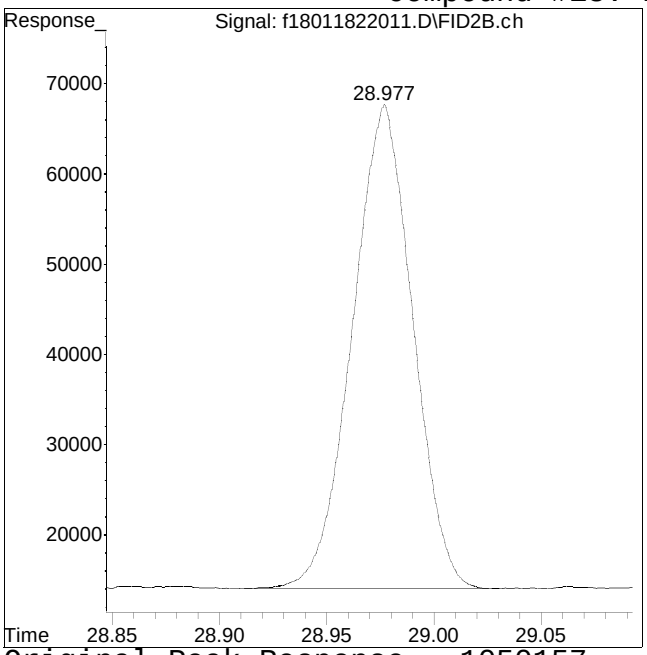
M4 = Poor automated baseline construction.

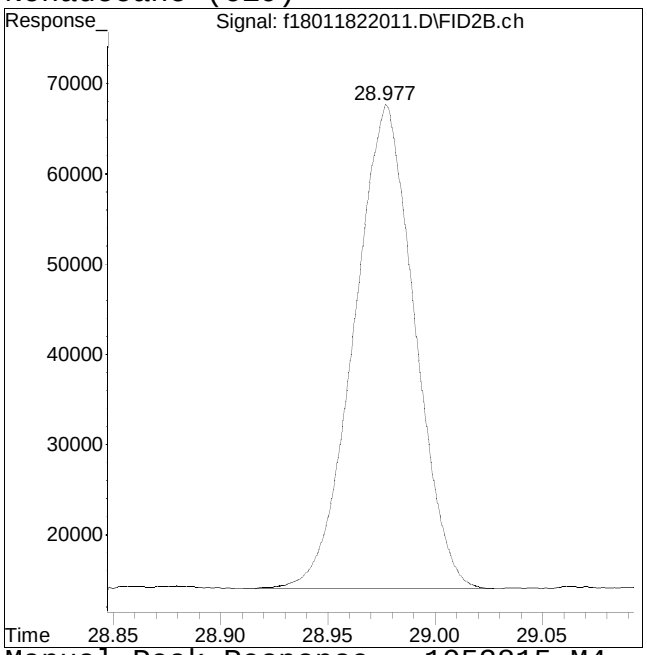
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #18: n-Nonadecane (C19)





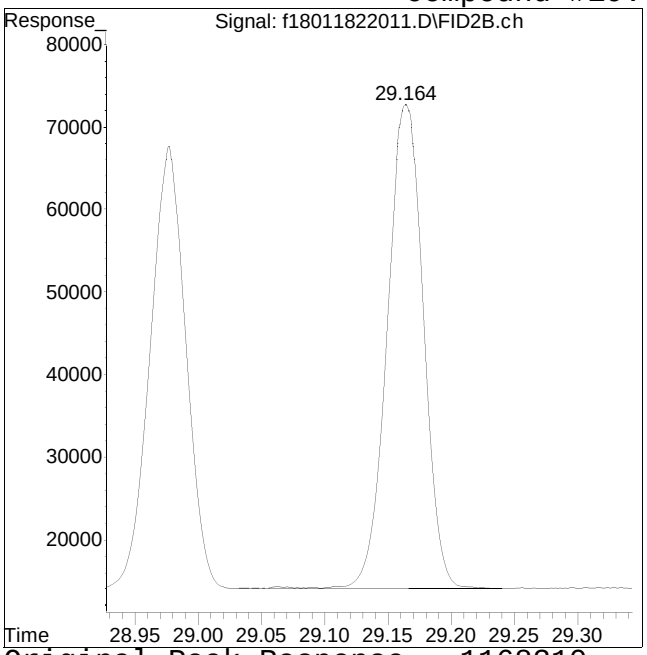
Original Peak Response = 1050157 Manual Peak Response = 1053815 M4
M4 = Poor automated baseline construction.

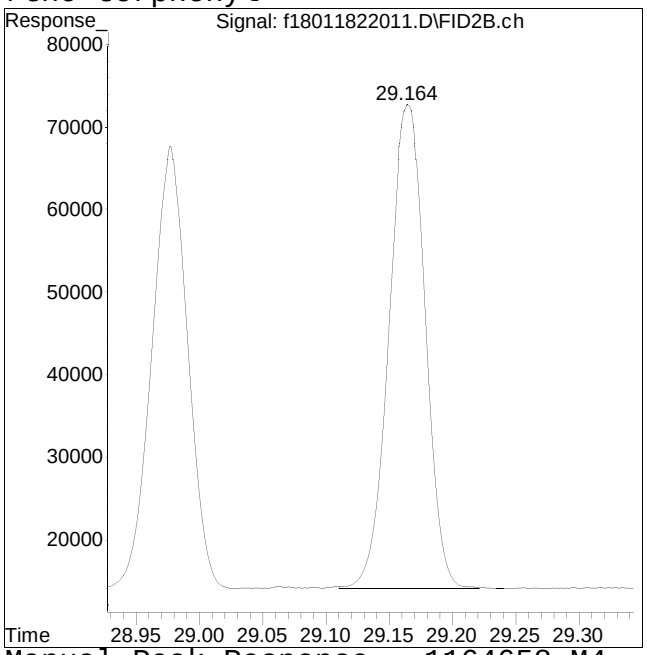
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #19: ortho-terphenyl





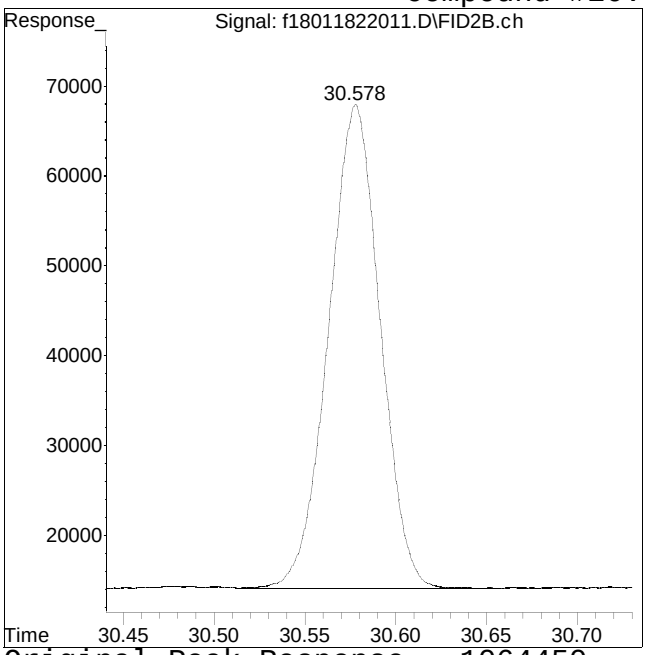
Original Peak Response = 1168310 Manual Peak Response = 1164658 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

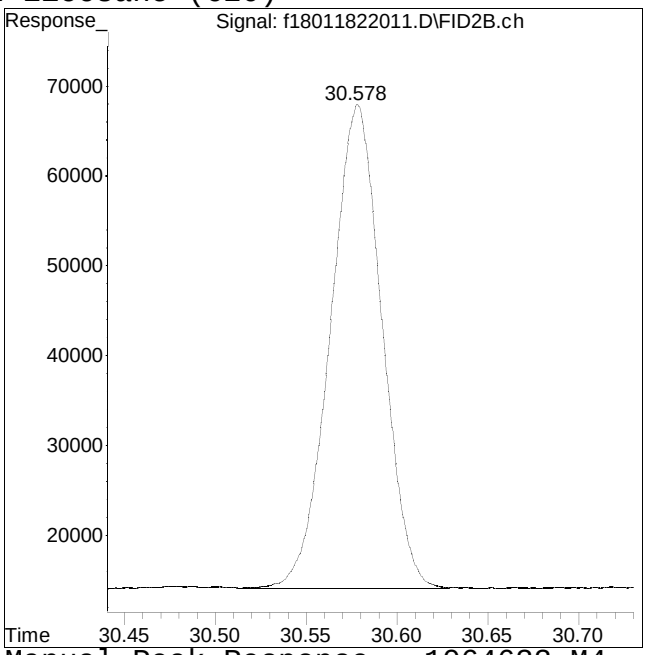
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #20: n-Eicosane (C20)



Original Peak Response = 1064450



Manual Peak Response = 1064633 M4

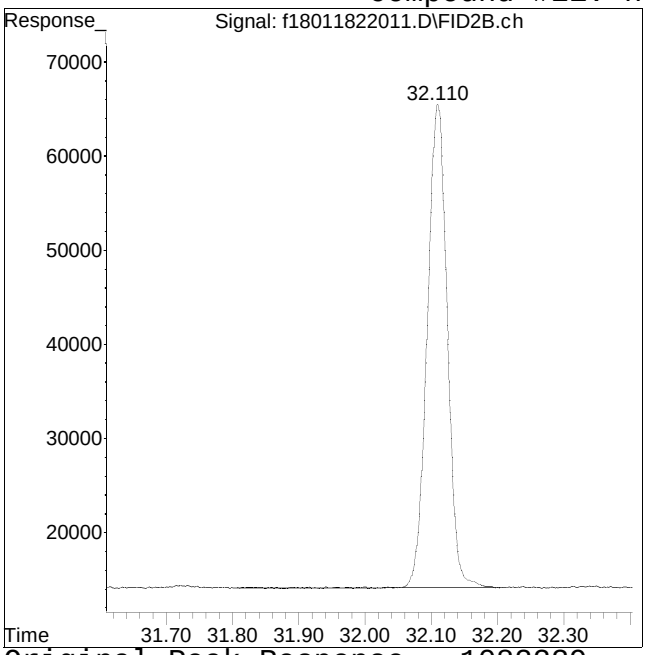
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

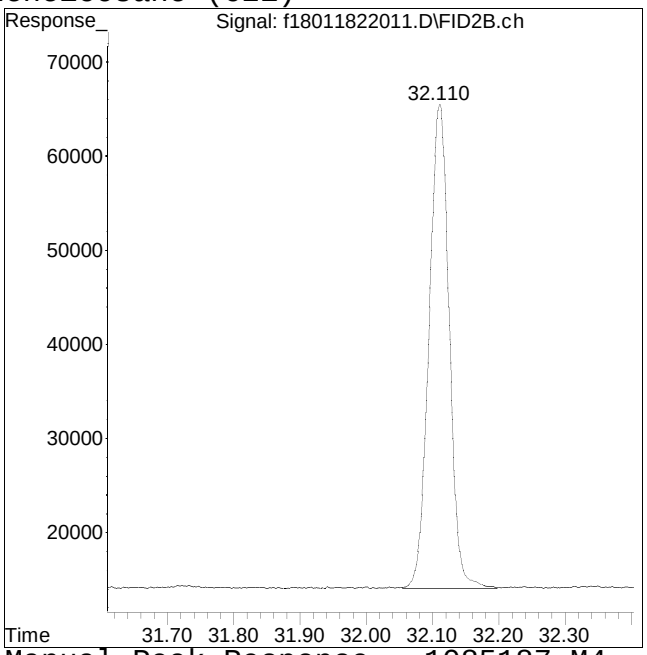
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #21: n-Heneicosane (C21)



Original Peak Response = 1082229



Manual Peak Response = 1085187 M4

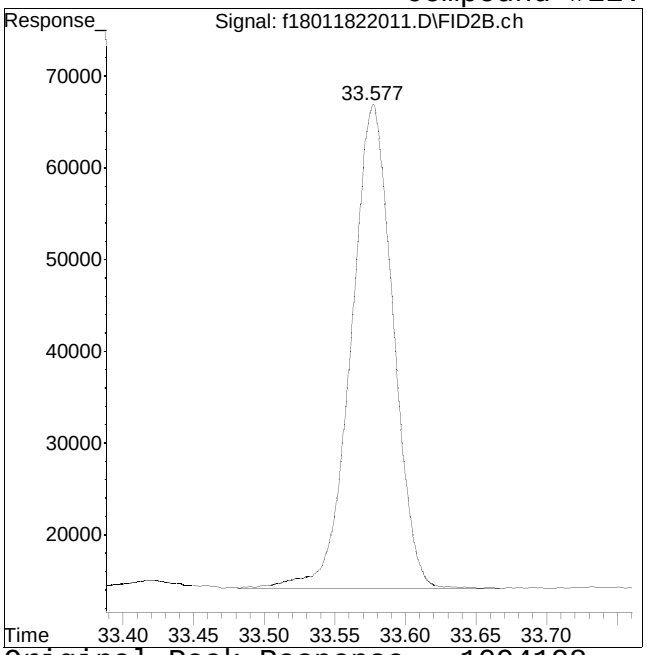
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

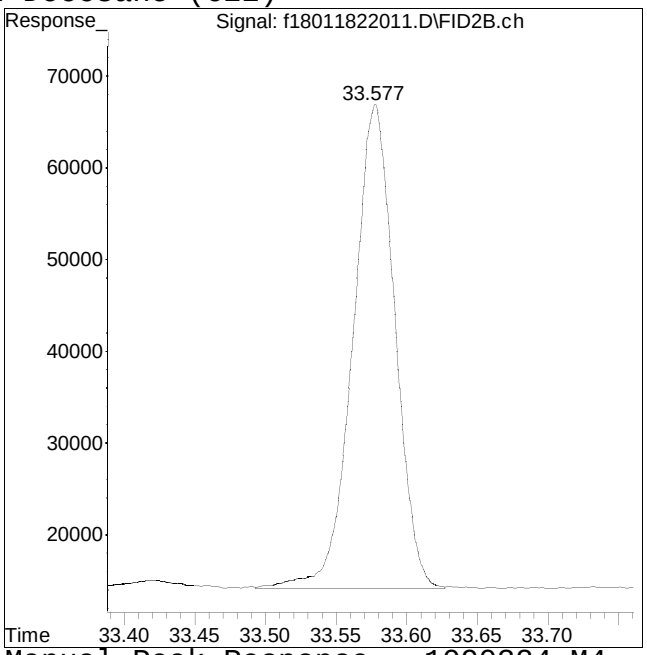
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #22: n-Docosane (C22)



Original Peak Response = 1094198



Manual Peak Response = 1090324 M4

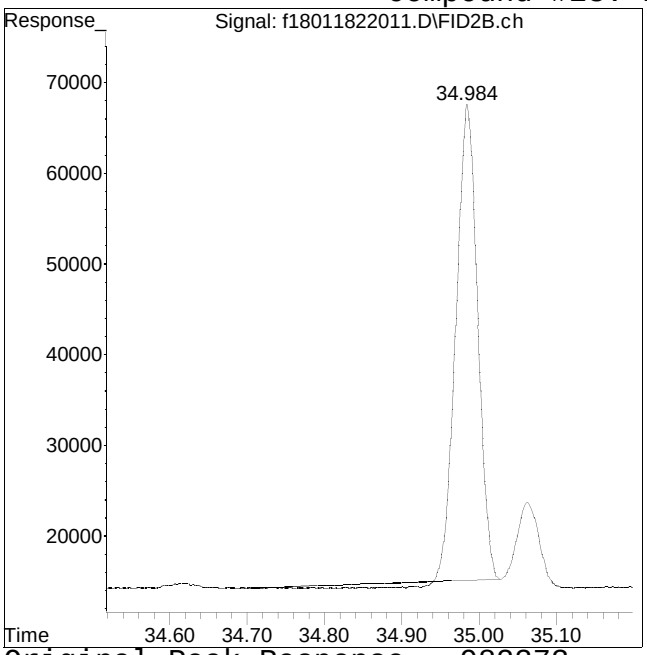
M4 = Poor automated baseline construction.

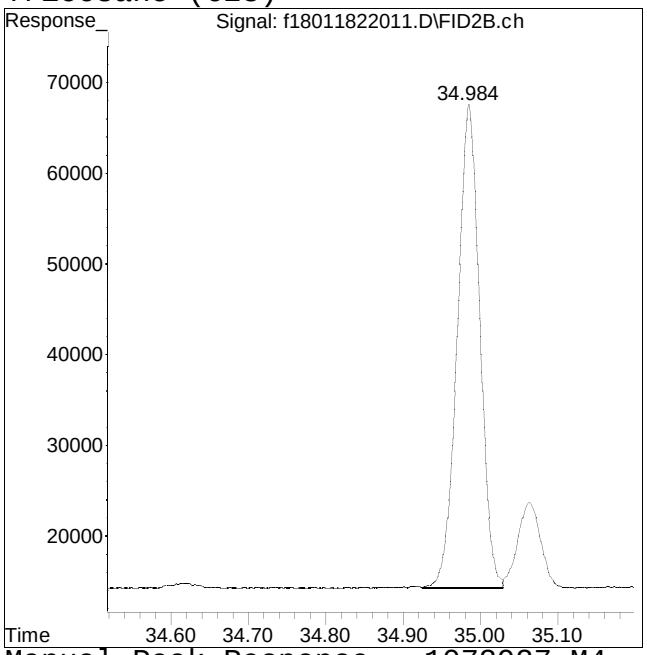
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #23: n-Tricosane (C23)





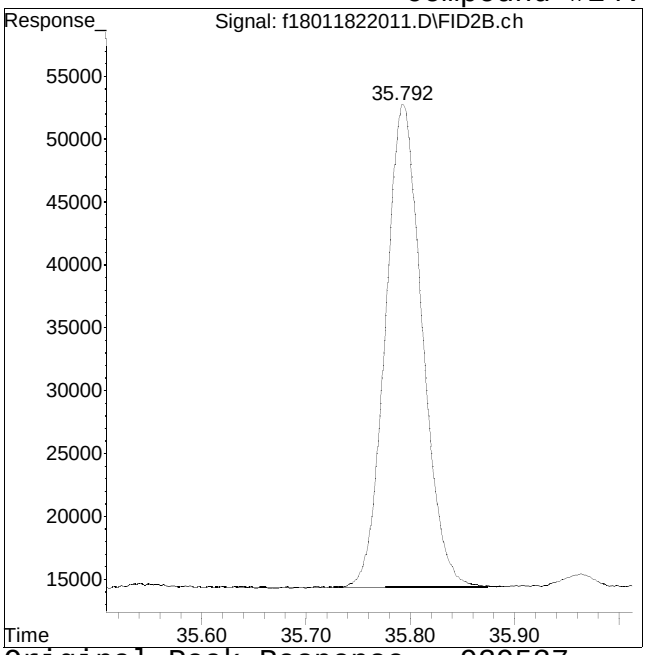
Original Peak Response = 982373 Manual Peak Response = 1072927 M4
M4 = Poor automated baseline construction.

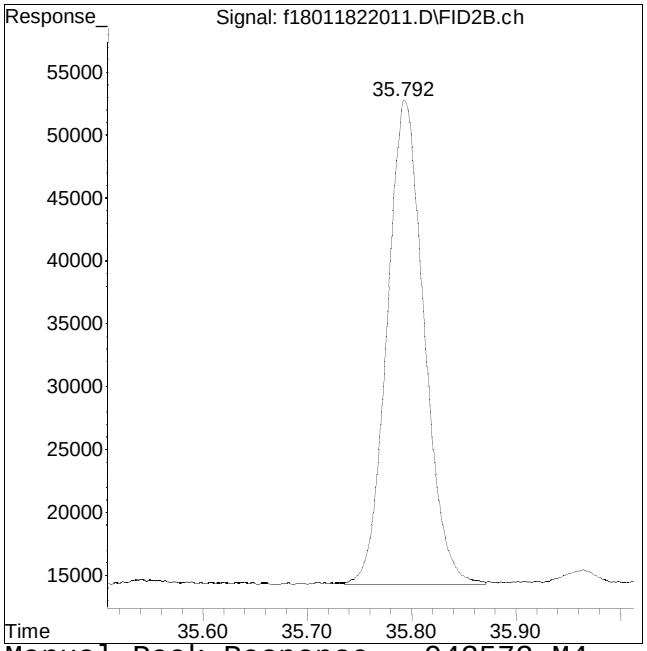
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #24: d50-Tetracosane





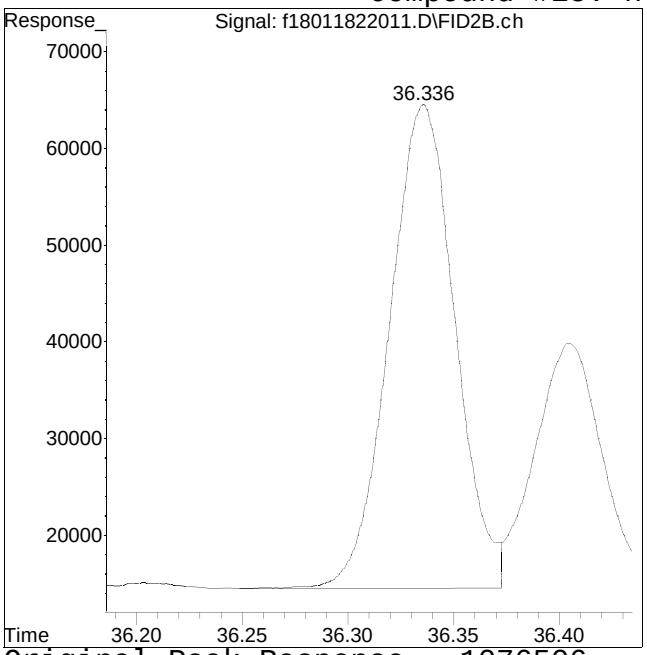
Original Peak Response = 939537 Manual Peak Response = 943573 M4
M4 = Poor automated baseline construction.

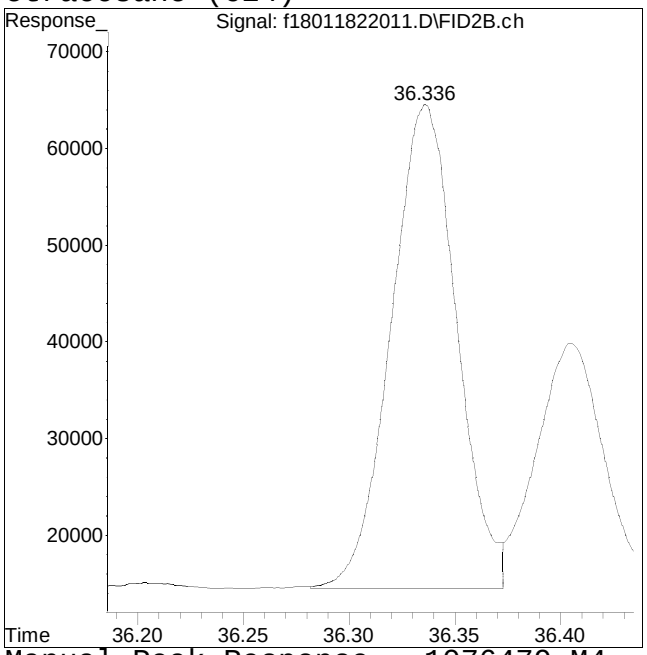
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #25: n-Tetracosane (C24)





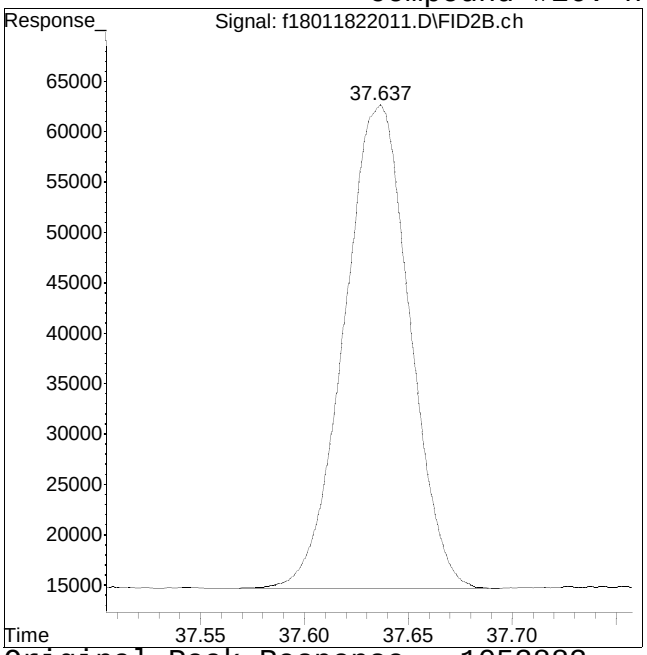
Original Peak Response = 1076506 Manual Peak Response = 1076479 M4
M4 = Poor automated baseline construction.

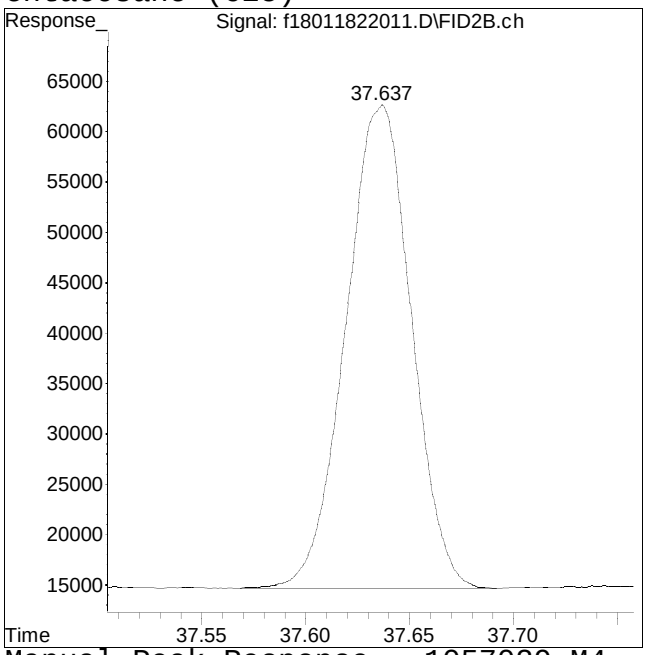
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #26: n-Pentacosane (C25)





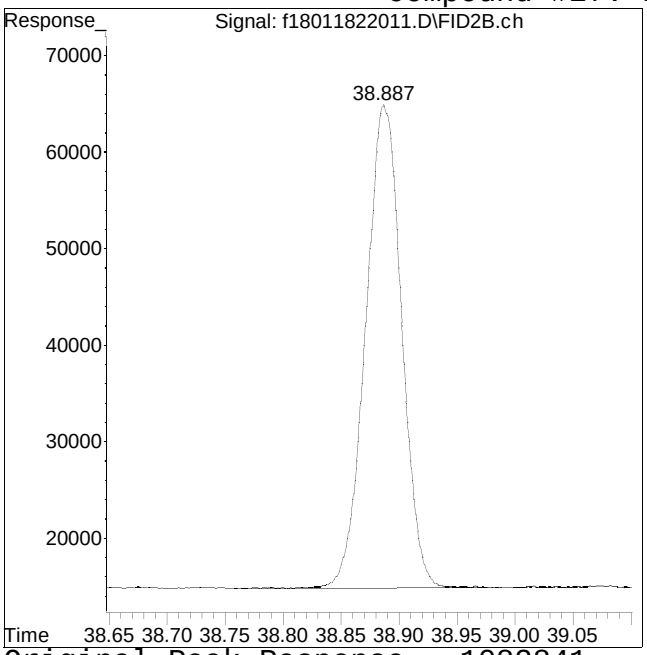
Original Peak Response = 1053883 Manual Peak Response = 1057029 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

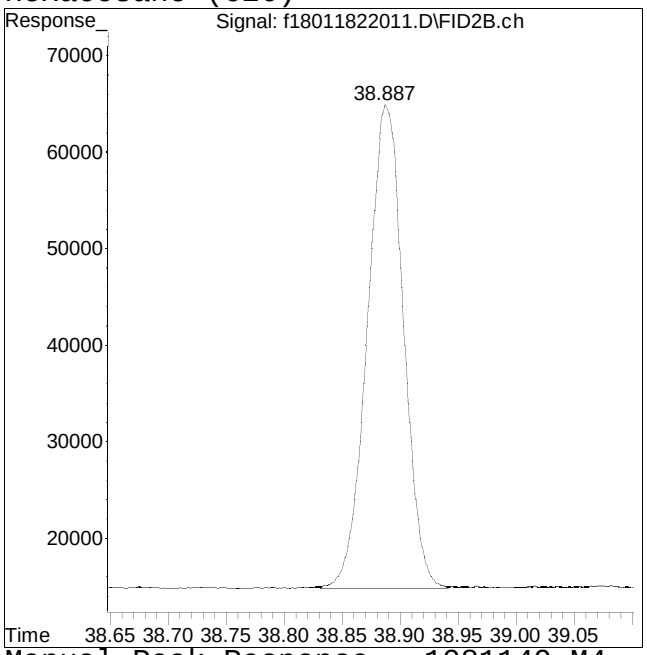
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #27: n-Hexacosane (C26)



Original Peak Response = 1082841



Manual Peak Response = 1081149 M4

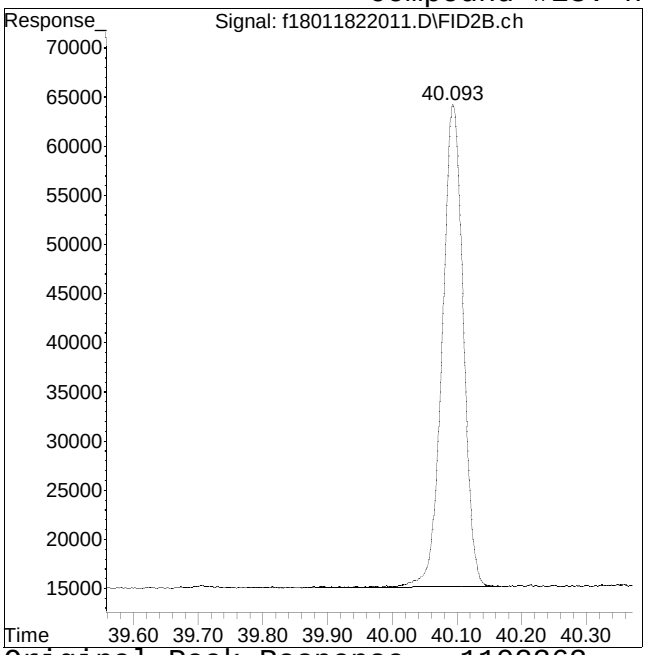
M4 = Poor automated baseline construction.

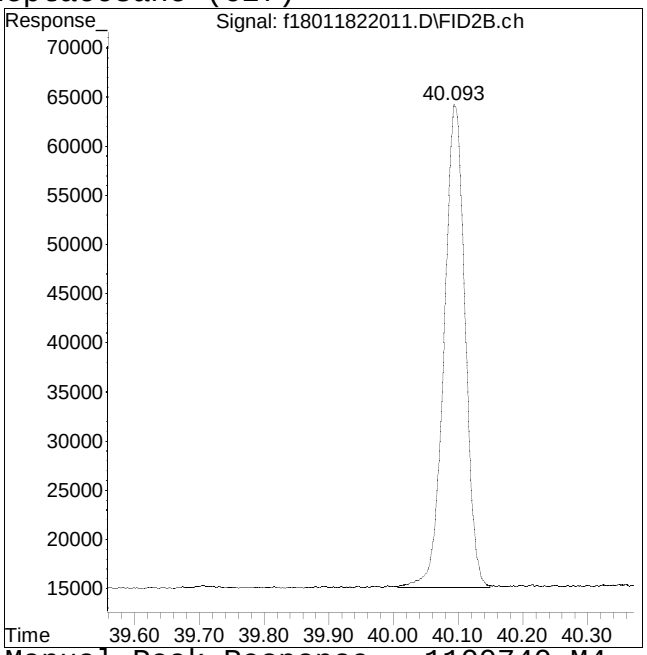
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #28: n-Heptacosane (C27)





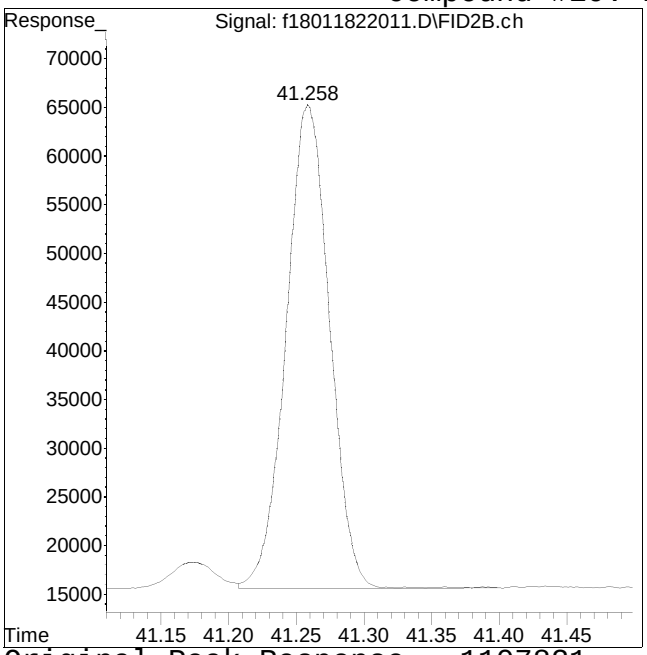
Original Peak Response = 1102363 Manual Peak Response = 1100740 M4
M4 = Poor automated baseline construction.

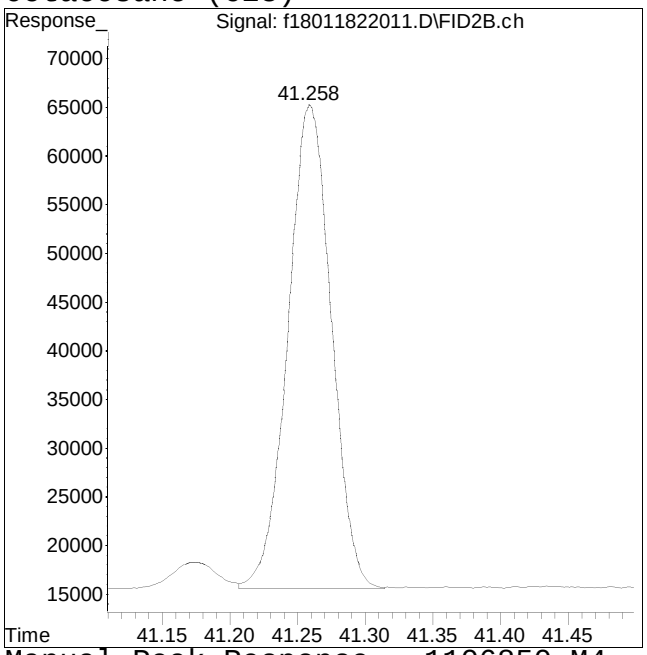
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #29: n-Octacosane (C28)





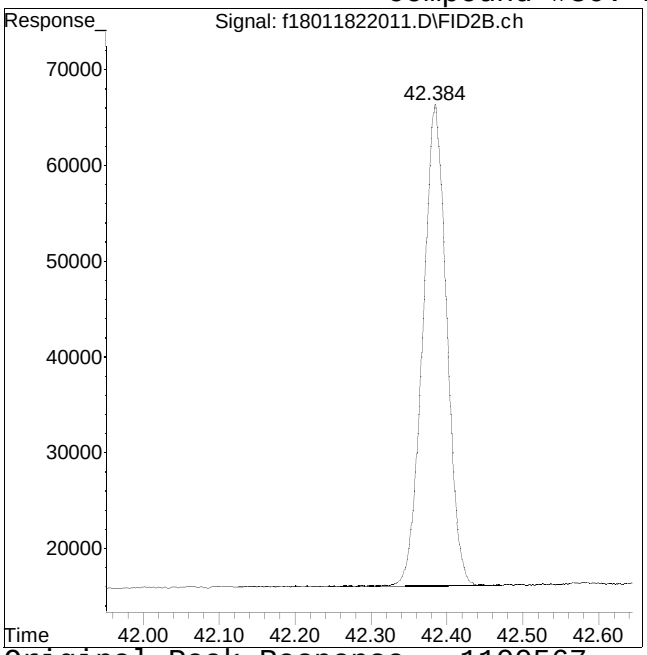
Original Peak Response = 1107821 Manual Peak Response = 1106850 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

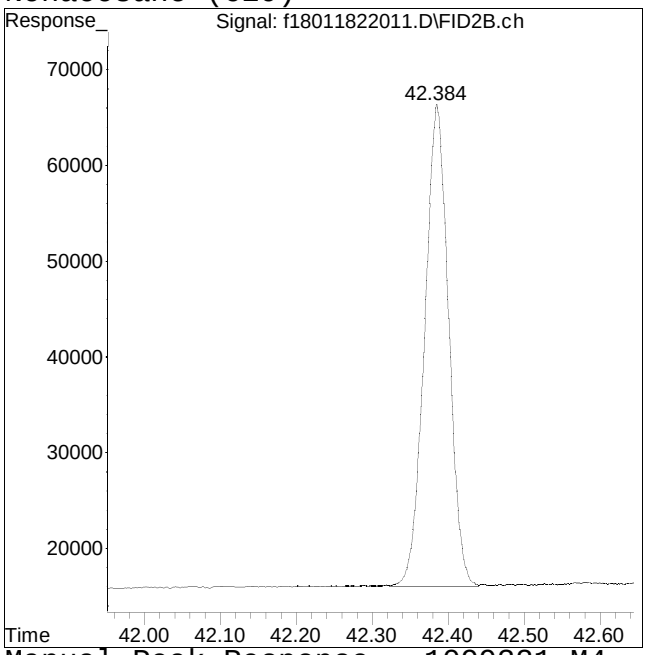
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #30: n-Nonacosane (C29)



Original Peak Response = 1100567



Manual Peak Response = 1099321 M4

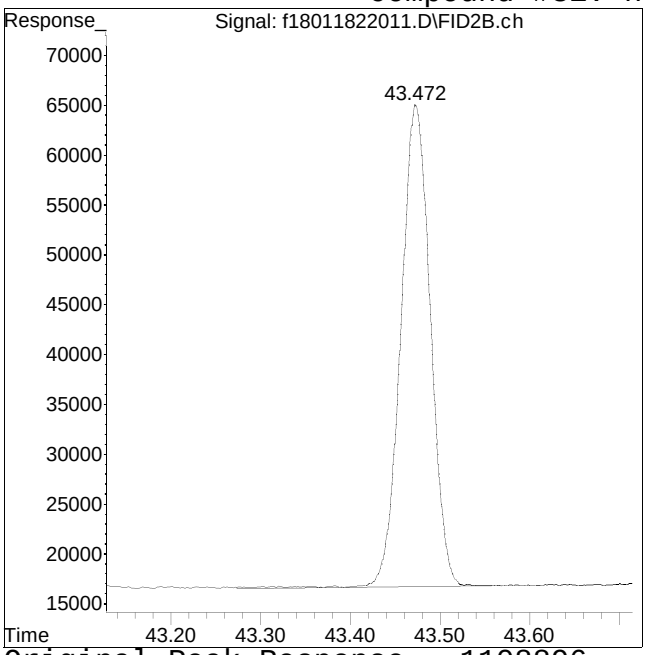
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

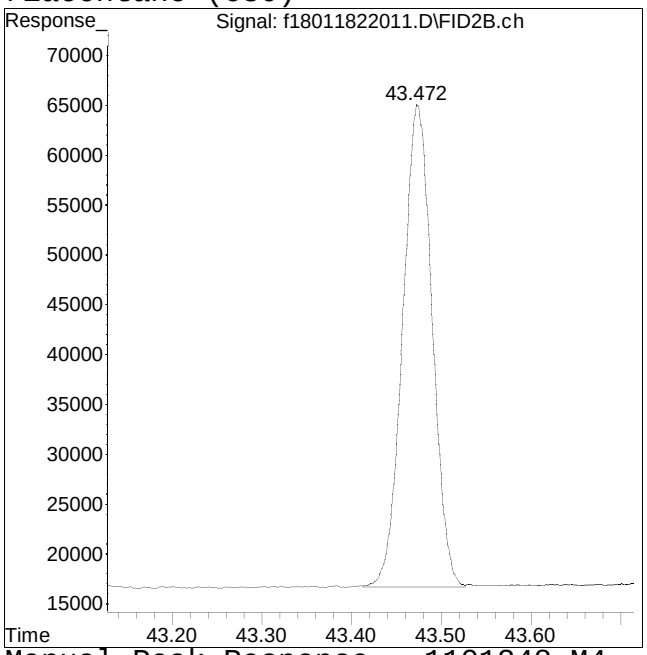
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #31: n-Triacontane (C30)



Original Peak Response = 1108896



Manual Peak Response = 1101248 M4

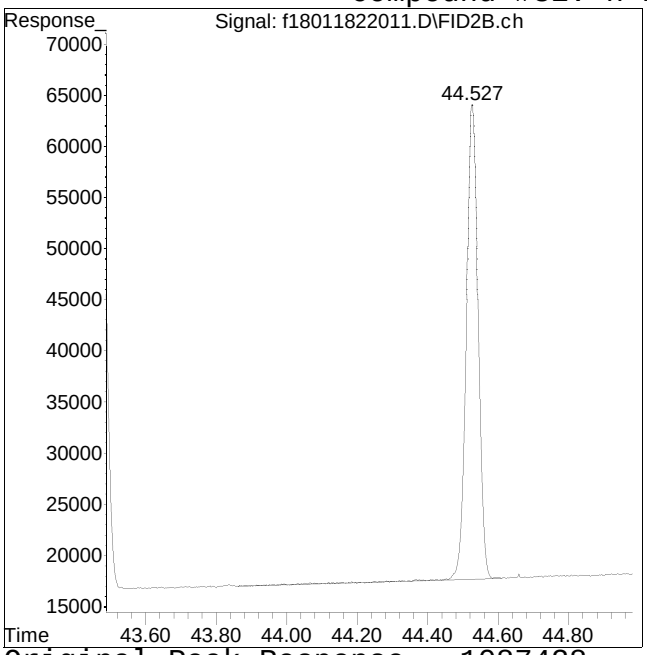
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

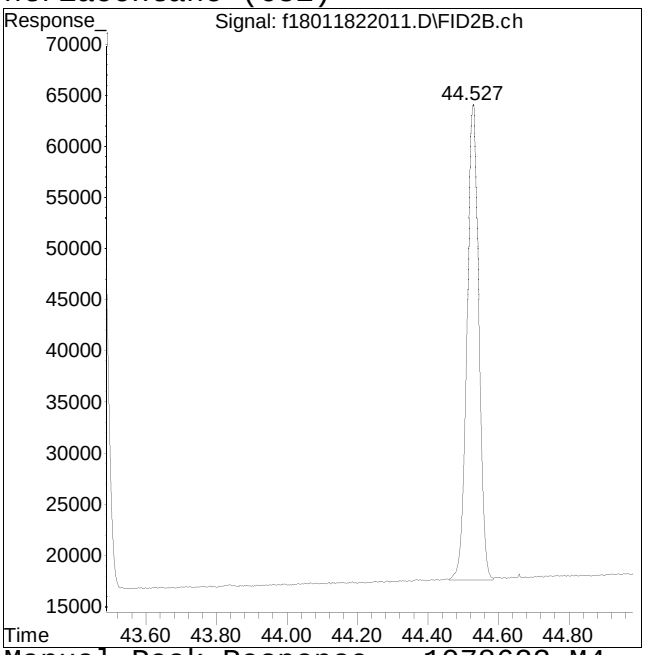
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #32: n-Hentriacontane (C31)



Original Peak Response = 1087428



Manual Peak Response = 1078623 M4

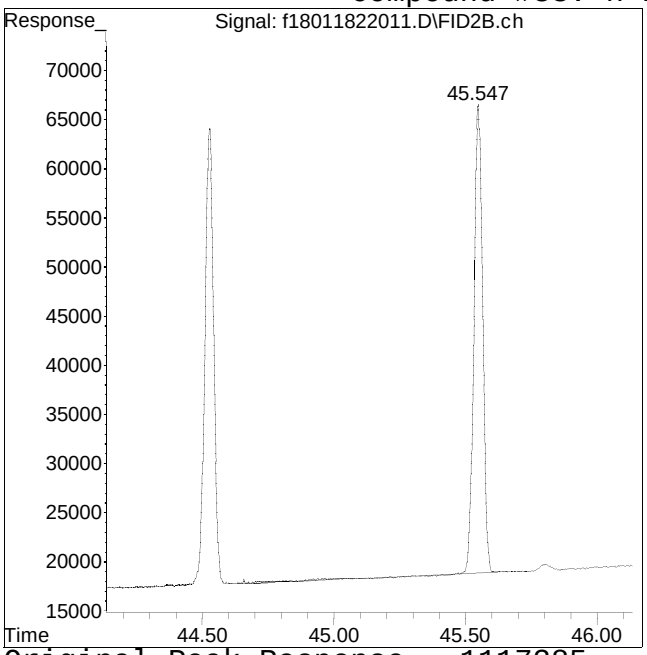
M4 = Poor automated baseline construction.

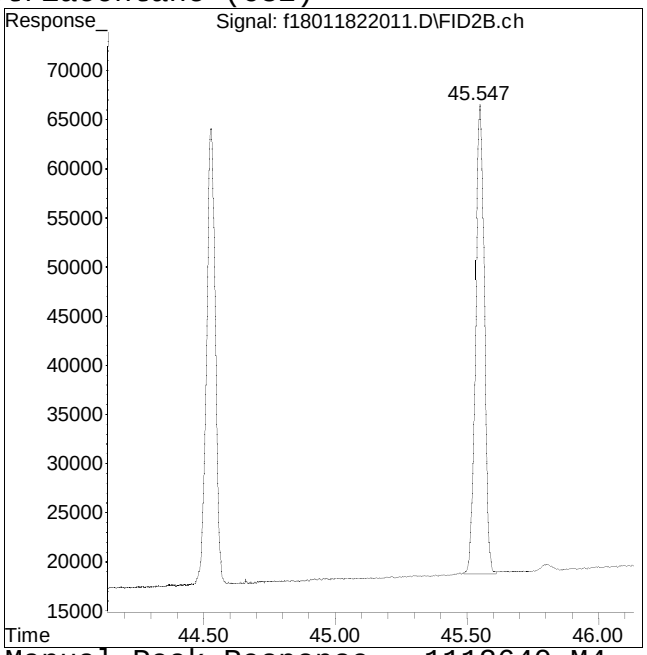
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #33: n-Dotriacontane (C32)





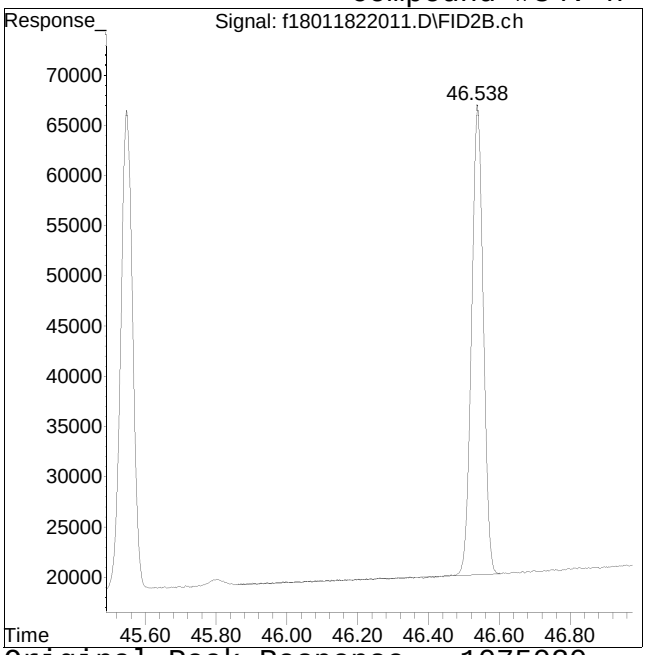
Original Peak Response = 1117385 Manual Peak Response = 1112640 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

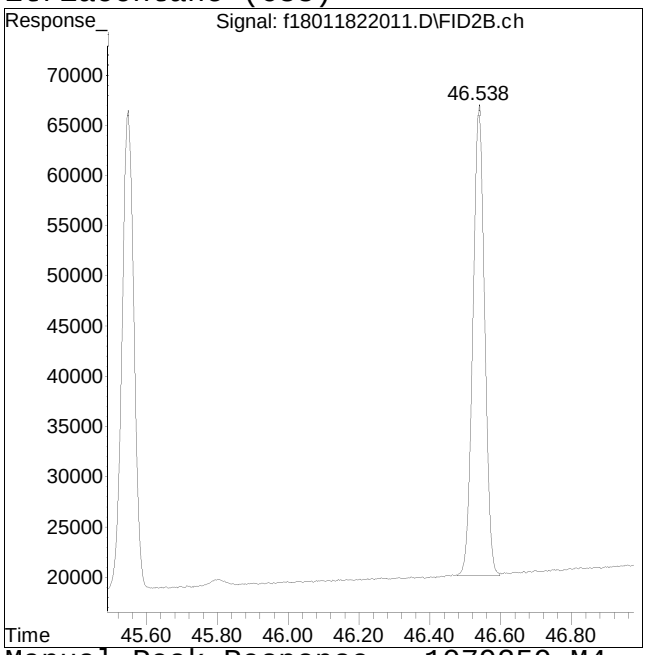
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #34: n-Tritriacontane (C33)



Original Peak Response = 1075020



Manual Peak Response = 1079259 M4

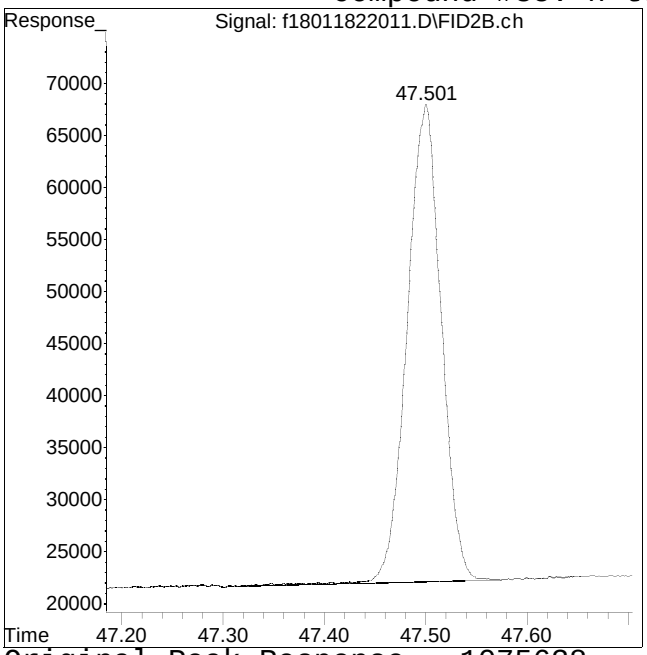
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

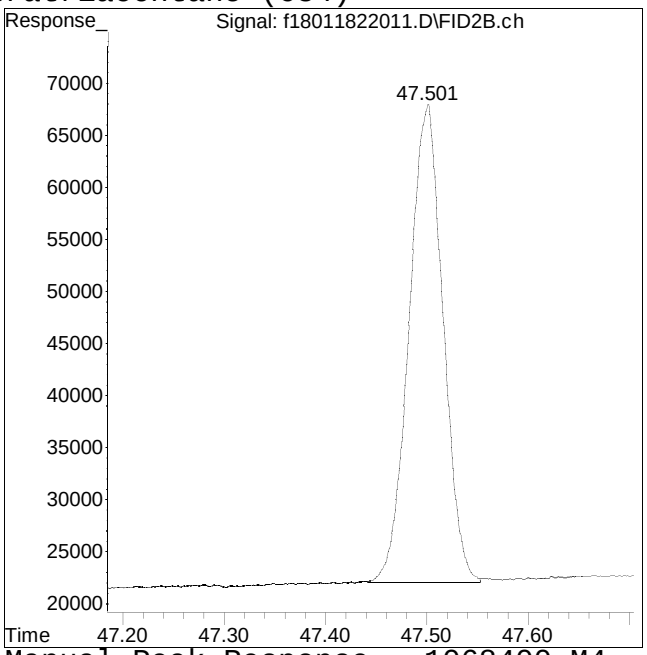
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #35: n-tetratriacontane (C34)



Original Peak Response = 1075638



Manual Peak Response = 1068400 M4

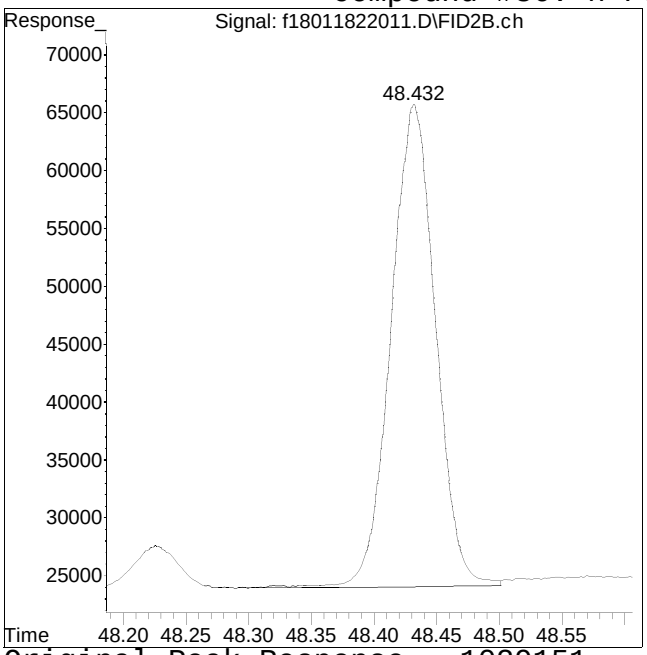
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

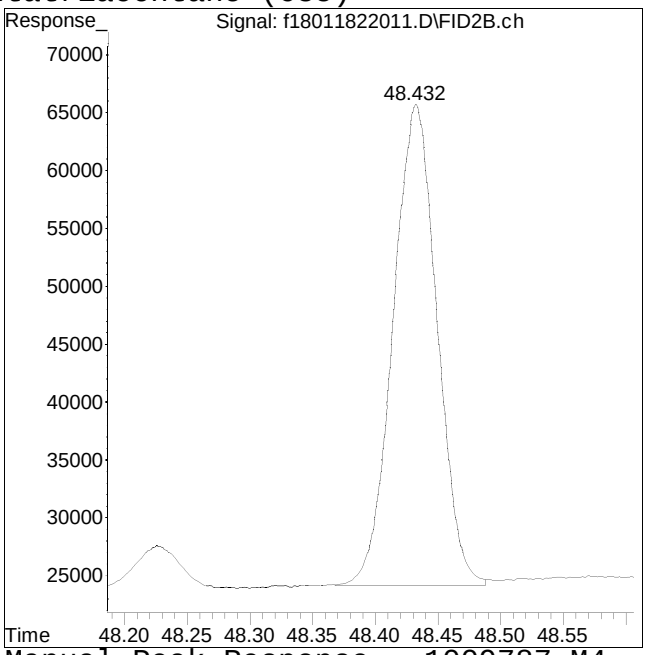
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #36: n-Pentatriacontane (C35)



Original Peak Response = 1029151



Manual Peak Response = 1009787 M4

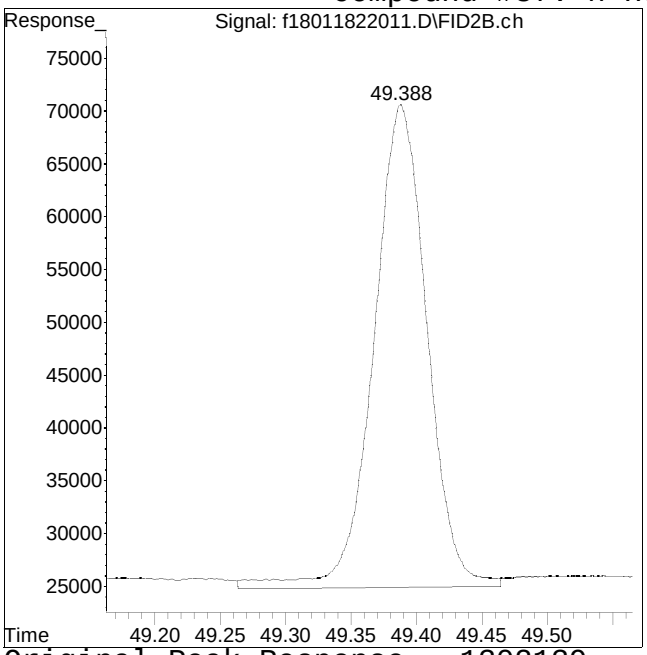
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

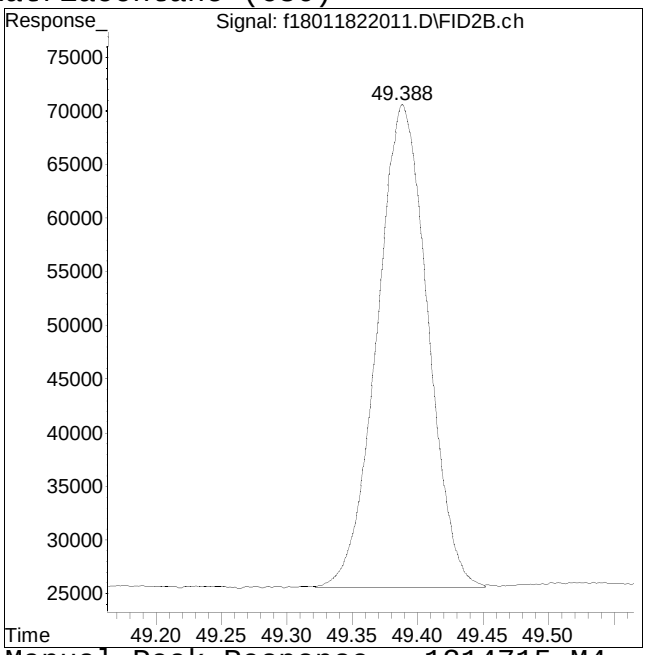
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #37: n-Hexatriacontane (C36)



Original Peak Response = 1302139



Manual Peak Response = 1214715 M4

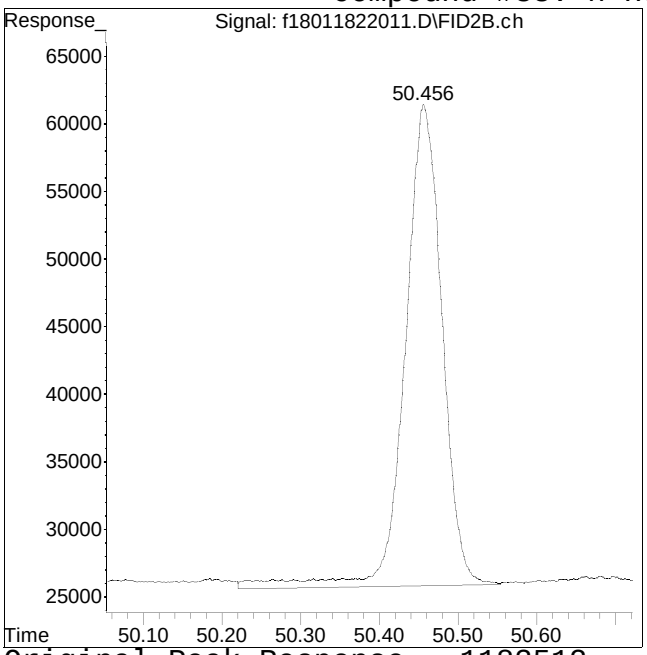
M4 = Poor automated baseline construction.

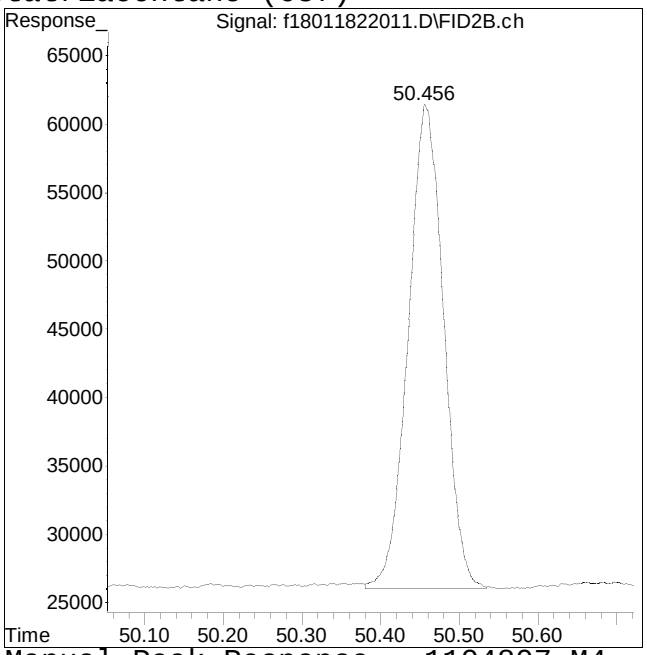
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #38: n-Heptatriacontane (C37)





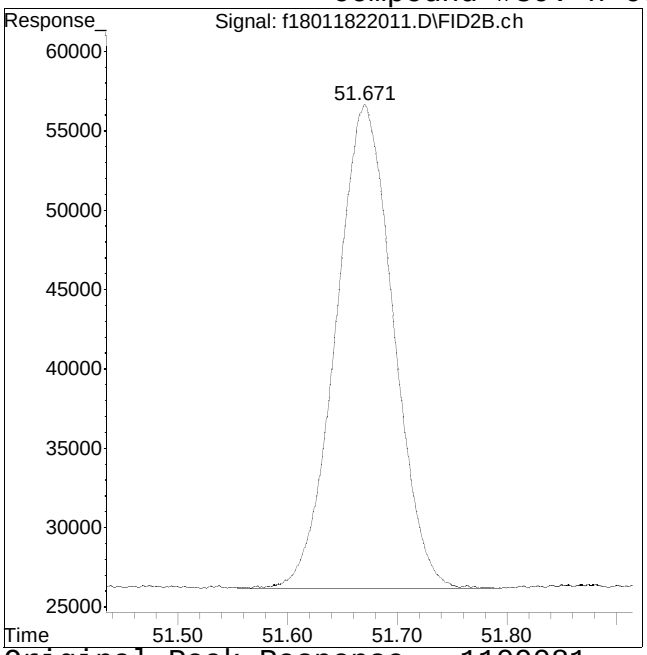
Original Peak Response = 1183512 Manual Peak Response = 1104807 M4
M4 = Poor automated baseline construction.

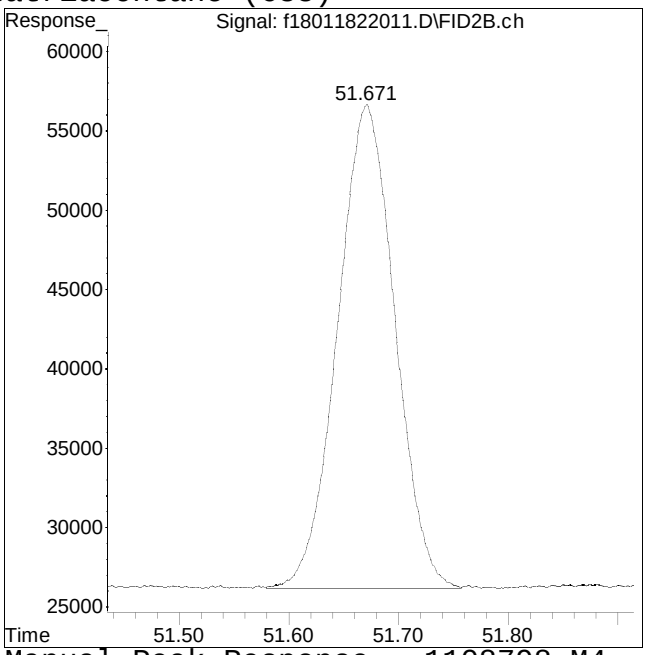
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #39: n-Octatriacontane (C38)





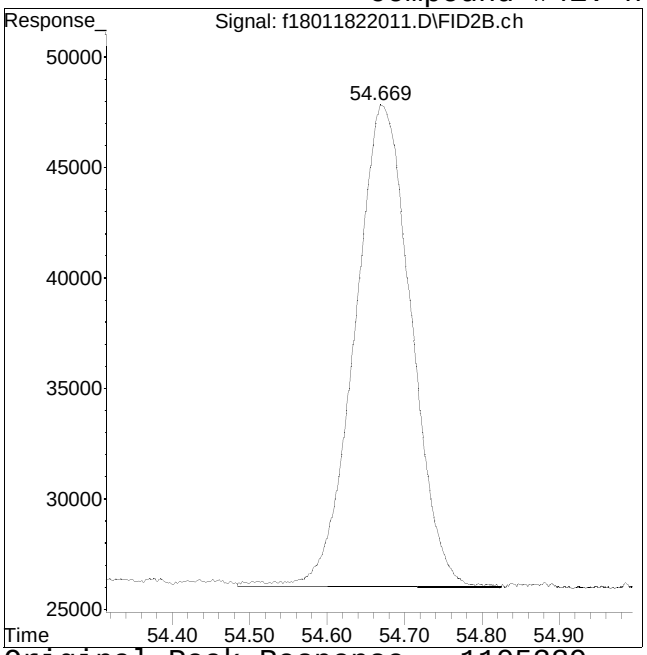
Original Peak Response = 1109081 Manual Peak Response = 1108798 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

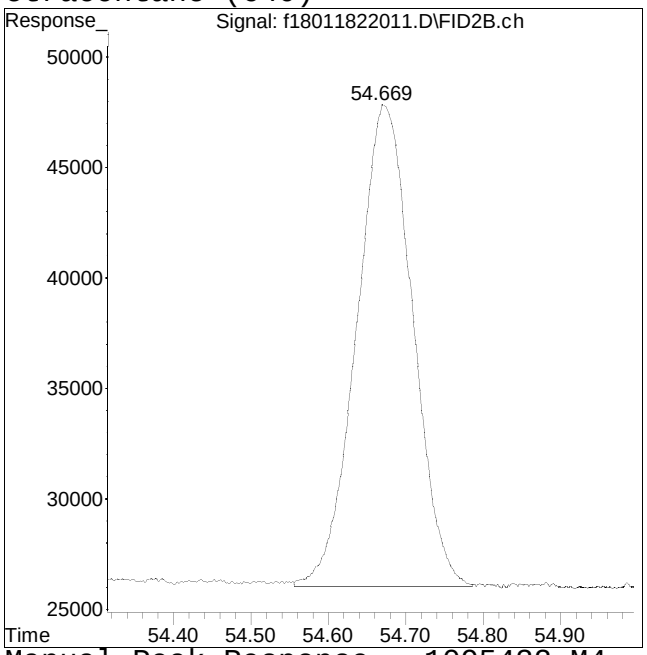
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822011.D
Date Inj'd : 1/18/2022 7:48 pm
Sample : I1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:28 pm

Compound #41: n-Tetracontane (C40)



Original Peak Response = 1105339



Manual Peak Response = 1095432 M4

M4 = Poor automated baseline construction.

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822013.D
Signal(s) : FID2B.ch
Acq On : 18 Jan 2022 09:14 pm
Operator : FID18:WR
Sample : I1801182202R
Misc : WG1596727,FRBE50,10ug/ml
ALS Vial : 57 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 17:44:06 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:34:07 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	31.196	54231064	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	29.170	11242254	9.747 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery =	19.49%#
24) s d50-Tetracosane	35.800	9085865	9.699 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery =	19.40%#
Target Compounds			
2) t n-Octane (C8)	5.552	9020672	10.165 ug/mL M4
3) t n-Nonane (C9)	7.768	9268185	10.057 ug/mL M4
4) t n-Decane (C10)	10.256	9620848	10.109 ug/mL M4
5) t n-Undecane (C11)	12.765	9630531	10.034 ug/mL M4
6) t n-Dodecane (C12)	15.189	9784935	10.088 ug/mL M4
7) t n-Tridecane (C13)	17.493	9861611	10.069 ug/mL M4
9) t n-Tetradecane (C14)	19.671	10183320	10.098 ug/mL M4
11) t n-Pentadecane (C15)	21.733	10295106	10.134 ug/mL M4
12) t n-Hexadecane (C16)	23.685	10263407	9.999 ug/mL M4
14) t n-Heptadecane (C17)	25.539	10448545	9.996 ug/mL M4
15) t Pristane	25.648	10658211	10.082 ug/mL M4
16) t n-Octadecane (C18)	27.301	10568301	10.015 ug/mL M4
17) t Phytane	27.461	9813548	10.070 ug/mL M4
18) t n-Nonadecane (C19)	28.981	10646945	10.095 ug/mL M4
20) t n-Eicosane (C20)	30.583	10735934	10.057 ug/mL M4
21) t n-Heneicosane (C21)	32.115	10802696	10.035 ug/mL M4
22) t n-Docosane (C22)	33.581	10804730	9.927 ug/mL M4
23) t n-Tricosane (C23)	34.989	10787869	9.979 ug/mL M4
25) t n-Tetracosane (C24)	36.341	10784045	10.204 ug/mL M4
26) t n-Pentacosane (C25)	37.641	10586660	9.920 ug/mL M4
27) t n-Hexacosane (C26)	38.890	10882528	9.917 ug/mL M4
28) t n-Heptacosane (C27)	40.100	10903136	10.017 ug/mL M4
29) t n-Octacosane (C28)	41.263	11118253	9.973 ug/mL M4
30) t n-Nonacosane (C29)	42.388	11086634	9.972 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822013.D
Signal(s) : FID2B.ch
Acq On : 18 Jan 2022 09:14 pm
Operator : FID18:WR
Sample : I1801182202R
Misc : WG1596727,FRBE50,10ug/ml
ALS Vial : 57 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 17:44:06 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:34:07 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

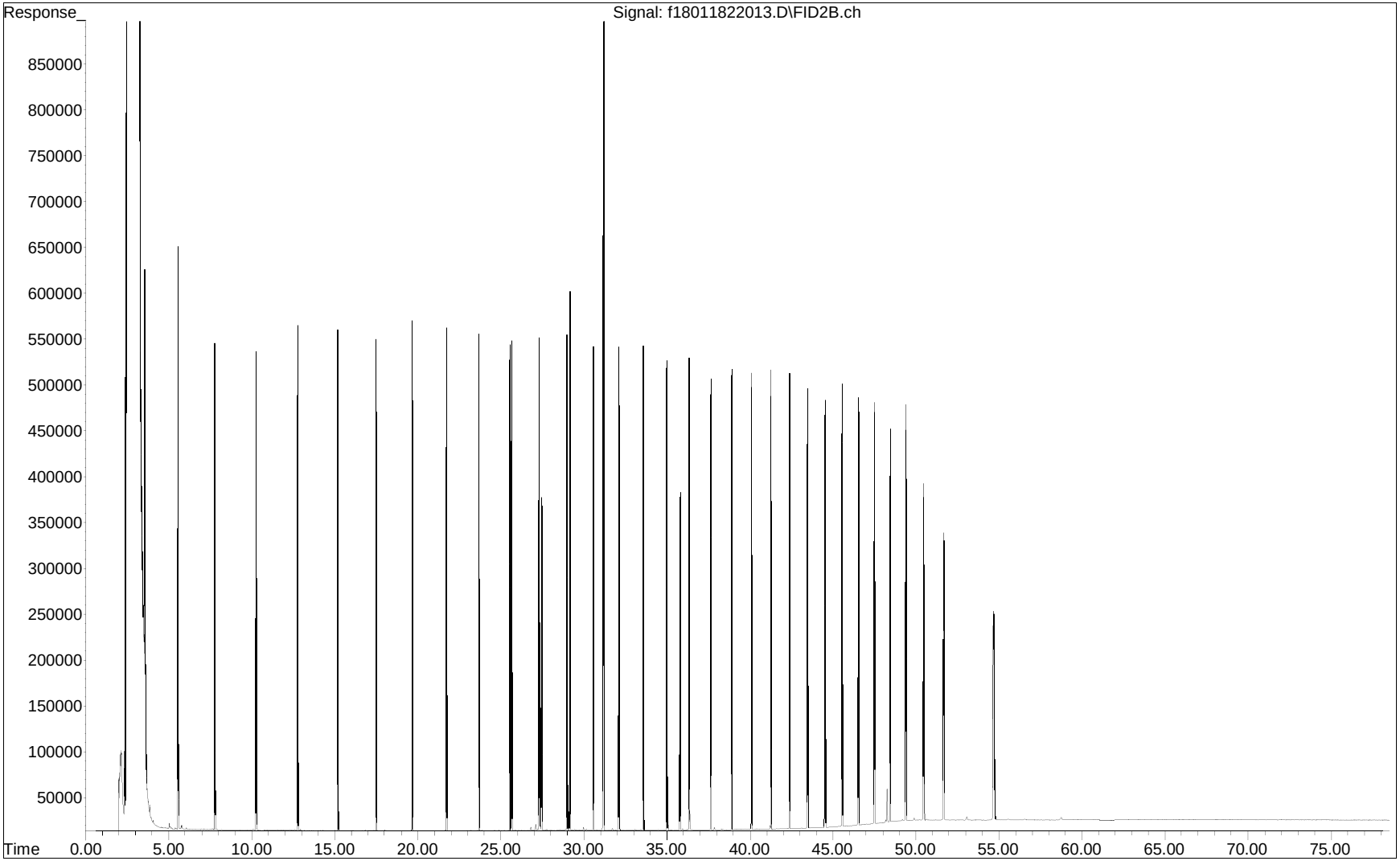
	Compound	R.T.	Response	Conc Units
31) t	n-Triacontane (C30)	43.476	11136046	9.975 ug/mL M4
32) t	n-Hentriacontane (C31)	44.531	10770872	9.880 ug/mL M4
33) t	n-Dotriacontane (C32)	45.550	11290579	9.942 ug/mL M4
34) t	n-Tritriacontane (C33)	46.541	10971221	9.966 ug/mL M4
35) t	n-tetratriacontane (C34)	47.501	10934090	9.977 ug/mL M4
36) t	n-Pentatriacontane (C35)	48.435	10238201	9.530 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.391	12373786	10.132 ug/mL M4
38) t	n-Heptatriacontane (C37)	50.463	11282737	10.079 ug/mL M4
39) t	n-Octatriacontane (C38)	51.680	11473679	10.043 ug/mL M4
41) t	n-Tetracontane (C40)	54.682	11405008	9.996 ug/mL M4

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\f18011822013.D
Operator : FID18:WR
Acquired : 18 Jan 2022 09:14 pm using AcqMethod FID18.M
Sample Name: I1801182202R
Instrument: FID 18
Misc Info : WG1596727,FRBE50,10ug/ml
Vial Number: 57
CurrentMeth: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M

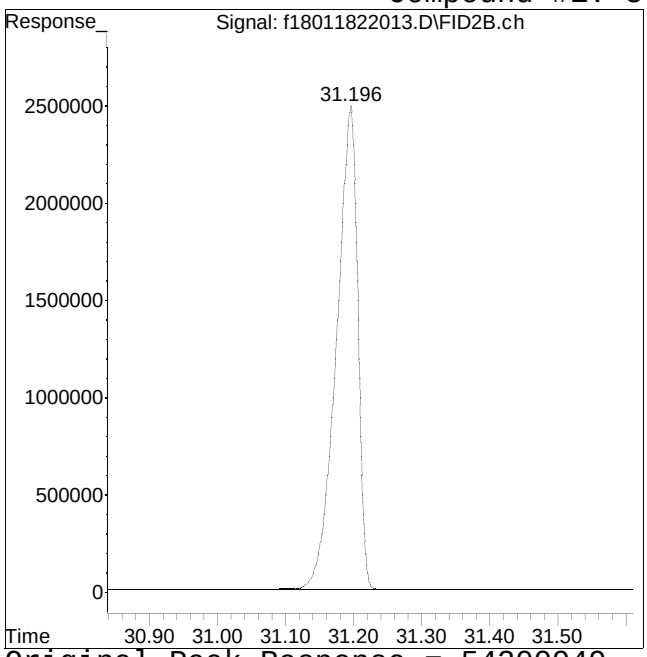


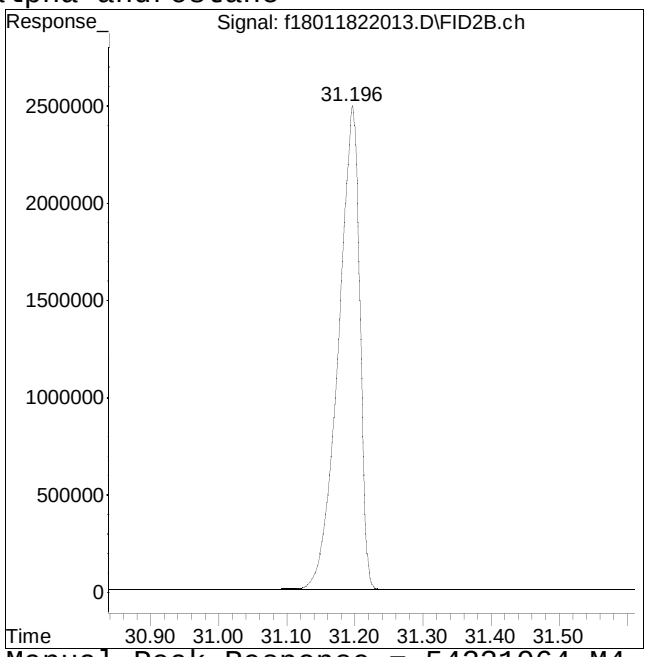
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #1: 5-alpha-androstane





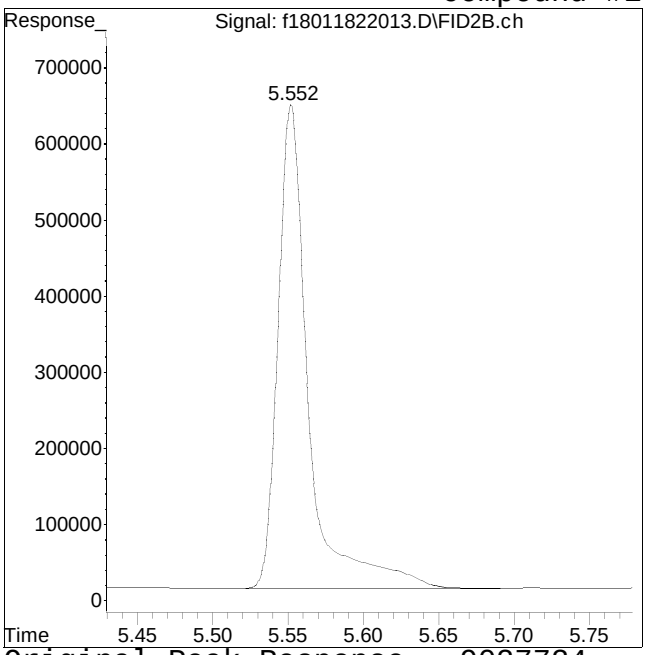
Original Peak Response = 54200949 Manual Peak Response = 54231064 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

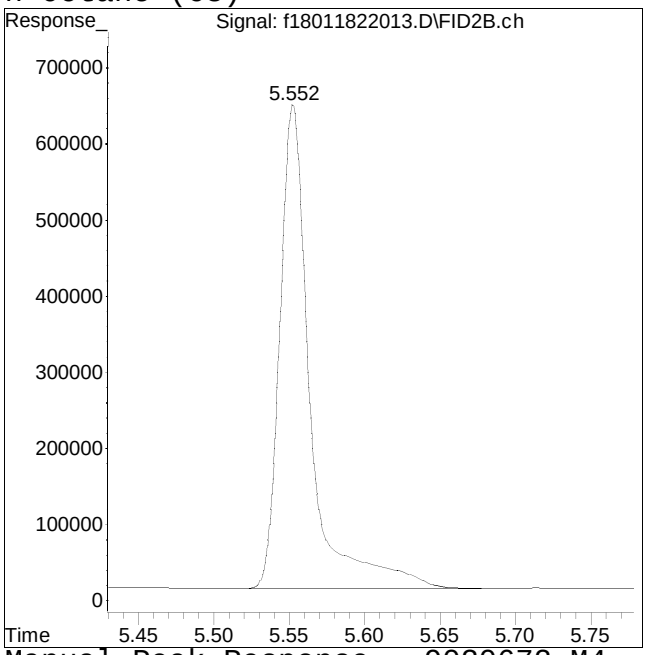
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #2: n-Octane (C8)



Original Peak Response = 9027724



Manual Peak Response = 9020672 M4

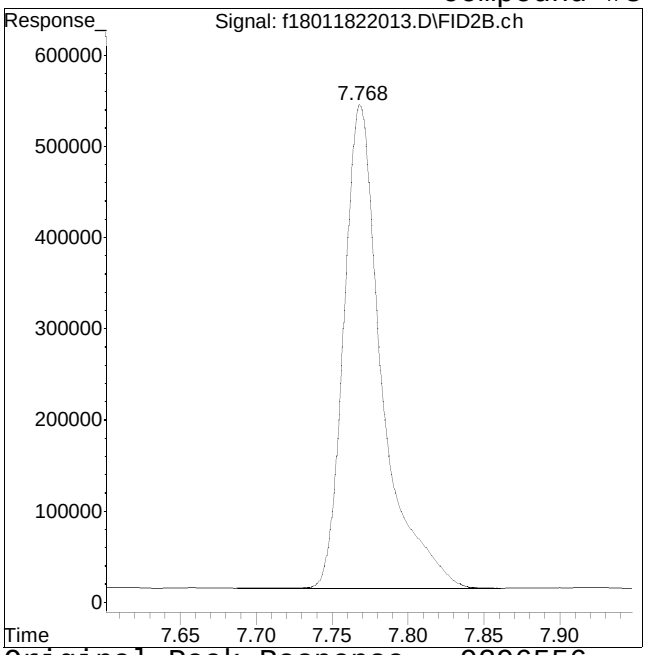
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

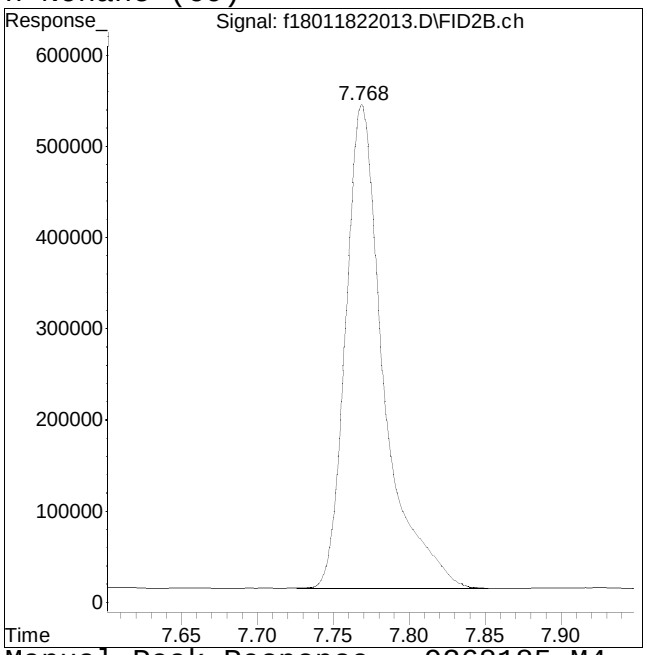
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #3: n-Nonane (C9)



Original Peak Response = 9296556



Manual Peak Response = 9268185 M4

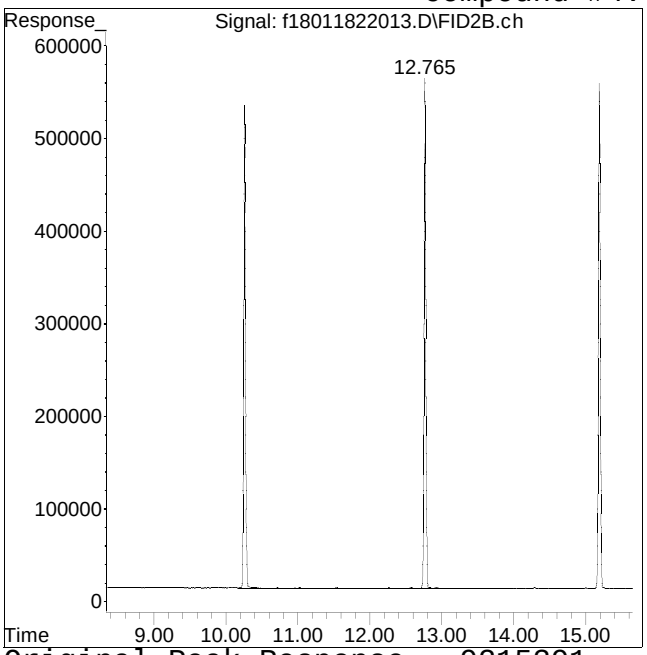
M4 = Poor automated baseline construction.

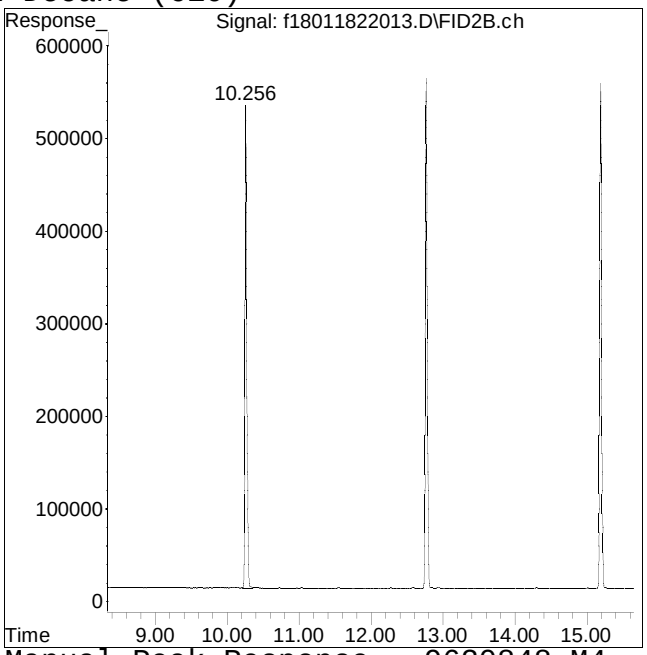
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #4: n-Decane (C10)





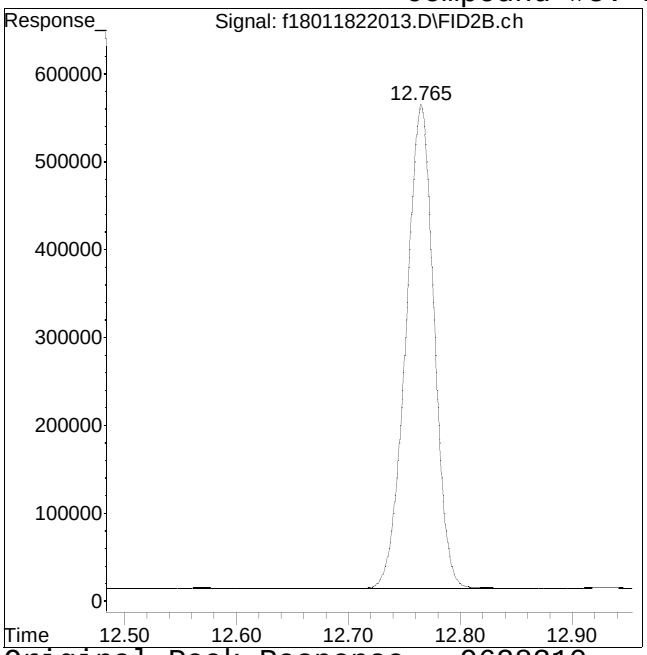
Original Peak Response = 9215391 Manual Peak Response = 9620848 M4
M4 = Poor automated baseline construction.

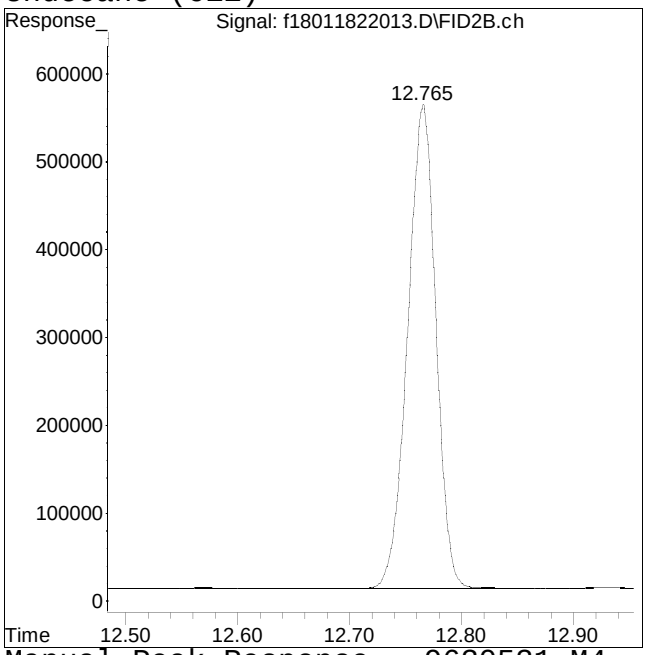
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #5: n-Undecane (C11)





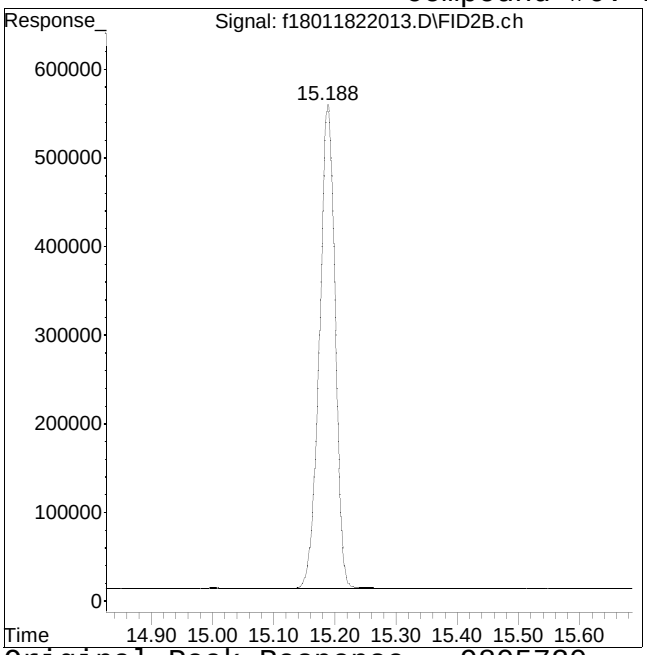
Original Peak Response = 9628310 Manual Peak Response = 9630531 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

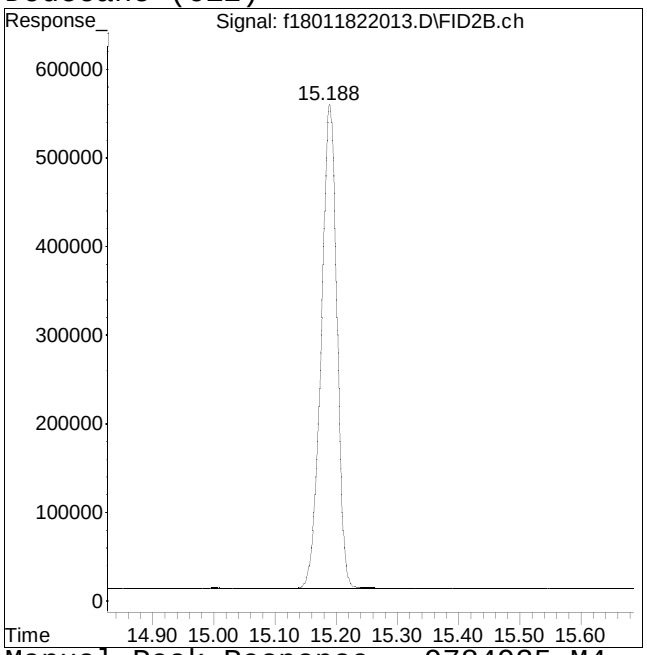
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #6: n-Dodecane (C12)



Original Peak Response = 9805720



Manual Peak Response = 9784935 M4

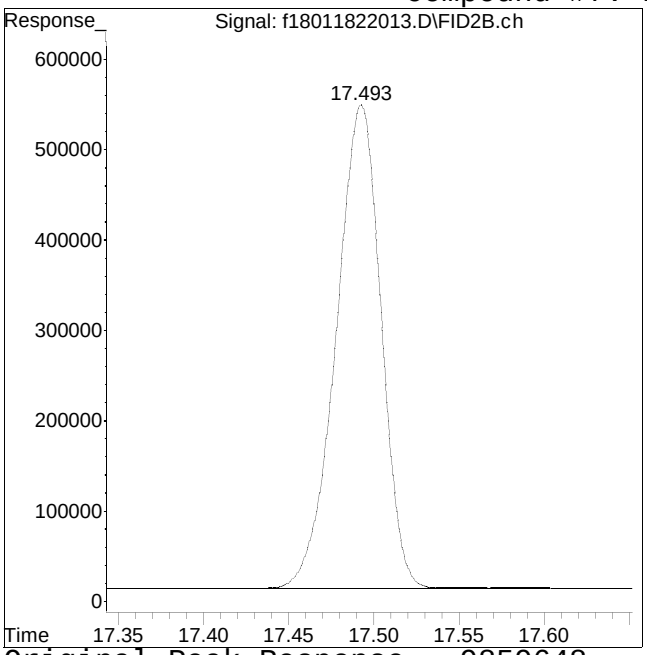
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

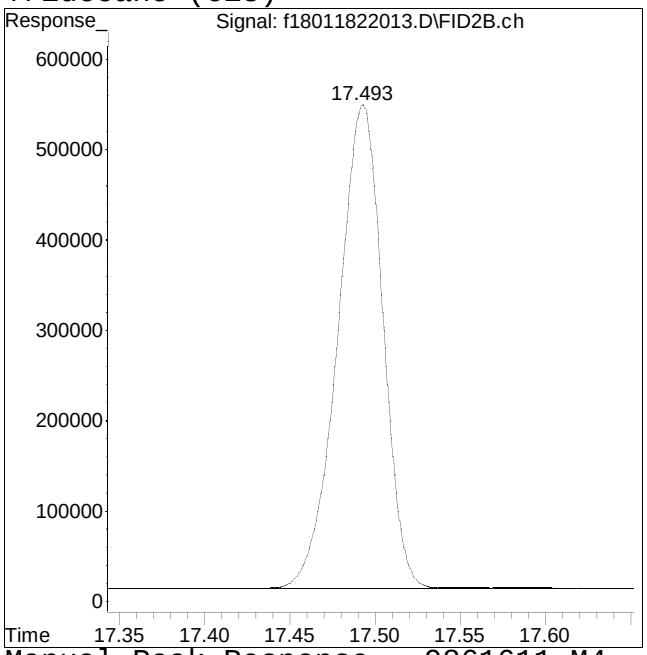
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #7: n-Tridecane (C13)



Original Peak Response = 9859648



Manual Peak Response = 9861611 M4

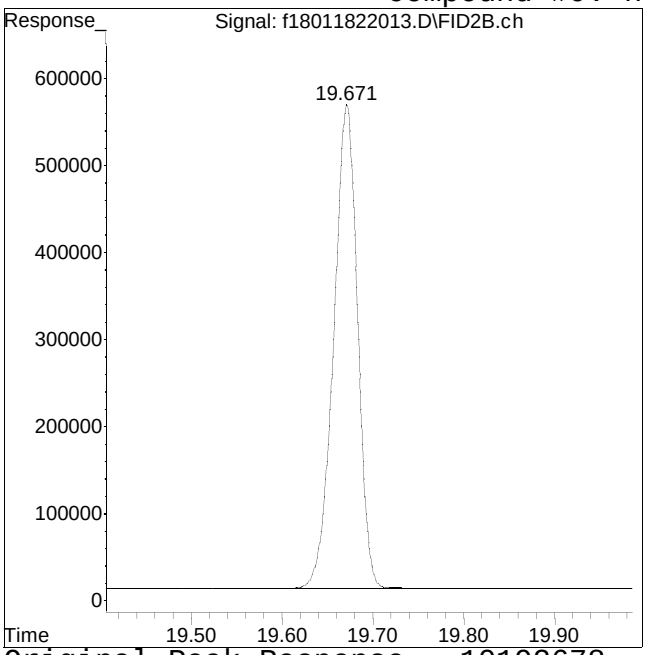
M4 = Poor automated baseline construction.

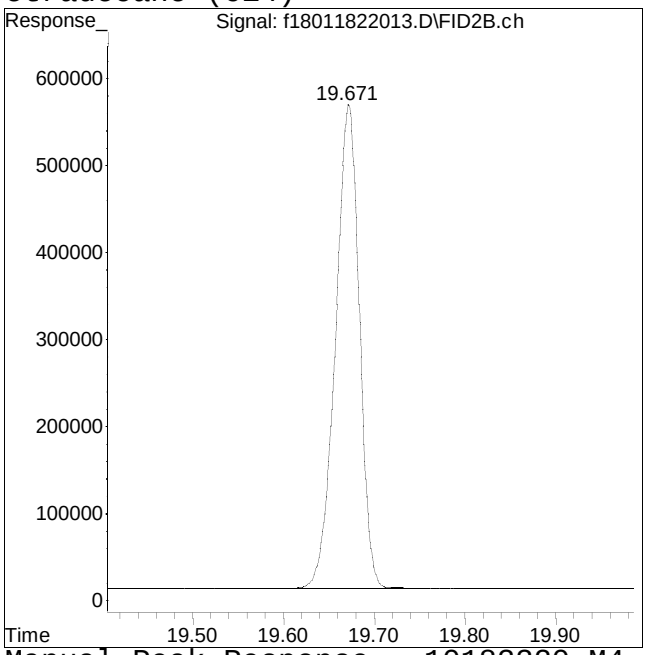
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #9: n-Tetradecane (C14)





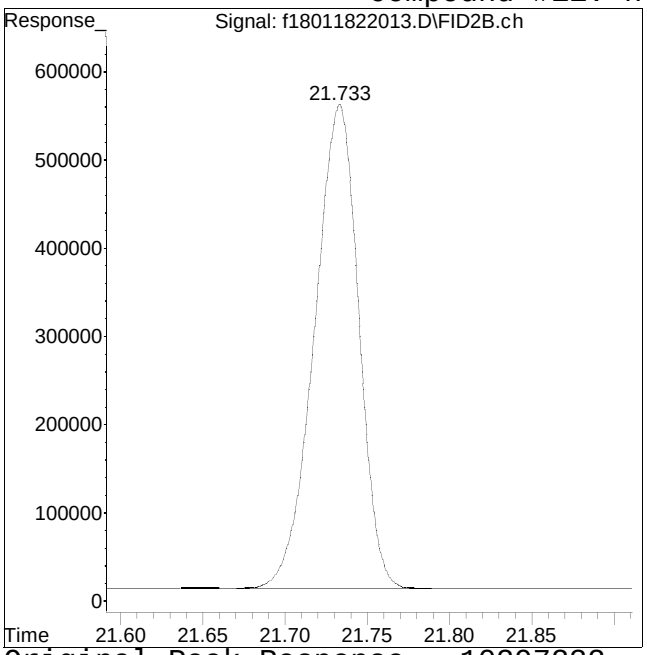
Original Peak Response = 10192678 Manual Peak Response = 10183320 M4
M4 = Poor automated baseline construction.

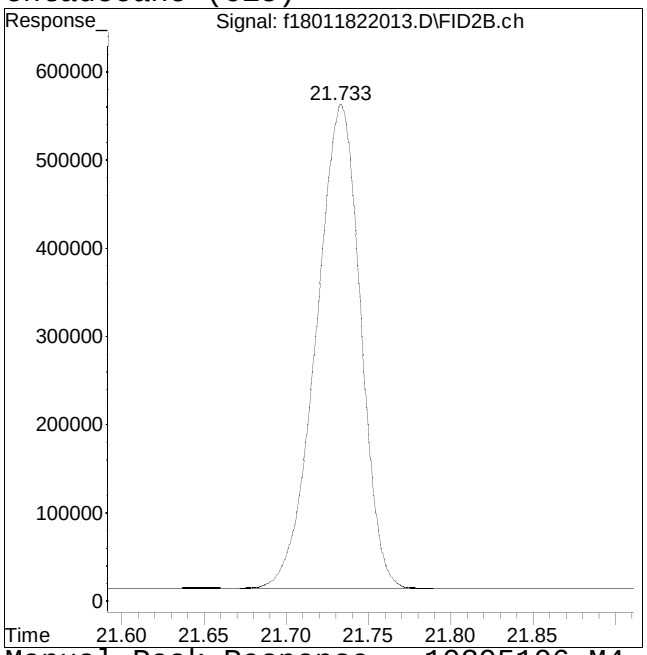
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #11: n-Pentadecane (C15)





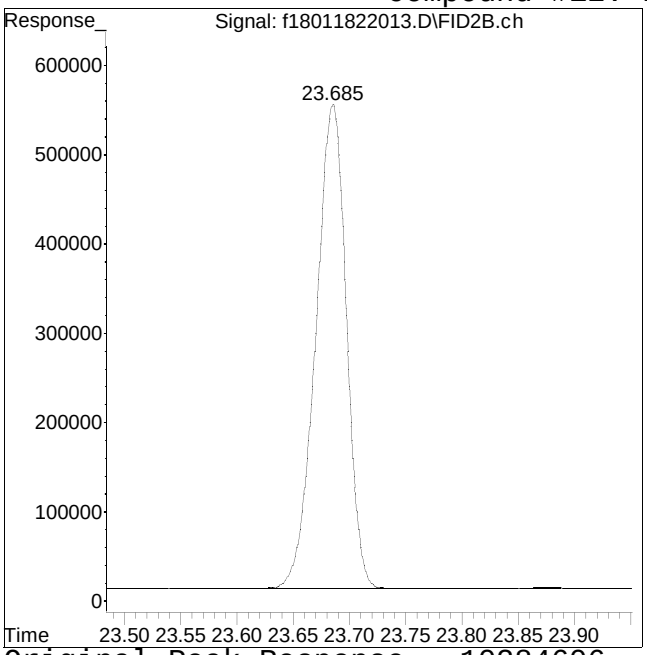
Original Peak Response = 10297232 Manual Peak Response = 10295106 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

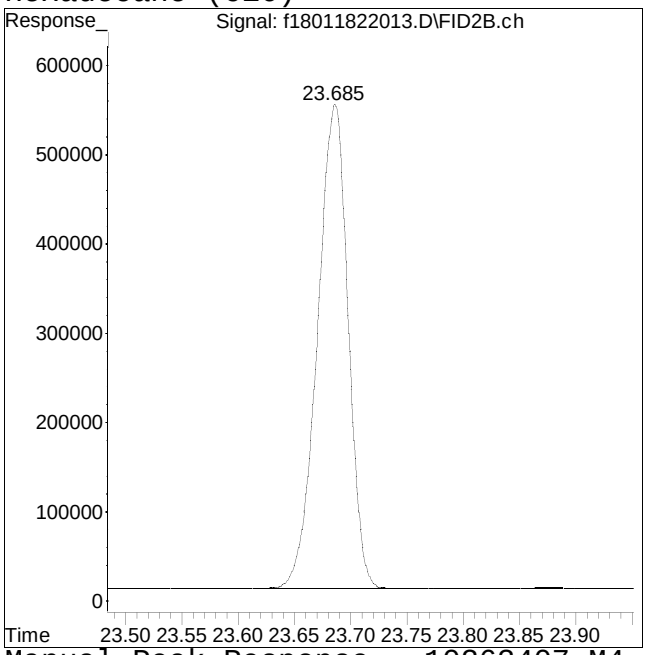
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #12: n-Hexadecane (C16)



Original Peak Response = 10284606



Manual Peak Response = 10263407 M4

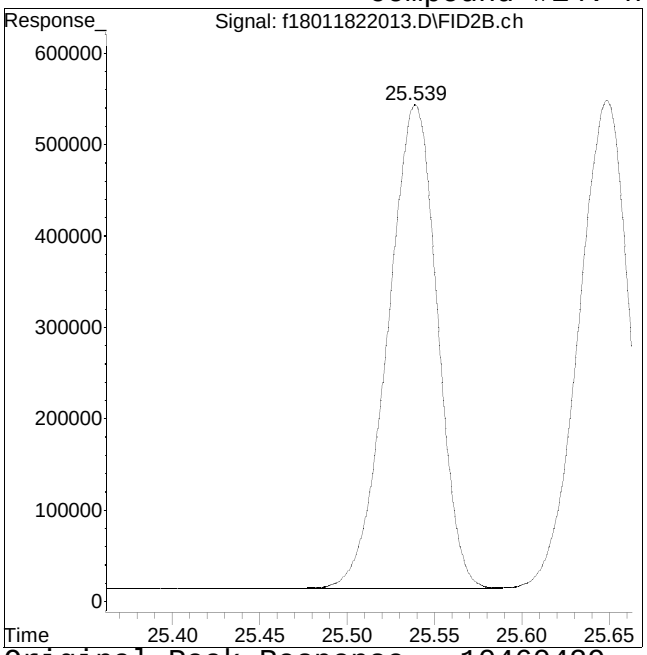
M4 = Poor automated baseline construction.

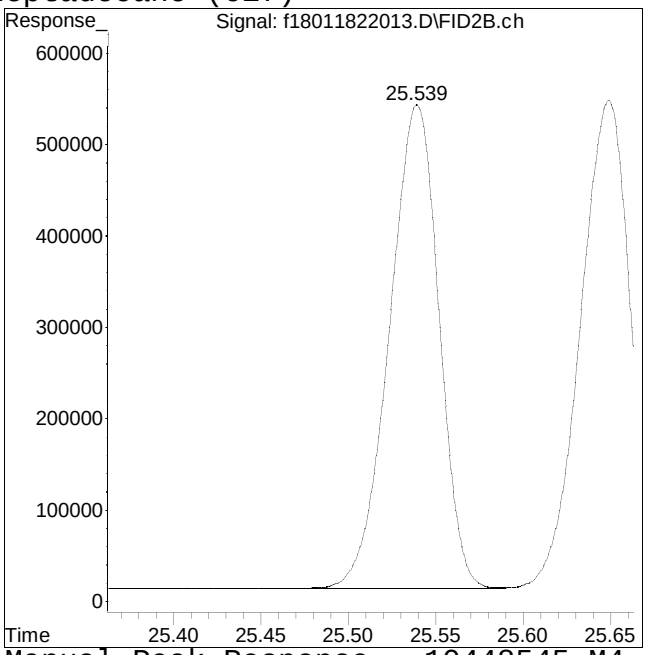
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #14: n-Heptadecane (C17)





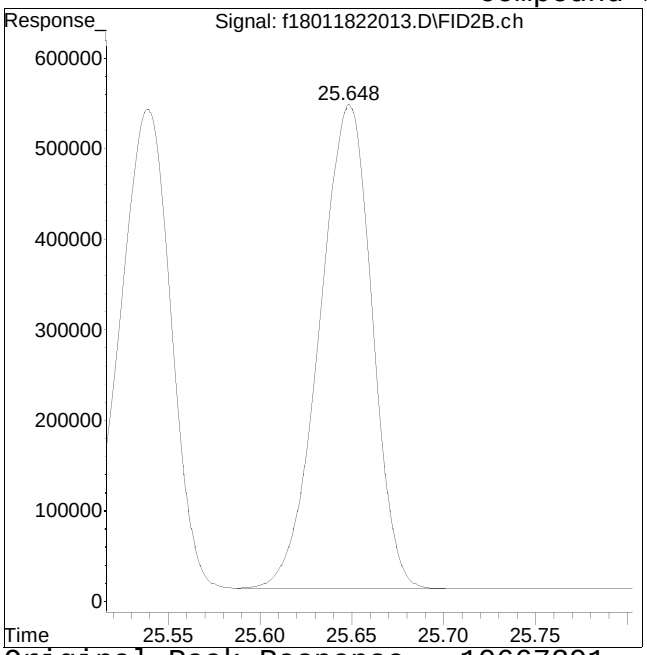
Original Peak Response = 10460429 Manual Peak Response = 10448545 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

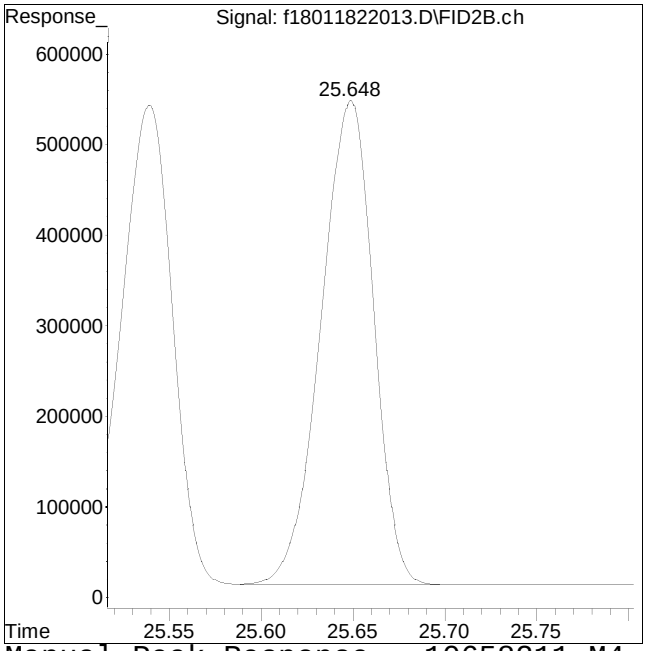
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #15: Pristane



Original Peak Response = 10667291



Manual Peak Response = 10658211 M4

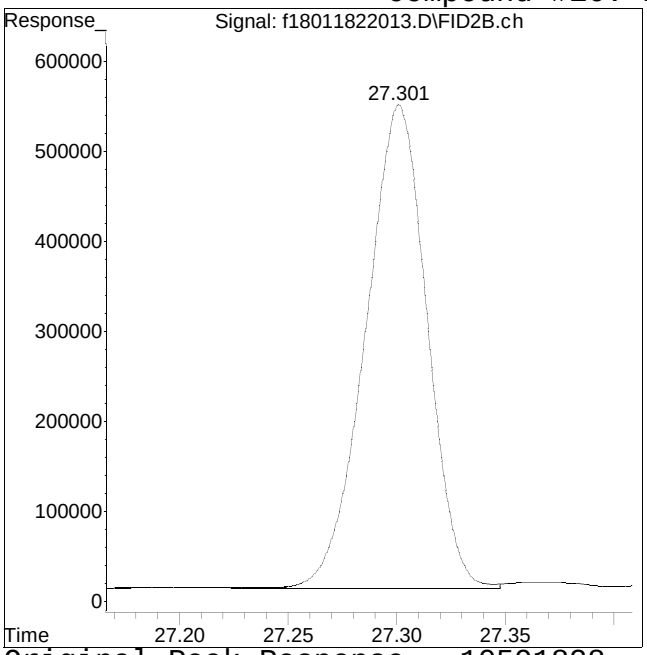
M4 = Poor automated baseline construction.

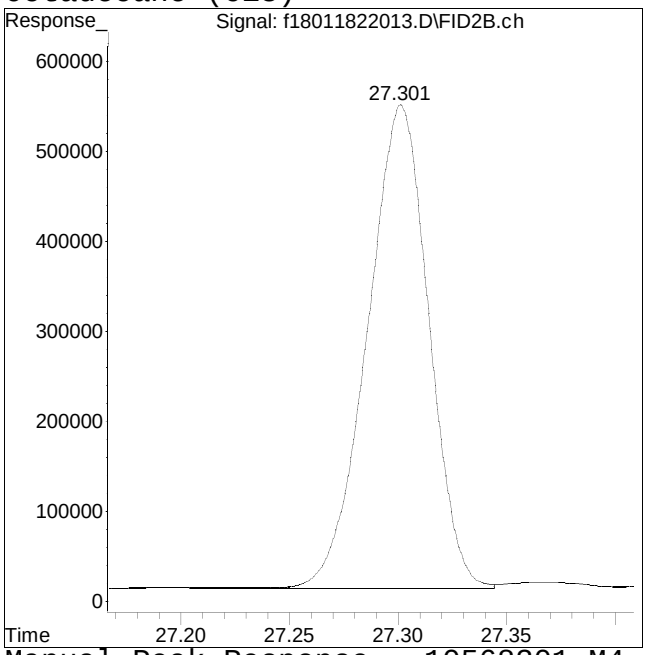
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #16: n-Octadecane (C18)





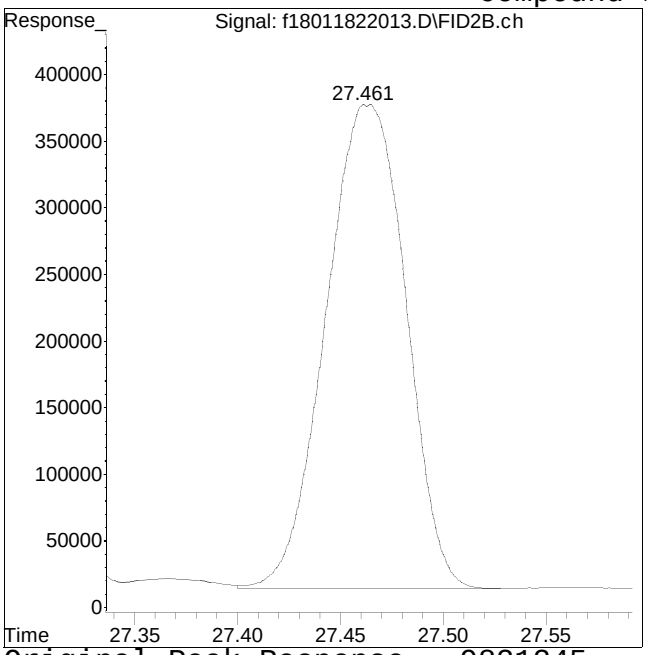
Original Peak Response = 10591828 Manual Peak Response = 10568301 M4
M4 = Poor automated baseline construction.

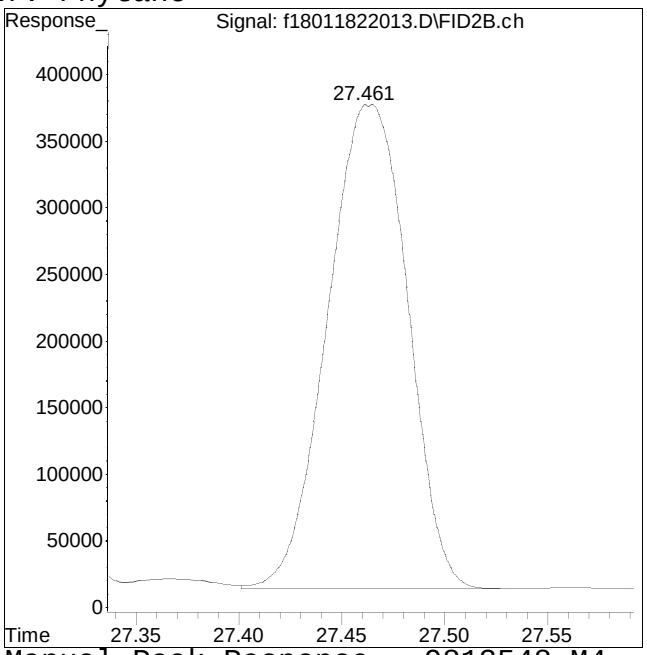
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #17: Phytane





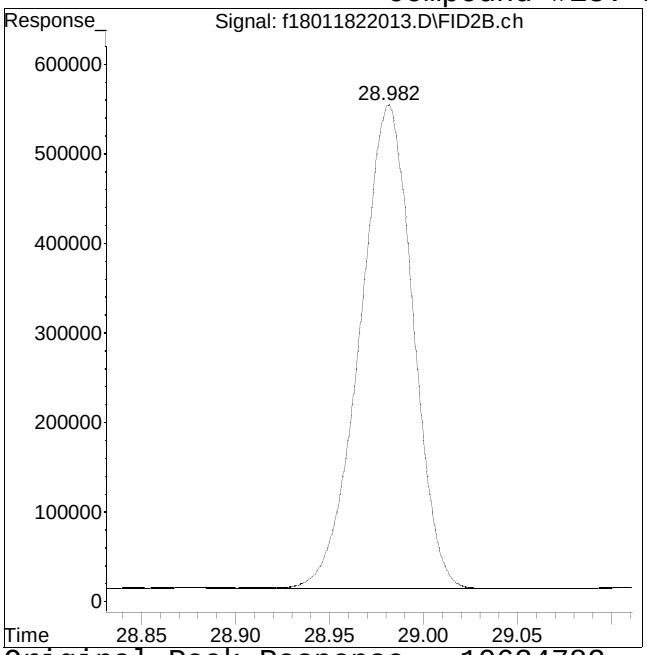
Original Peak Response = 9821245 Manual Peak Response = 9813548 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

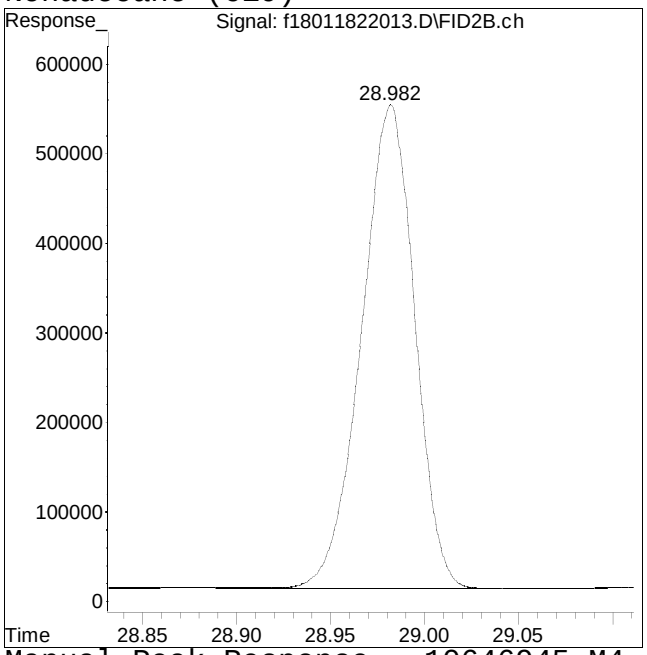
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #18: n-Nonadecane (C19)



Original Peak Response = 10634782



Manual Peak Response = 10646945 M4

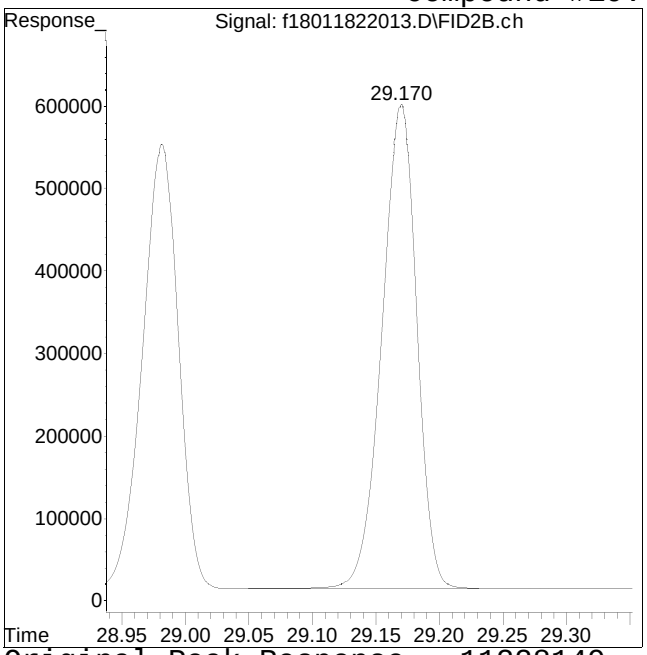
M4 = Poor automated baseline construction.

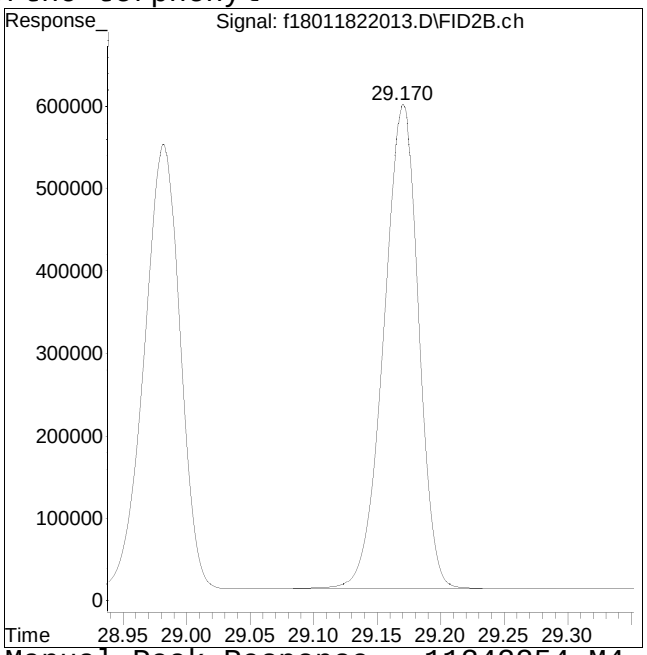
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #19: ortho-terphenyl





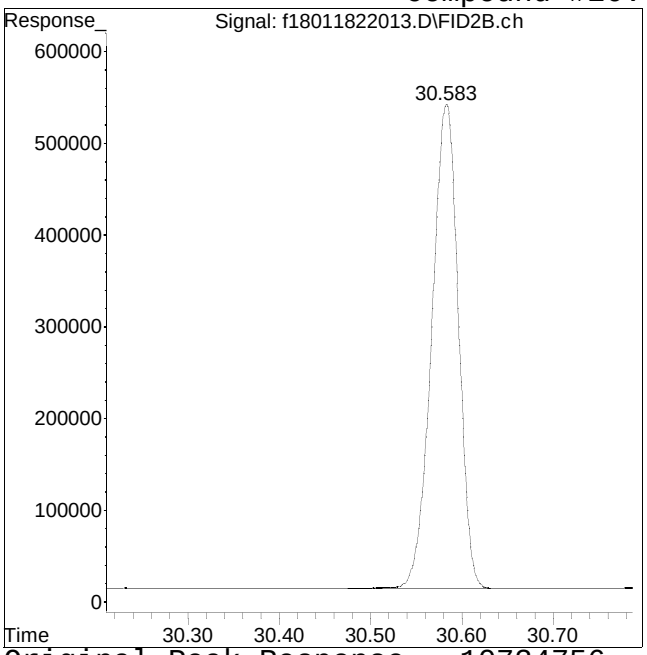
Original Peak Response = 11228149 Manual Peak Response = 11242254 M4
M4 = Poor automated baseline construction.

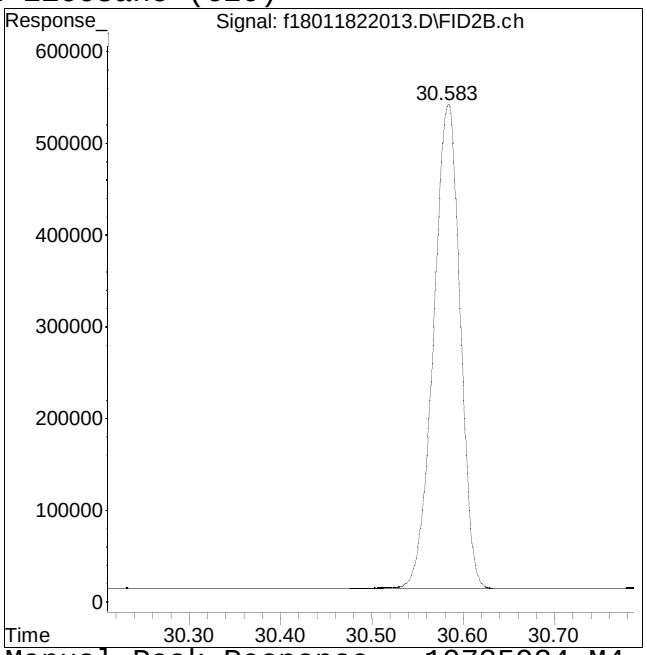
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #20: n-Eicosane (C20)





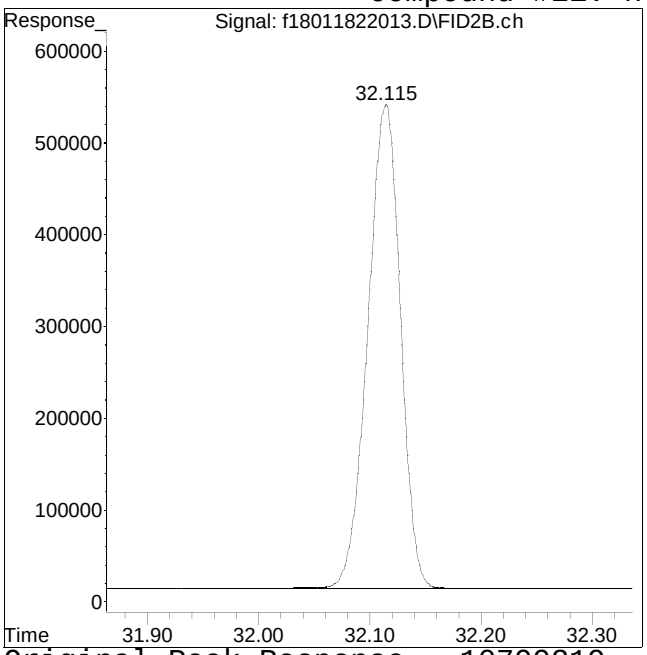
Original Peak Response = 10734756 Manual Peak Response = 10735934 M4
M4 = Poor automated baseline construction.

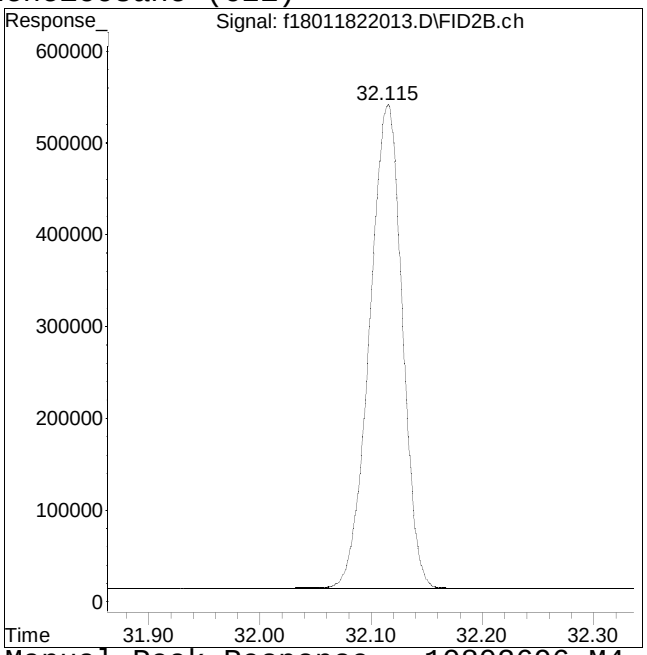
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #21: n-Heneicosane (C21)





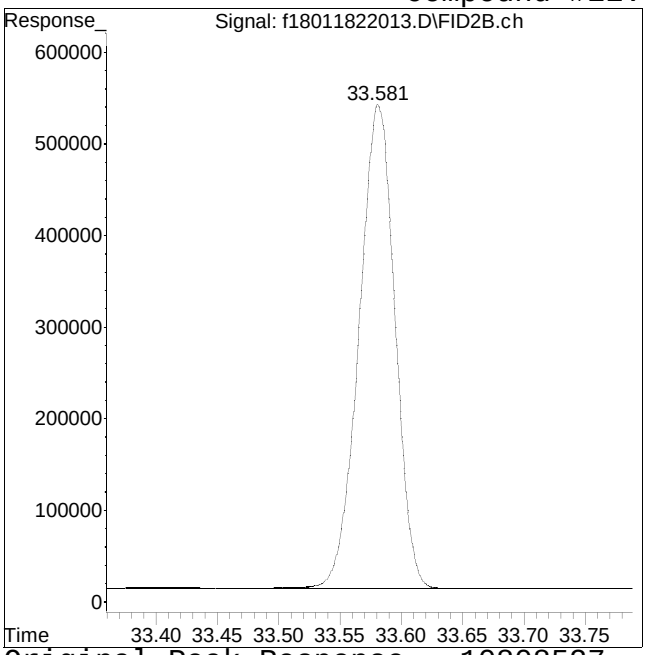
Original Peak Response = 10799219 Manual Peak Response = 10802696 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

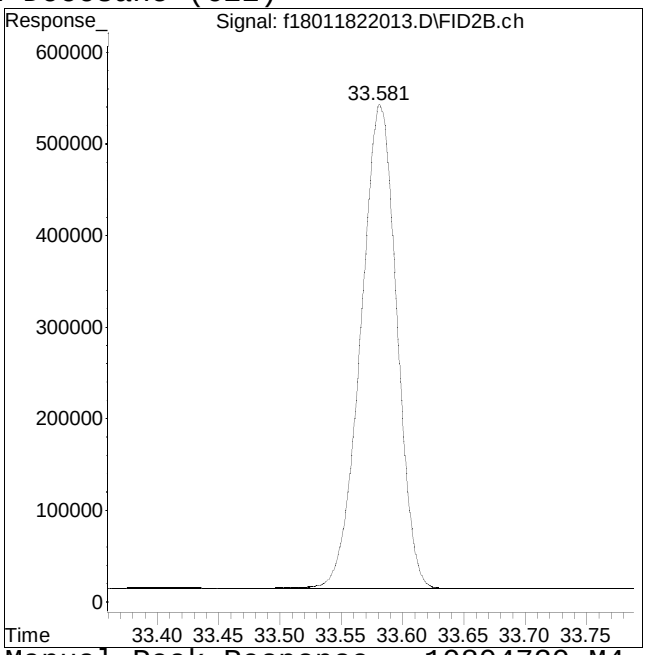
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #22: n-Docosane (C22)



Original Peak Response = 10808527



Manual Peak Response = 10804730 M4

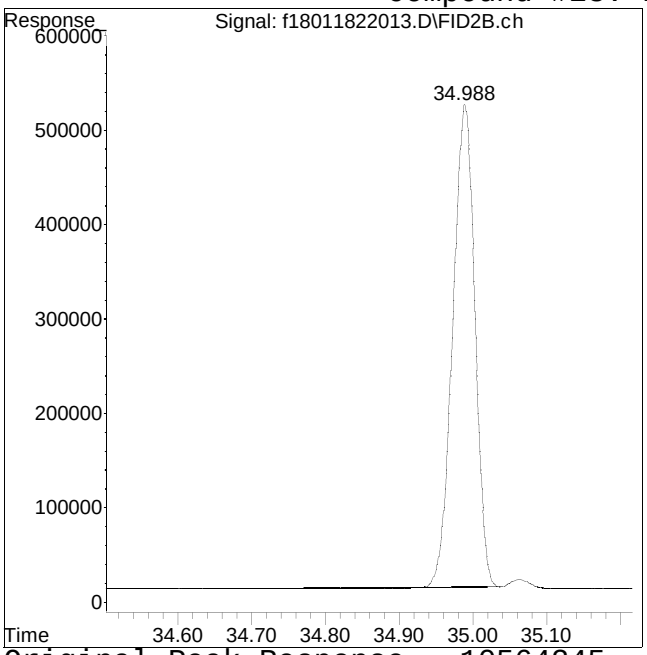
M4 = Poor automated baseline construction.

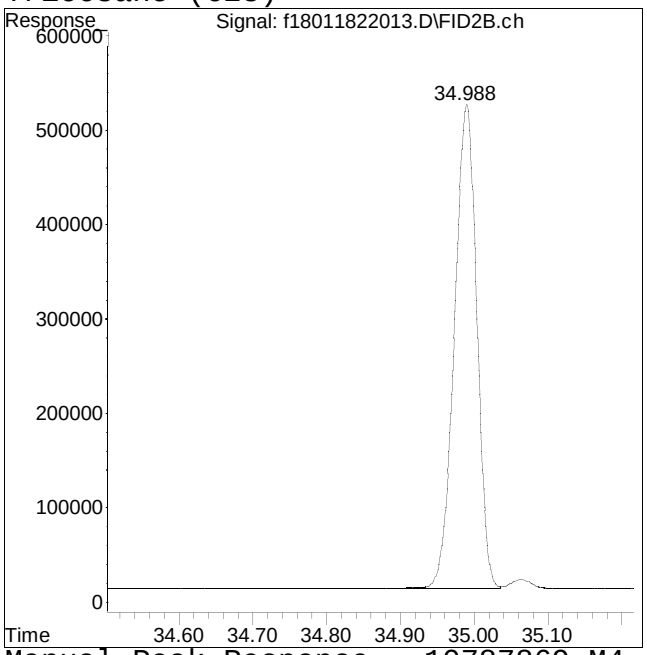
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #23: n-Tricosane (C23)





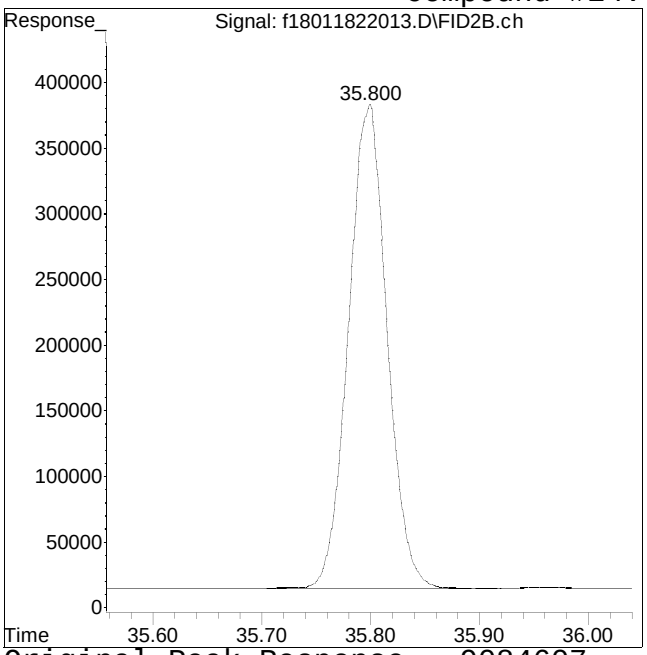
Original Peak Response = 10564245 Manual Peak Response = 10787869 M4
M4 = Poor automated baseline construction.

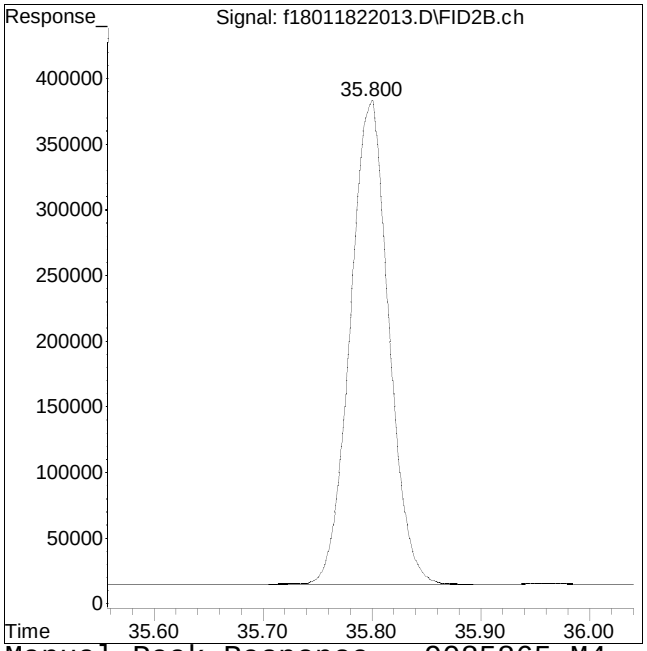
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #24: d50-Tetracosane





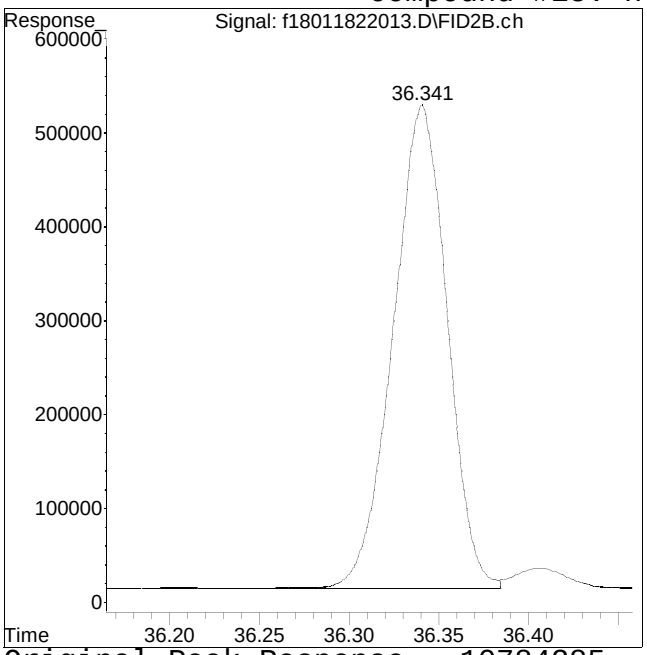
Original Peak Response = 9084607 Manual Peak Response = 9085865 M4
M4 = Poor automated baseline construction.

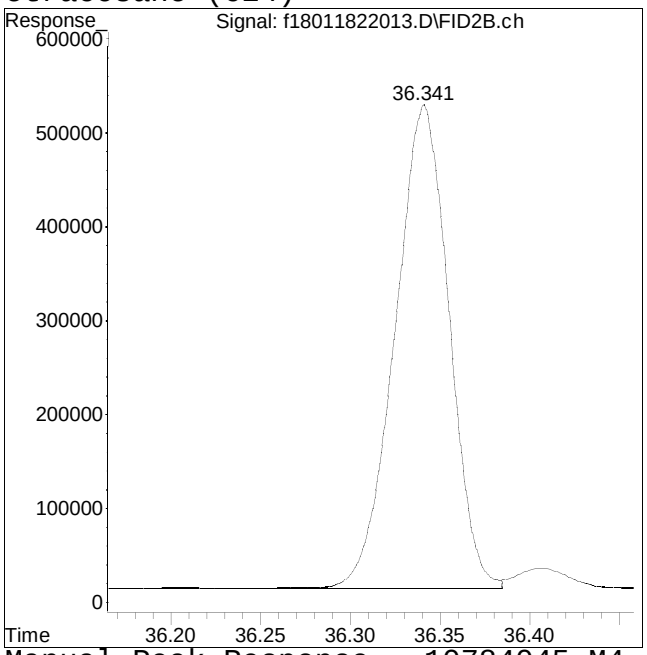
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #25: n-Tetracosane (C24)





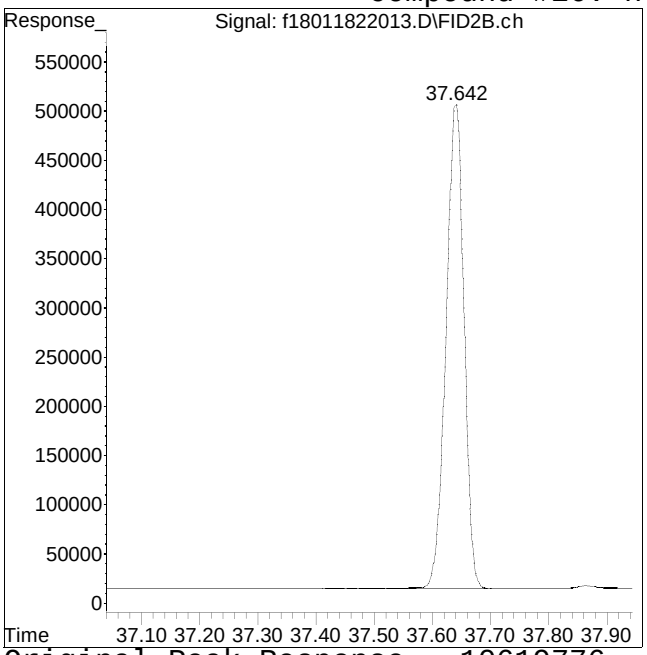
Original Peak Response = 10784285 Manual Peak Response = 10784045 M4
M4 = Poor automated baseline construction.

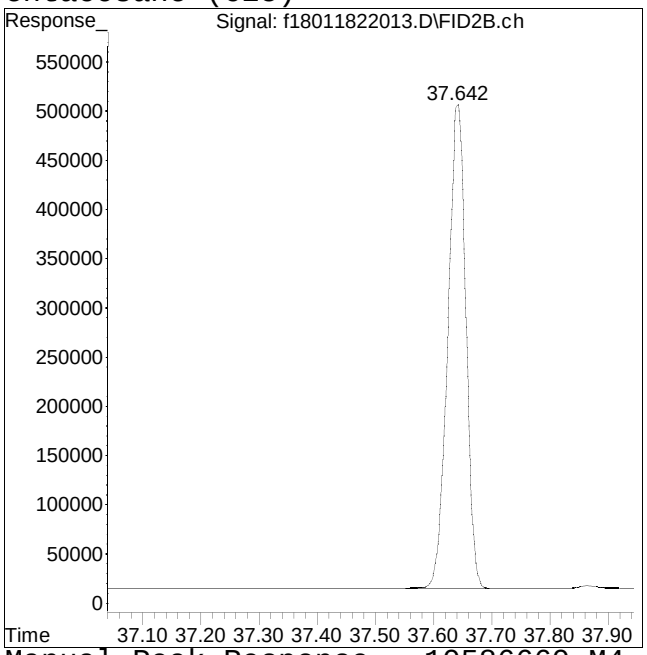
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #26: n-Pentacosane (C25)





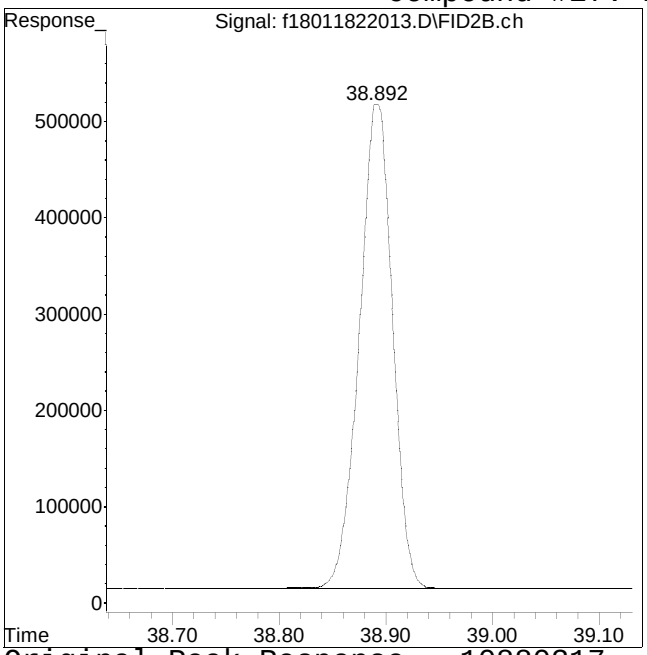
Original Peak Response = 10619776 Manual Peak Response = 10586660 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

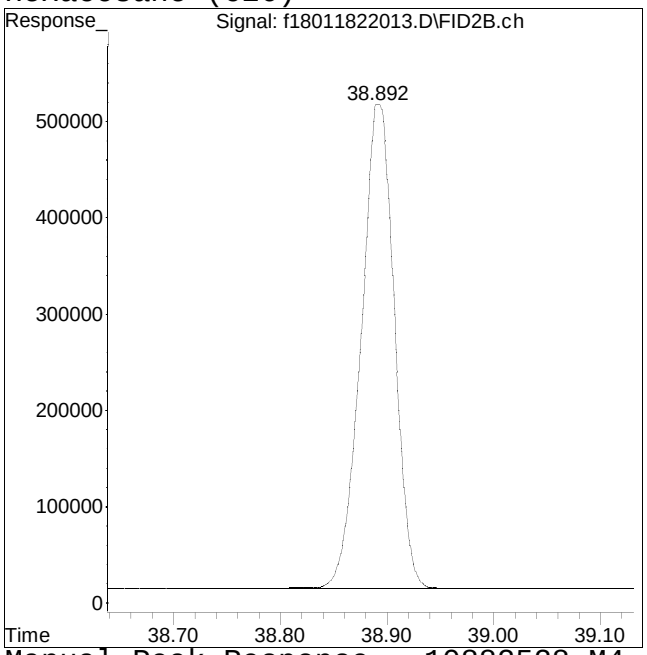
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #27: n-Hexacosane (C26)



Original Peak Response = 10880317



Manual Peak Response = 10882528 M4

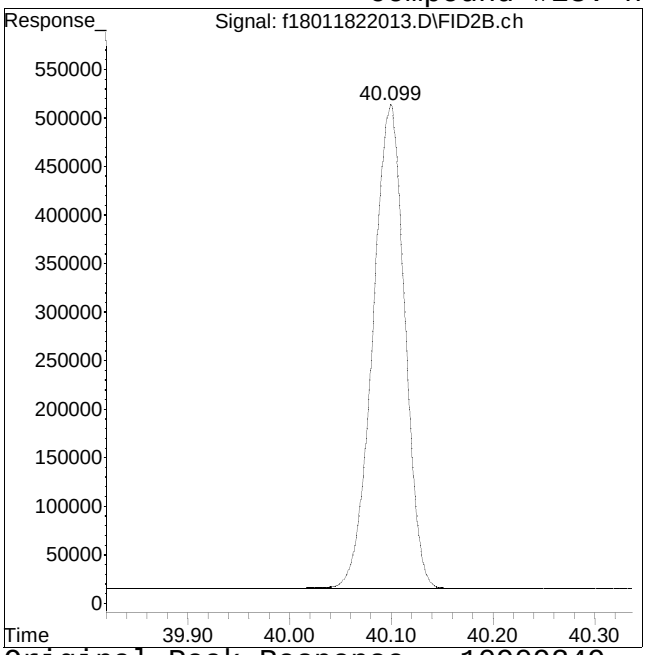
M4 = Poor automated baseline construction.

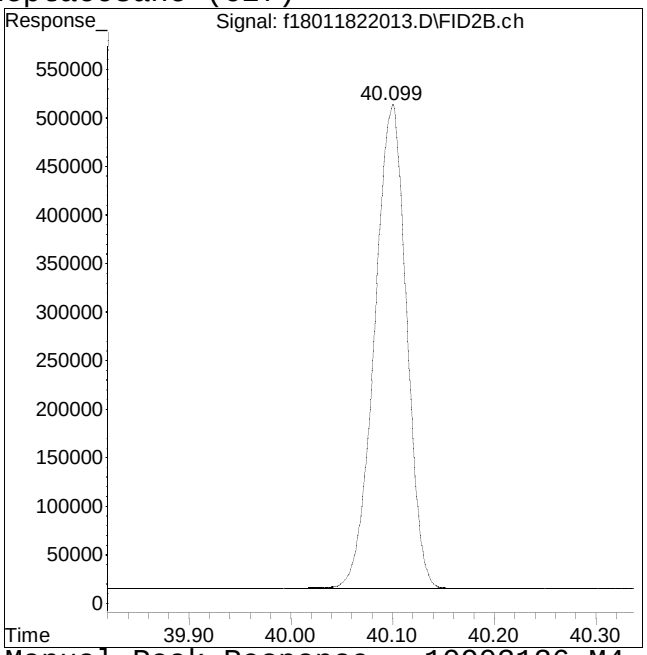
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #28: n-Heptacosane (C27)





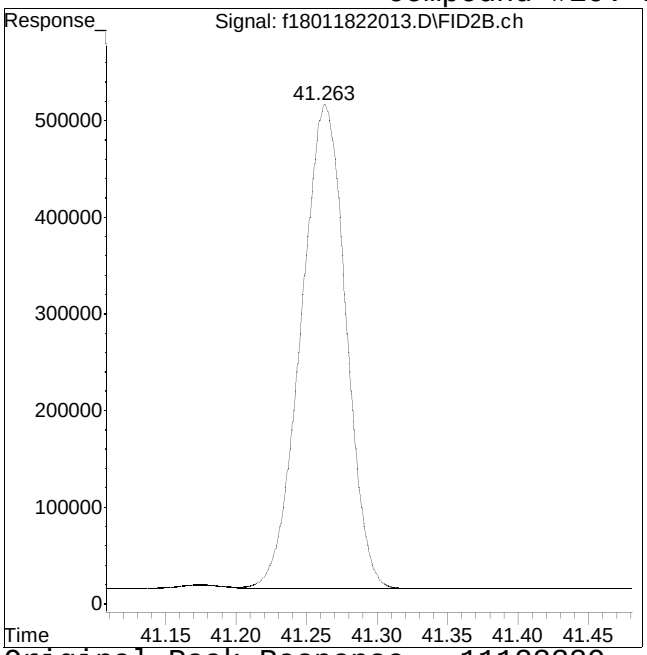
Original Peak Response = 10909249 Manual Peak Response = 10903136 M4
M4 = Poor automated baseline construction.

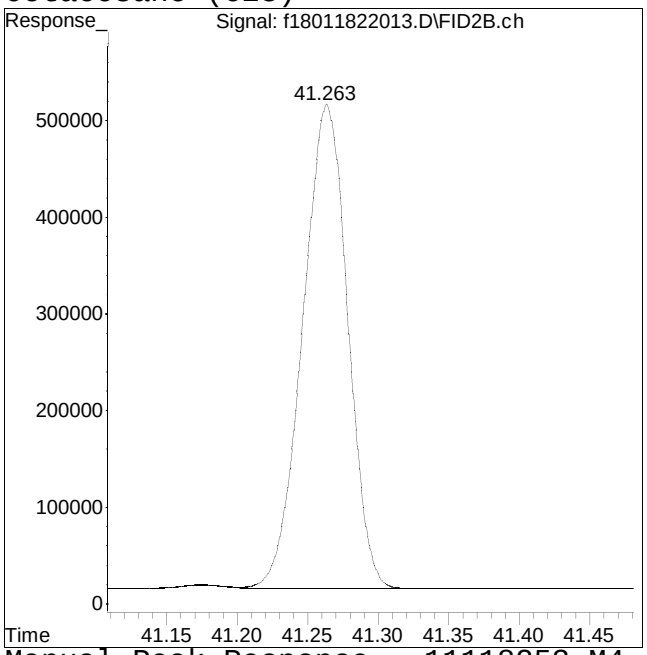
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #29: n-Octacosane (C28)





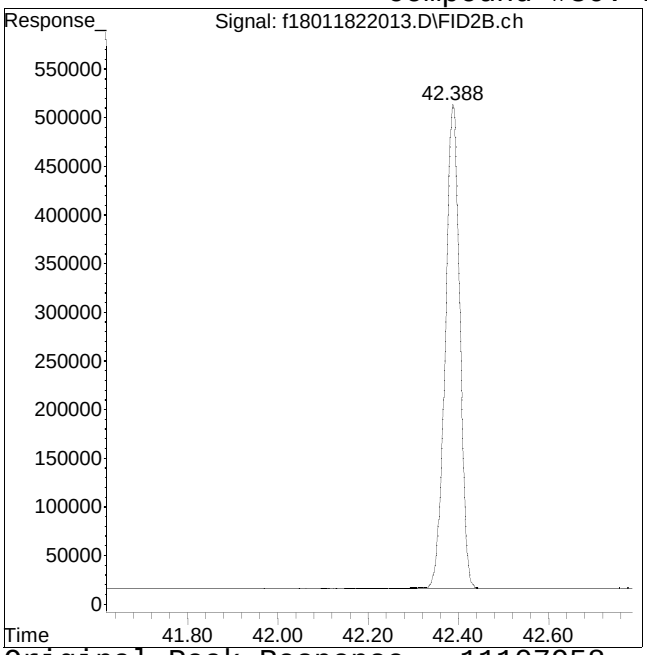
Original Peak Response = 11123339 Manual Peak Response = 11118253 M4
M4 = Poor automated baseline construction.

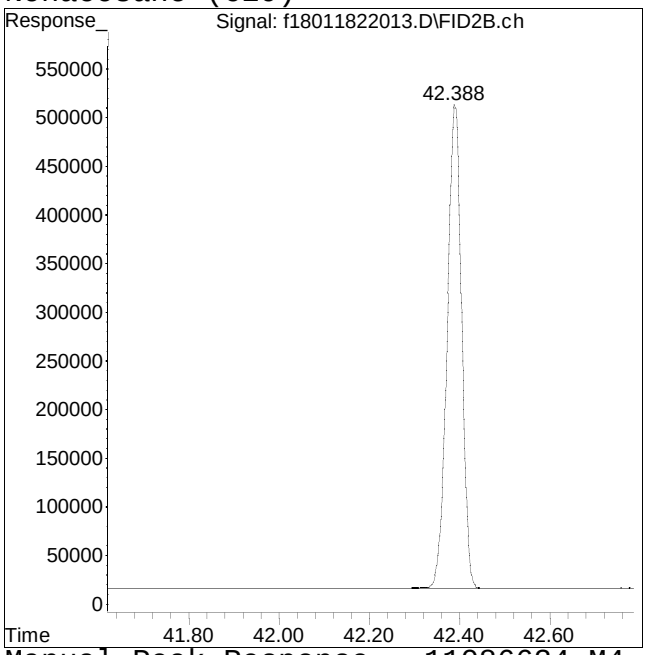
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #30: n-Nonacosane (C29)





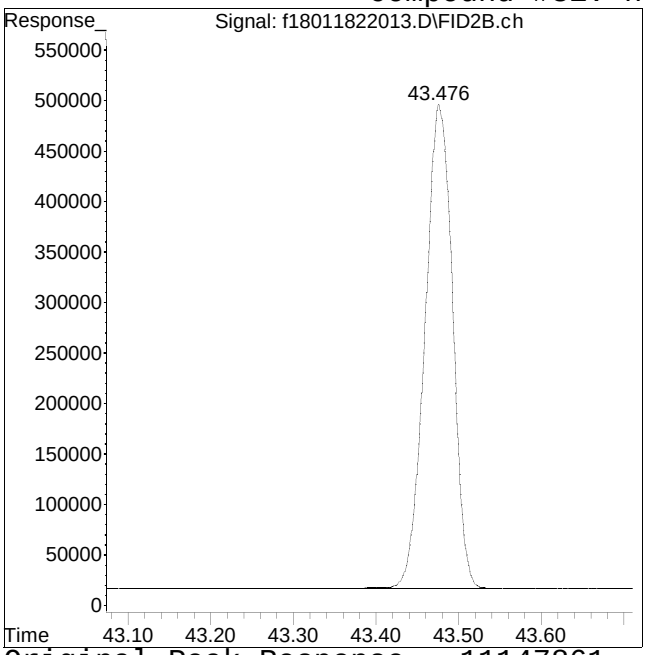
Original Peak Response = 11107958 Manual Peak Response = 11086634 M4
M4 = Poor automated baseline construction.

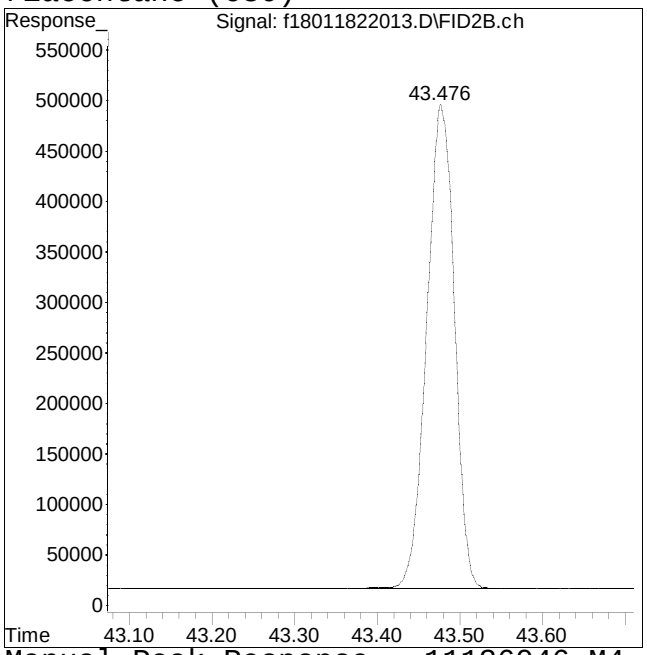
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #31: n-Triacontane (C30)





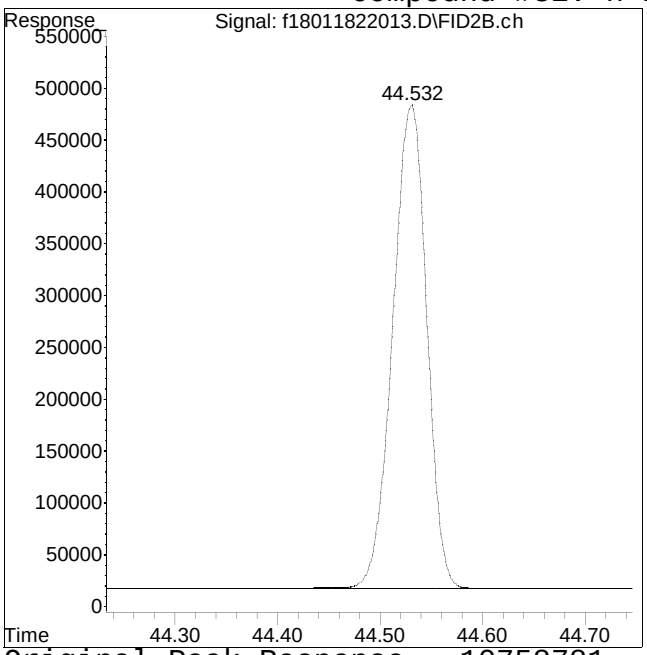
Original Peak Response = 11147861 Manual Peak Response = 11136046 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

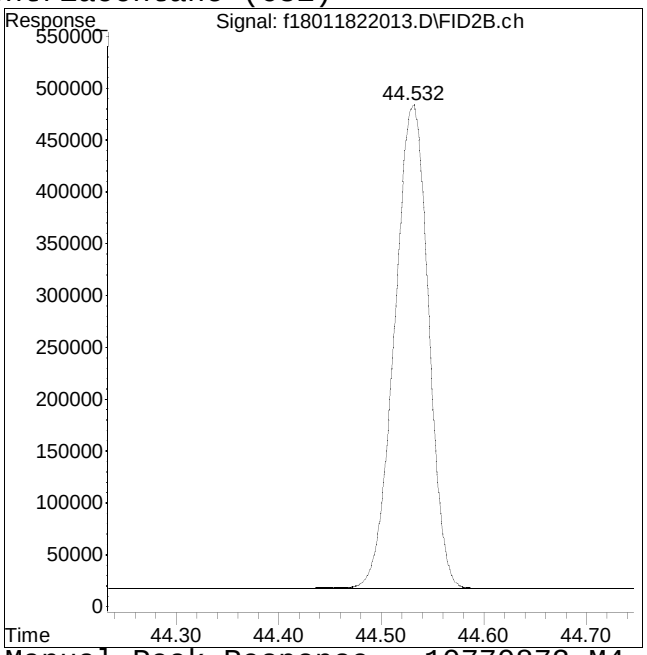
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #32: n-Hentriacontane (C31)



Original Peak Response = 10758781



Manual Peak Response = 10770872 M4

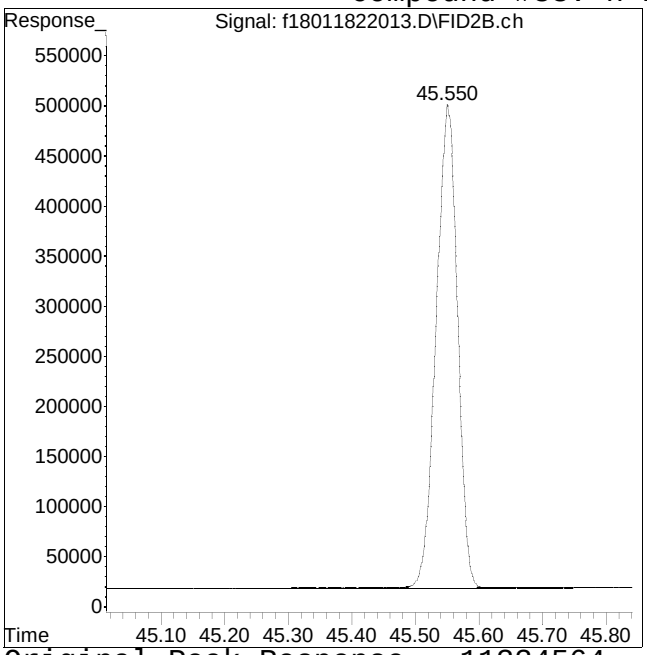
M4 = Poor automated baseline construction.

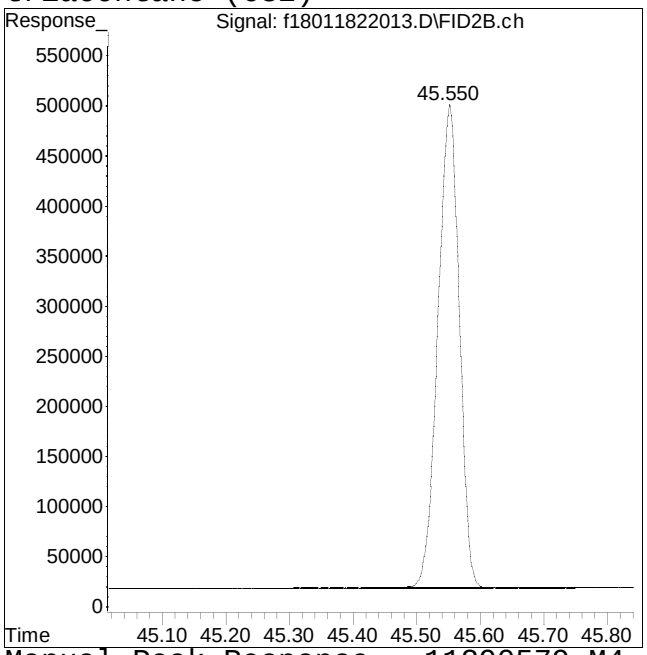
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #33: n-Dotriacontane (C32)





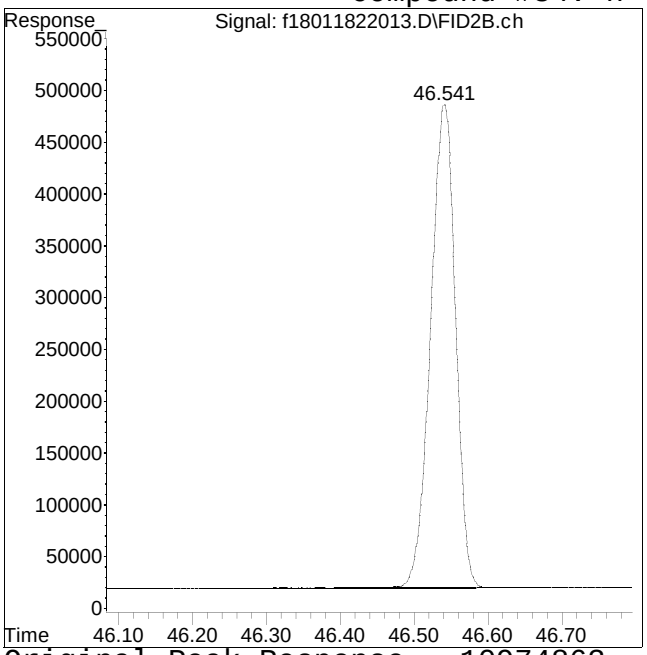
Original Peak Response = 11334564 Manual Peak Response = 11290579 M4
M4 = Poor automated baseline construction.

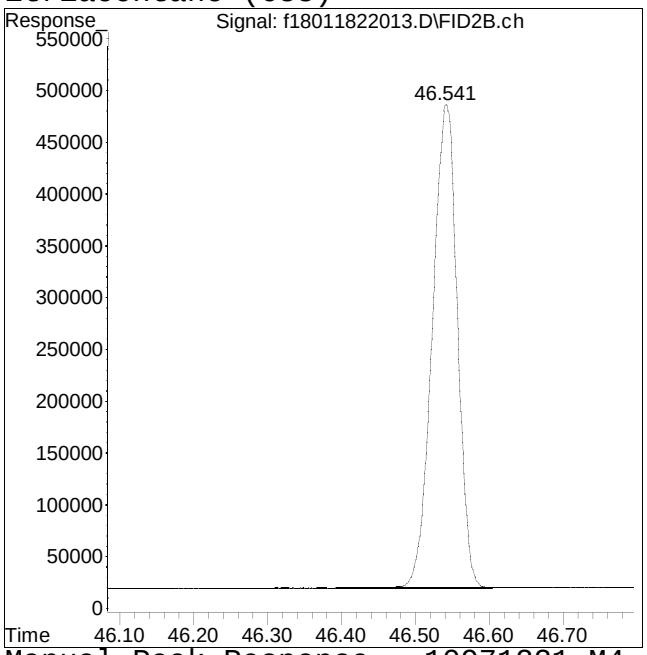
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #34: n-Tritriacontane (C33)





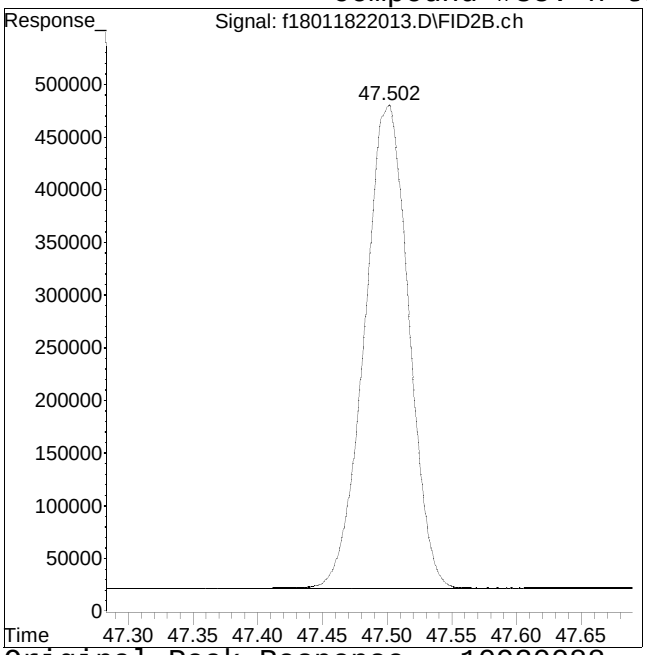
Original Peak Response = 10974863 Manual Peak Response = 10971221 M4
M4 = Poor automated baseline construction.

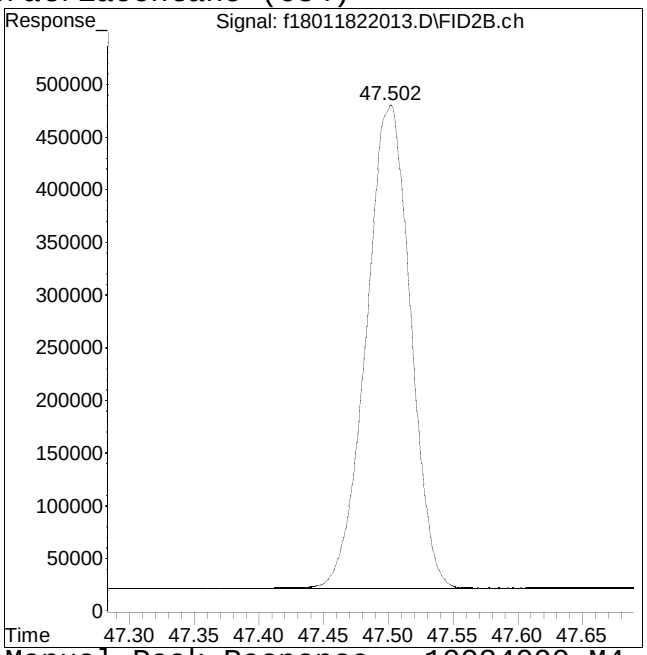
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #35: n-tetratriacontane (C34)





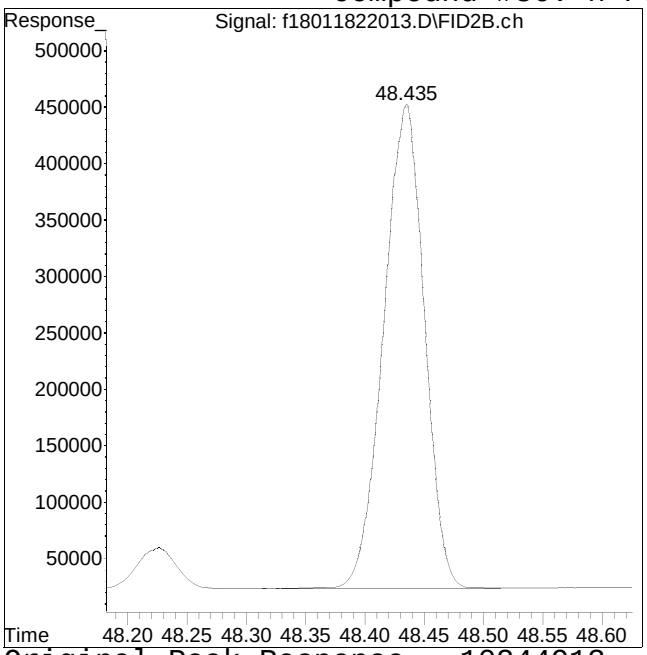
Original Peak Response = 10920088 Manual Peak Response = 10934090 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

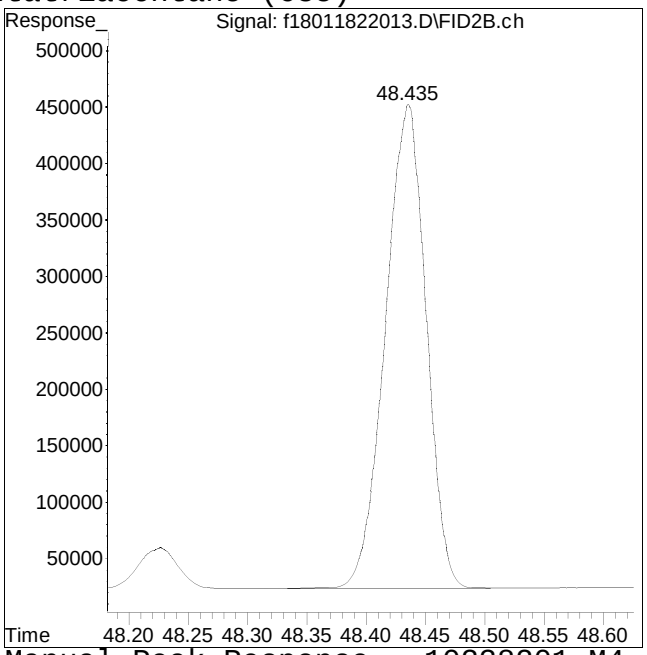
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #36: n-Pentatriacontane (C35)



Original Peak Response = 10244913



Manual Peak Response = 10238201 M4

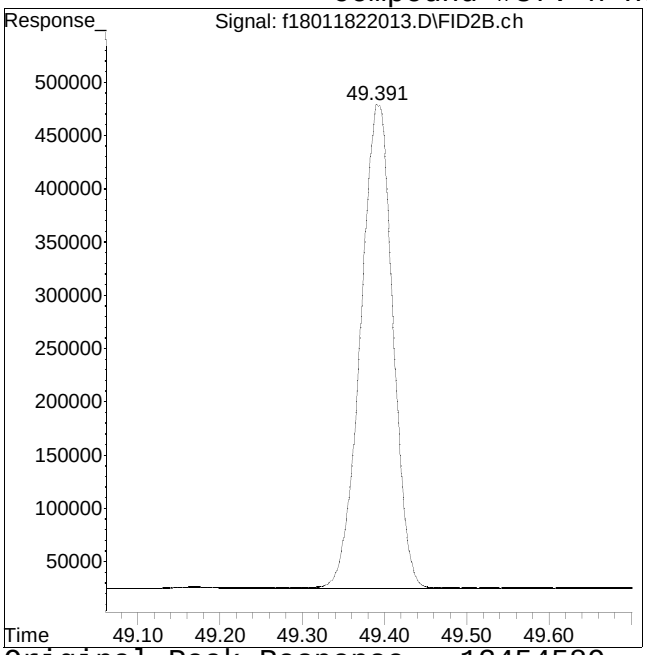
M4 = Poor automated baseline construction.

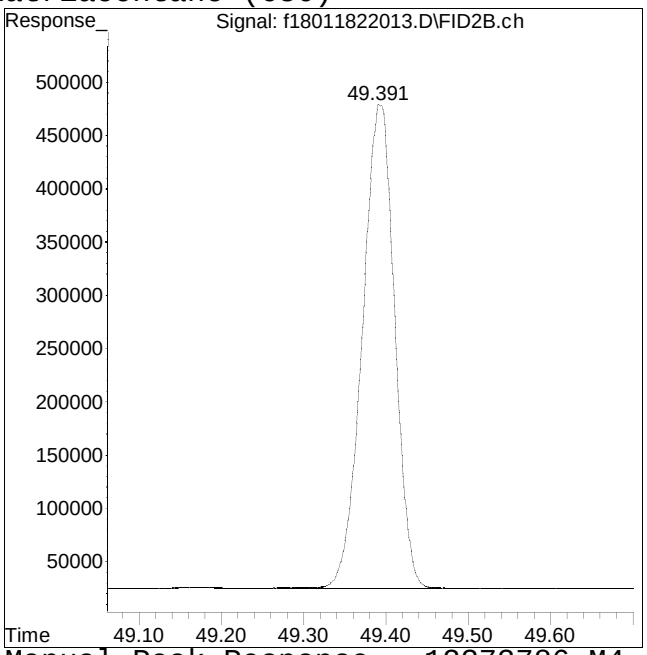
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #37: n-Hexatriacontane (C36)





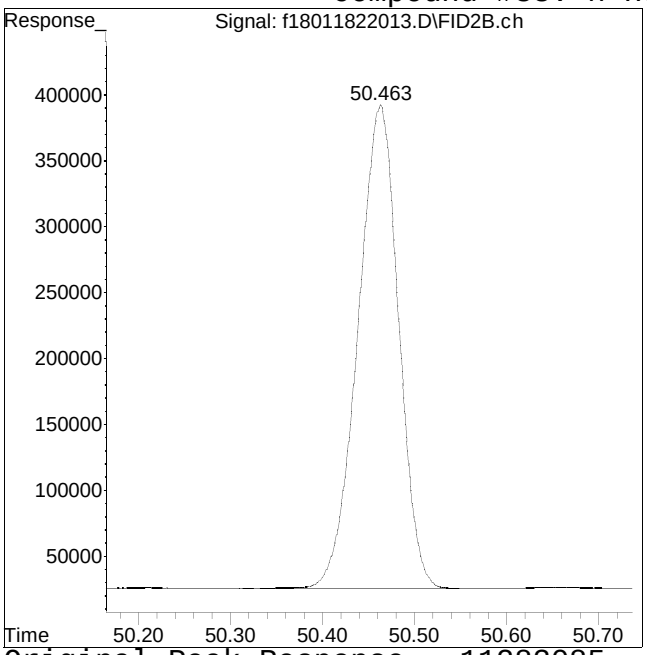
Original Peak Response = 12454589 Manual Peak Response = 12373786 M4
M4 = Poor automated baseline construction.

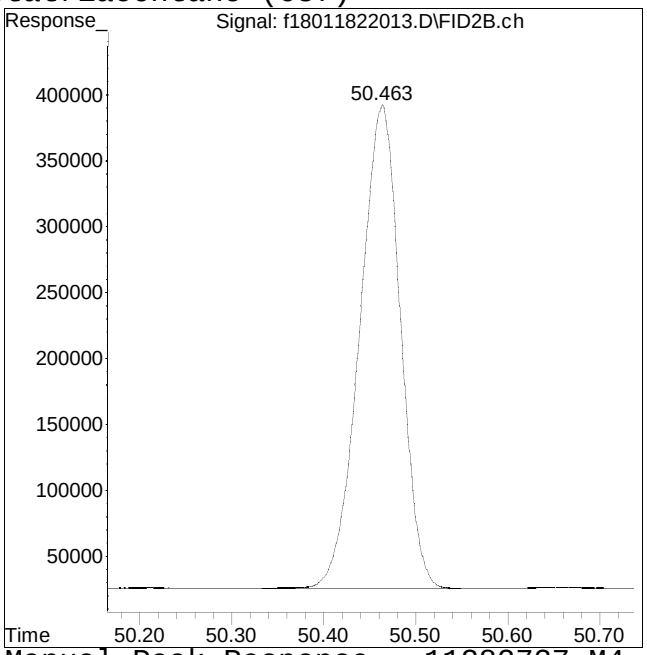
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #38: n-Heptatriacontane (C37)





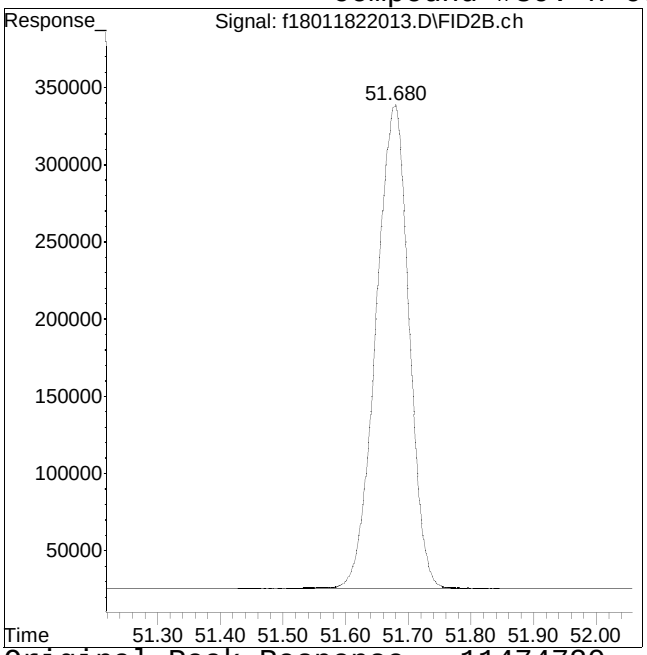
Original Peak Response = 11283085 Manual Peak Response = 11282737 M4
M4 = Poor automated baseline construction.

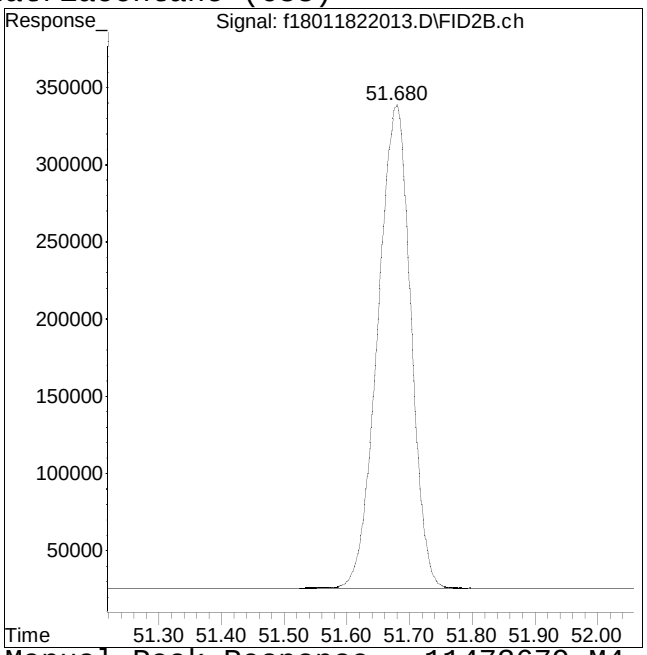
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #39: n-Octatriacontane (C38)





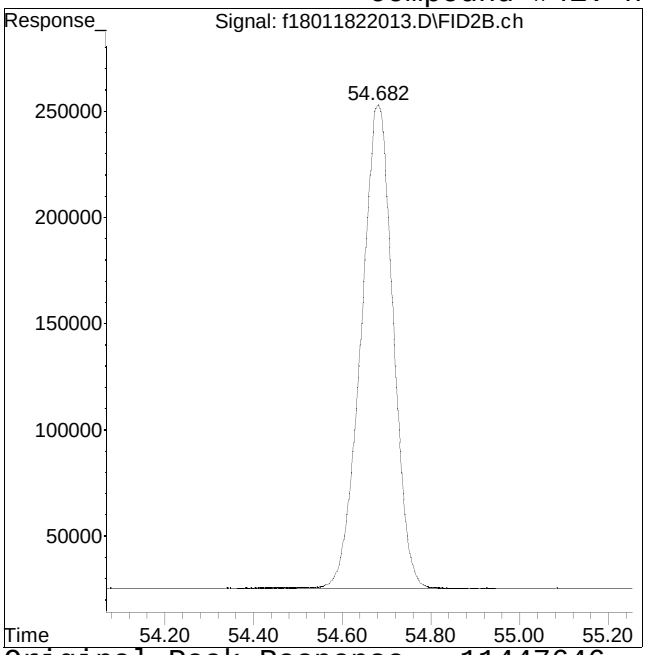
Original Peak Response = 11474720 Manual Peak Response = 11473679 M4
M4 = Poor automated baseline construction.

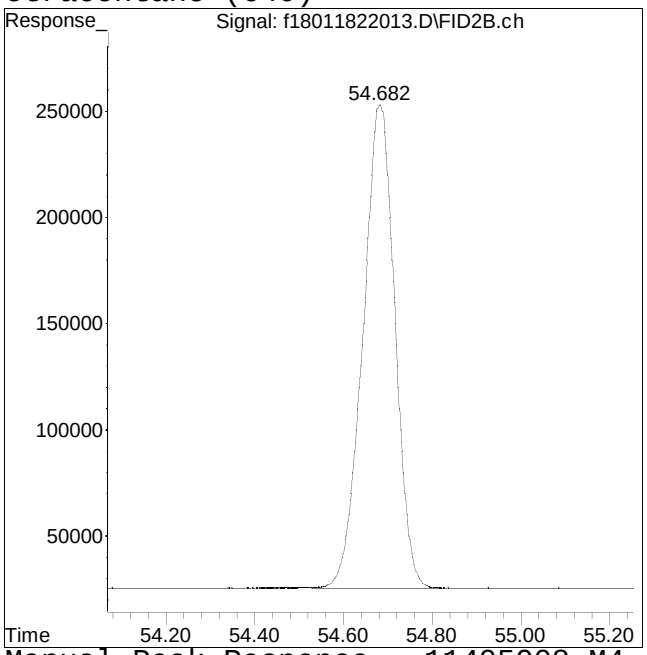
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822013.D
Date Inj'd : 1/18/2022 9:14 pm
Sample : I1801182202R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:34 pm

Compound #41: n-Tetracontane (C40)





Original Peak Response = 11447646 Manual Peak Response = 11405008 M4
M4 = Poor automated baseline construction.

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822015.D
Signal(s) : FID2B.ch
Acq On : 18 Jan 2022 10:40 pm
Operator : FID18:WR
Sample : I1801182203R
Misc : WG1596727,FRBE45,50ug/ml
ALS Vial : 58 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 18:03:02 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 18:02:19 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	31.197	57331683	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	29.192	61341902	51.555 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 103.11%	
24) s d50-Tetracosane	35.815	49942600	51.624 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 103.25%	
Target Compounds			
2) t n-Octane (C8)	5.579	48757001	52.690 ug/mL M4
3) t n-Nonane (C9)	7.788	50815885	53.026 ug/mL M4
4) t n-Decane (C10)	10.271	52589177	52.805 ug/mL M4
5) t n-Undecane (C11)	12.779	53562361	53.514 ug/mL M4
6) t n-Dodecane (C12)	15.204	53665106	52.941 ug/mL M4
7) t n-Tridecane (C13)	17.509	54132242	53.030 ug/mL M4
9) t n-Tetradecane (C14)	19.688	55163958	52.501 ug/mL M4
11) t n-Pentadecane (C15)	21.749	54868685	51.786 ug/mL M4
12) t n-Hexadecane (C16)	23.703	55916063	52.699 ug/mL M4
14) t n-Heptadecane (C17)	25.557	56964559	52.732 ug/mL M4
15) t Pristane	25.668	57106261	52.124 ug/mL M4
16) t n-Octadecane (C18)	27.318	57358797	52.515 ug/mL M4
17) t Phytane	27.482	52750587	52.206 ug/mL M4
18) t n-Nonadecane (C19)	29.000	56677032	51.660 ug/mL M4
20) t n-Eicosane (C20)	30.601	57469859	51.952 ug/mL M4
21) t n-Heneicosane (C21)	32.134	57346014	51.457 ug/mL M4
22) t n-Docosane (C22)	33.602	58341706	52.097 ug/mL M4
23) t n-Tricosane (C23)	35.012	58468244	52.327 ug/mL M4
25) t n-Tetracosane (C24)	36.364	55727825	50.380 ug/mL M4
26) t n-Pentacosane (C25)	37.663	57834702	52.639 ug/mL M4
27) t n-Hexacosane (C26)	38.915	59769841	52.918 ug/mL M4
28) t n-Heptacosane (C27)	40.121	57808919	51.311 ug/mL M4
29) t n-Octacosane (C28)	41.288	60281562	52.322 ug/mL M4
30) t n-Nonacosane (C29)	42.413	60338341	52.511 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822015.D
Signal(s) : FID2B.ch
Acq On : 18 Jan 2022 10:40 pm
Operator : FID18:WR
Sample : I1801182203R
Misc : WG1596727,FRBE45,50ug/ml
ALS Vial : 58 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 18:03:02 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 18:02:19 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

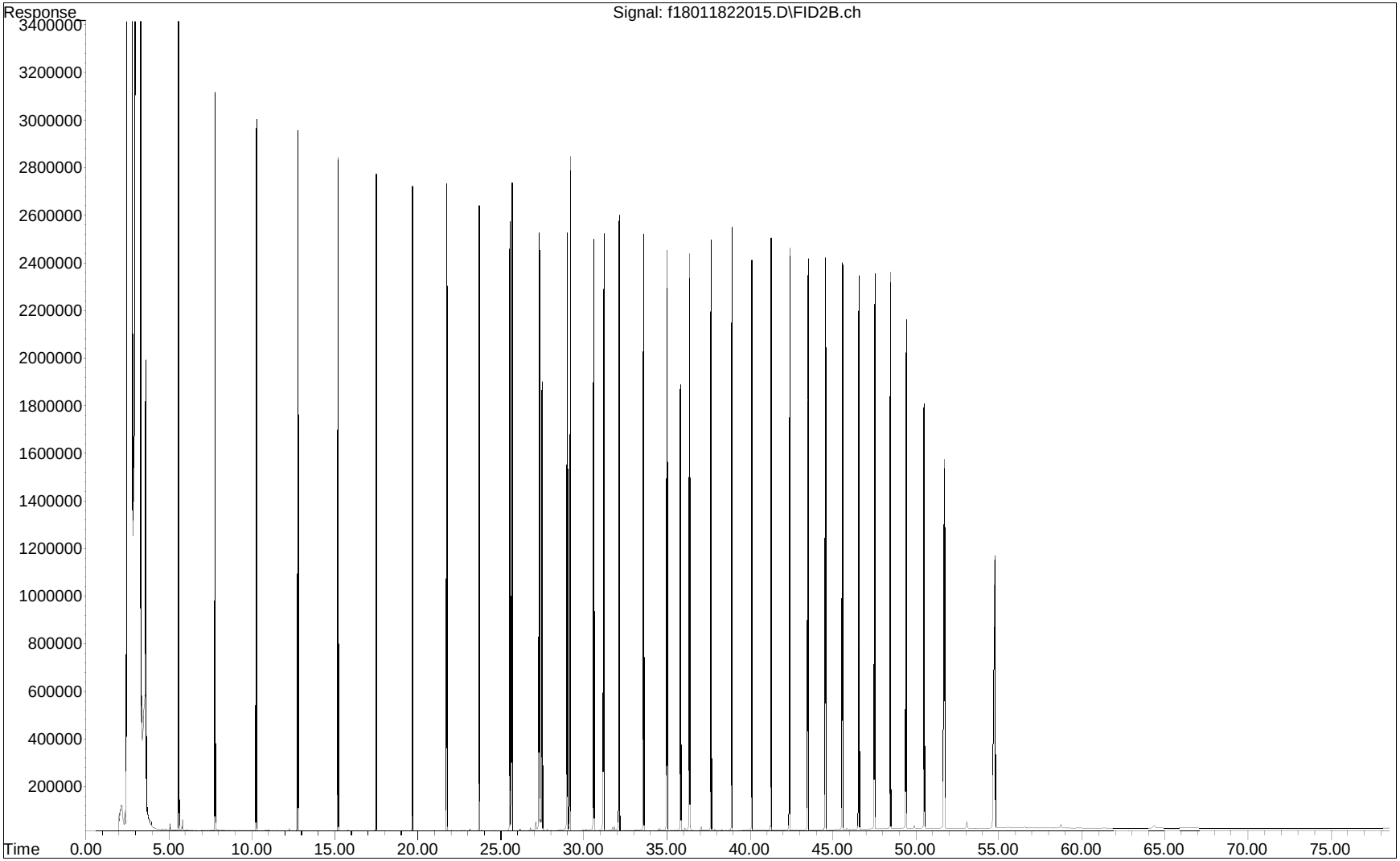
	Compound	R.T.	Response	Conc Units
31) t	n-Triacontane (C30)	43.502	60735595	52.595 ug/mL M4
32) t	n-Hentriacontane (C31)	44.555	59137471	52.733 ug/mL M4
33) t	n-Dotriacontane (C32)	45.575	62175919	52.924 ug/mL M4
34) t	n-Tritriacontane (C33)	46.565	60232569	52.751 ug/mL M4
35) t	n-tetratriacontane (C34)	47.527	60274959	52.932 ug/mL M4
36) t	n-Pentatriacontane (C35)	48.461	61045645	56.163 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.425	65914564	51.409 ug/mL M4
38) t	n-Heptatriacontane (C37)	50.493	60864270	51.946 ug/mL M4
39) t	n-Octatriacontane (C38)	51.717	63094899	52.921 ug/mL M4
41) t	n-Tetracontane (C40)	54.737	63634369	53.679 ug/mL M4

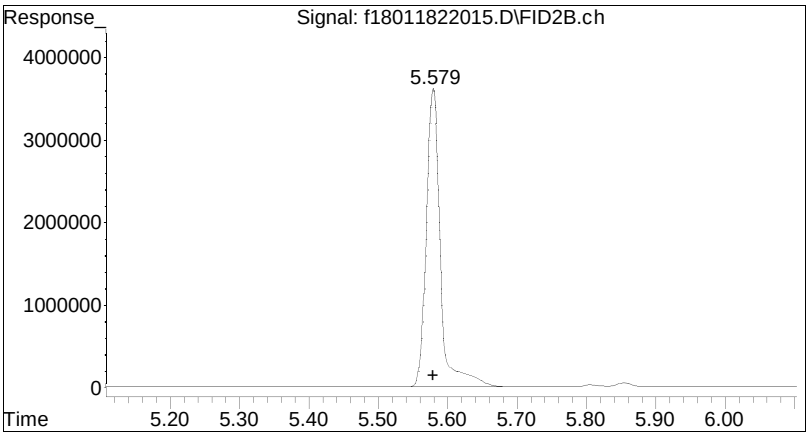
SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

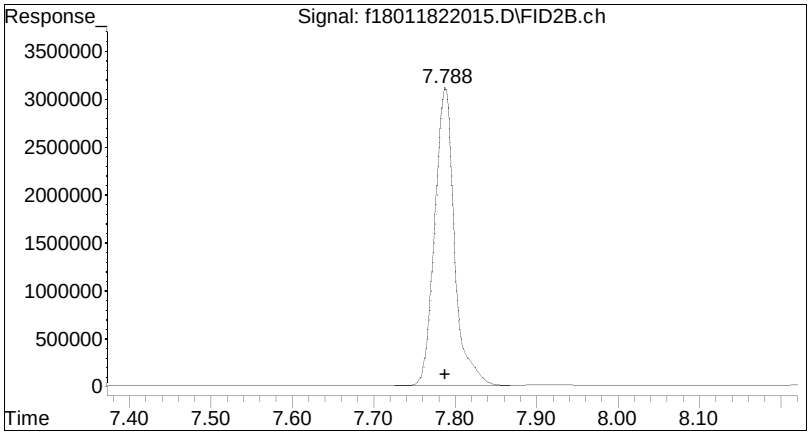
File :O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\f18011822015.D
Operator : FID18:WR
Acquired : 18 Jan 2022 10:40 pm using AcqMethod FID18.M
Sample Name: I1801182203R
Instrument: FID 18
Misc Info : WG1596727,FRBE45,50ug/ml
Vial Number: 58
CurrentMeth: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M





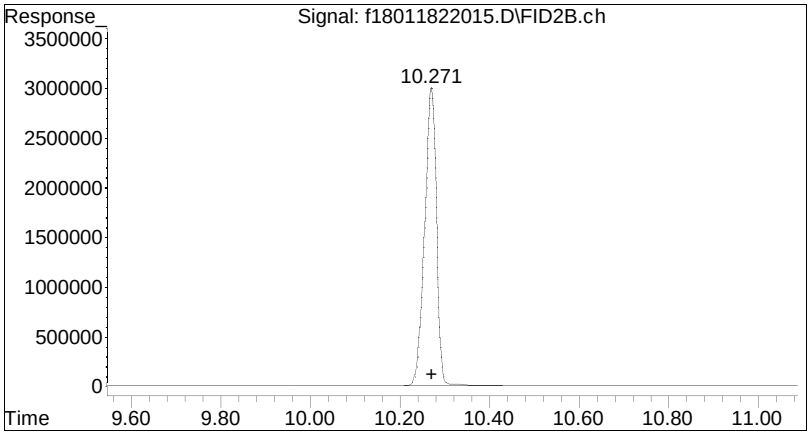
#2 n-Octane (C8)

R.T.: 5.579 min
Delta R.T.: 0.000 min
Response: 48757001
Conc: 52.69 ug/mL M4



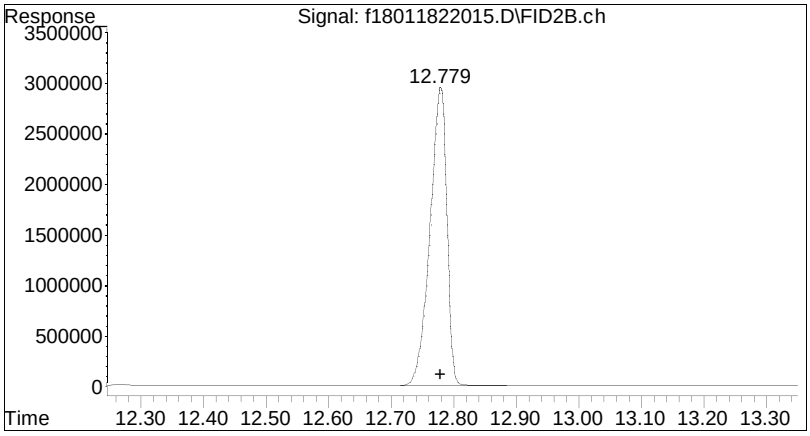
#3 n-Nonane (C9)

R.T.: 7.788 min
Delta R.T.: 0.000 min
Response: 50815885
Conc: 53.03 ug/mL M4



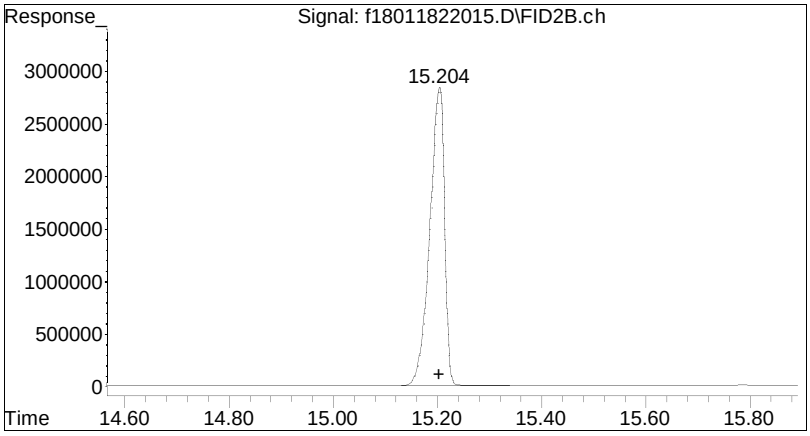
#4 n-Decane (C10)

R.T.: 10.271 min
Delta R.T.: 0.000 min
Response: 52589177
Conc: 52.81 ug/mL M4



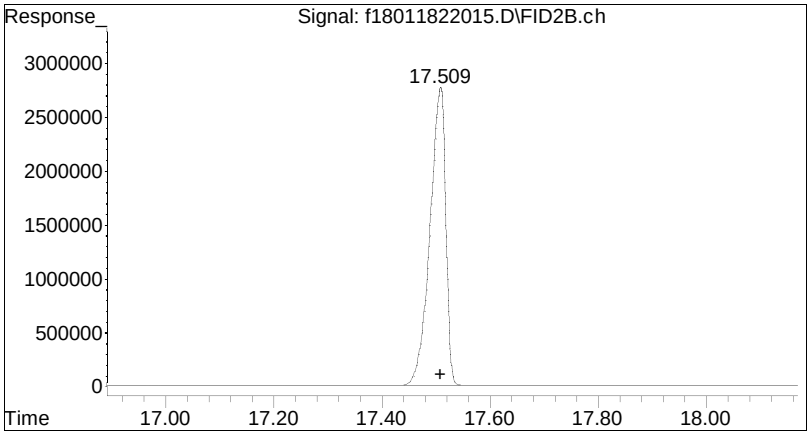
#5 n-Undecane (C11)

R.T.: 12.779 min
Delta R.T.: 0.000 min
Response: 53562361
Conc: 53.51 ug/mL M4



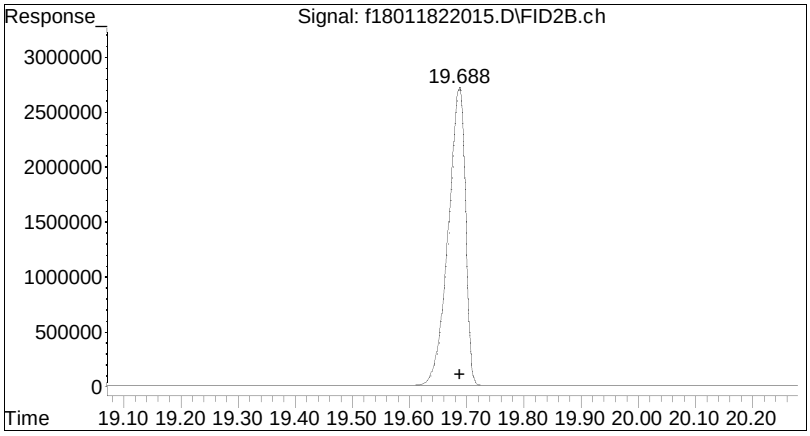
#6 n-Dodecane (C12)

R.T.: 15.204 min
Delta R.T.: 0.000 min
Response: 53665106
Conc: 52.94 ug/mL M4



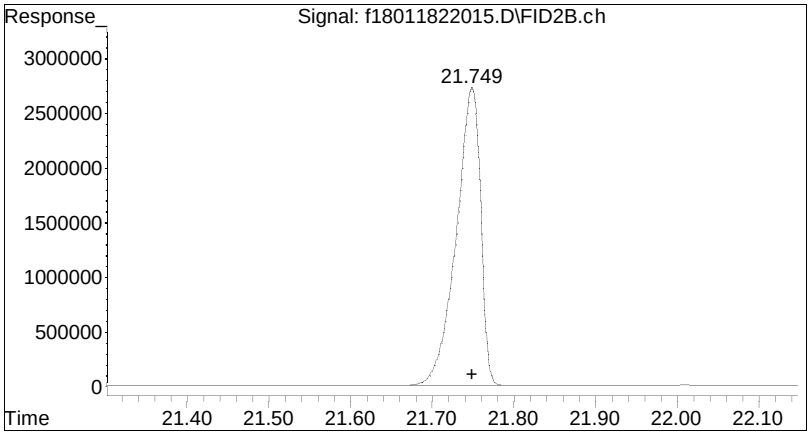
#7 n-Tridecane (C13)

R.T.: 17.509 min
Delta R.T.: 0.000 min
Response: 54132242
Conc: 53.03 ug/mL M4



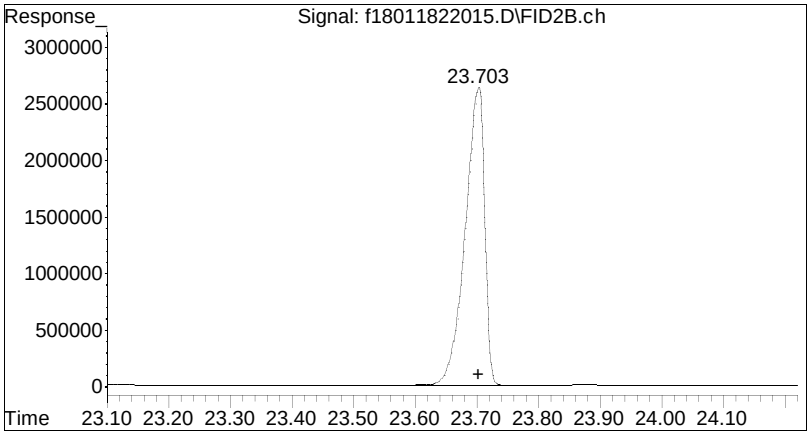
#9 n-Tetradecane (C14)

R.T.: 19.688 min
Delta R.T.: 0.000 min
Response: 55163958
Conc: 52.50 ug/mL M4



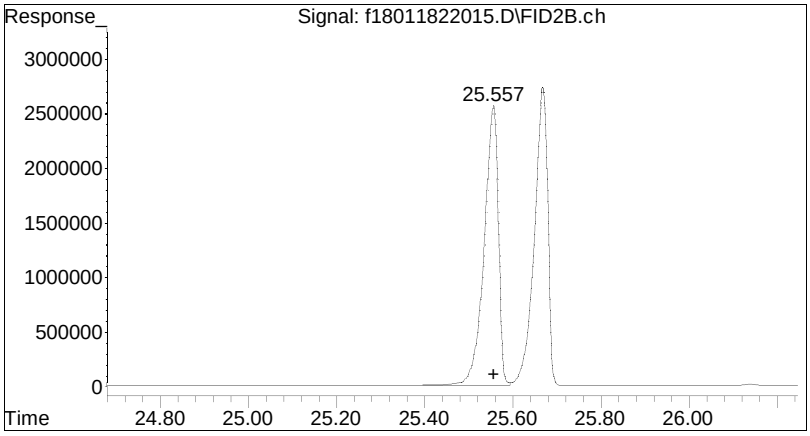
#11 n-Pentadecane (C15)

R.T.: 21.749 min
Delta R.T.: 0.000 min
Response: 54868685
Conc: 51.79 ug/mL M4



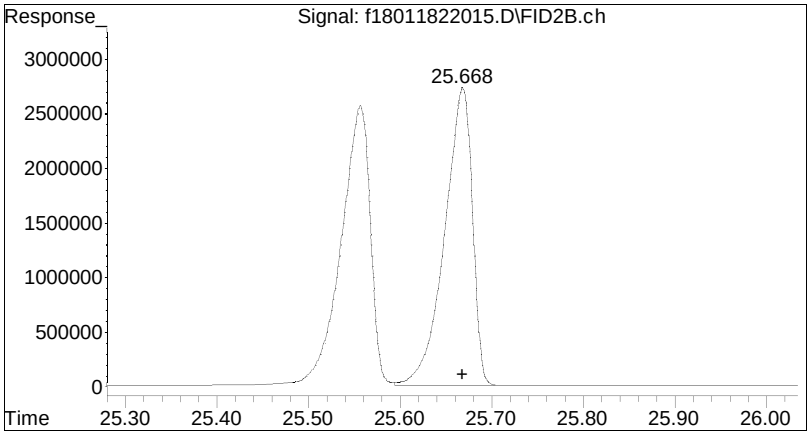
#12 n-Hexadecane (C16)

R.T.: 23.703 min
Delta R.T.: 0.000 min
Response: 55916063
Conc: 52.70 ug/mL M4



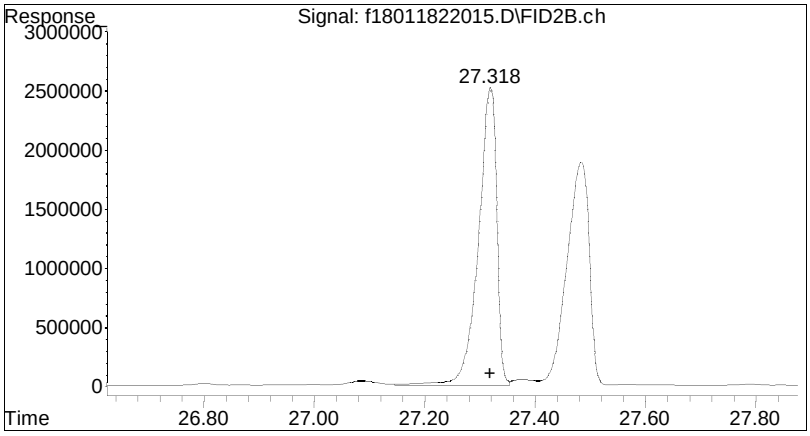
#14 n-Heptadecane (C17)

R.T.: 25.557 min
Delta R.T.: 0.000 min
Response: 56964559
Conc: 52.73 ug/mL M4



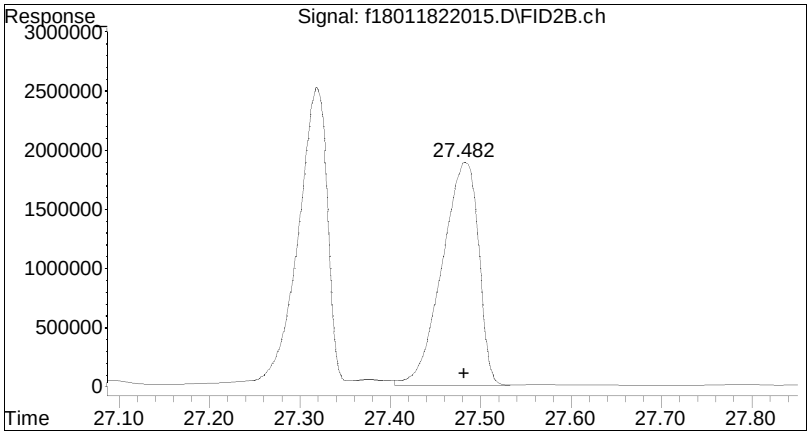
#15 Pristane

R.T.: 25.668 min
Delta R.T.: 0.000 min
Response: 57106261
Conc: 52.12 ug/mL M4



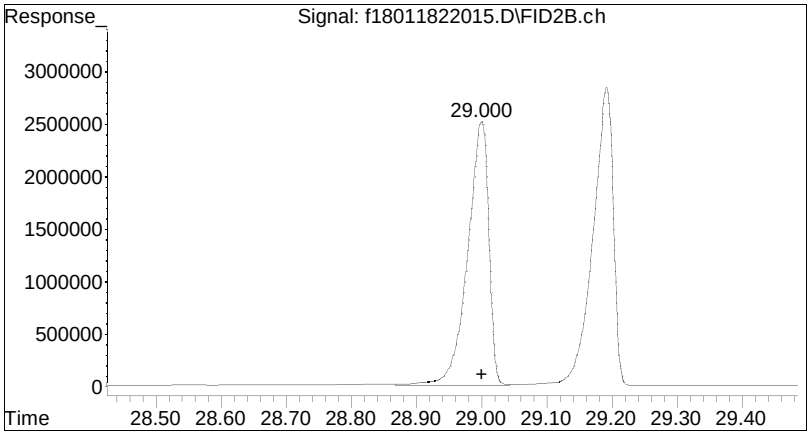
#16 n-Octadecane (C18)

R.T.: 27.318 min
Delta R.T.: 0.000 min
Response: 57358797
Conc: 52.51 ug/mL M4



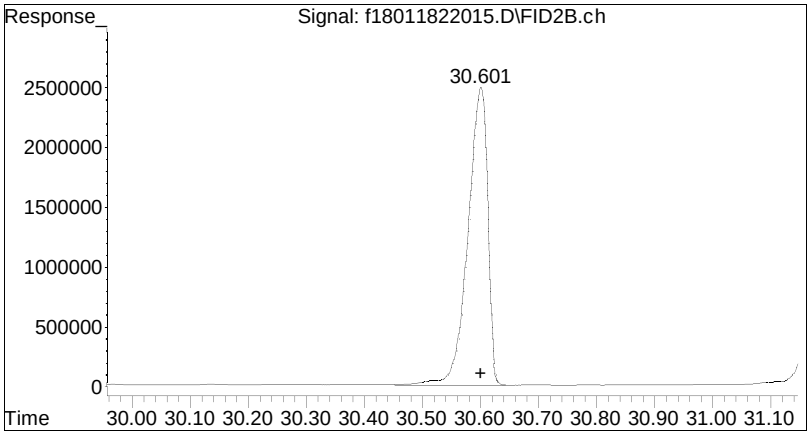
#17 Phytane

R.T.: 27.482 min
Delta R.T.: 0.000 min
Response: 52750587
Conc: 52.21 ug/mL M4



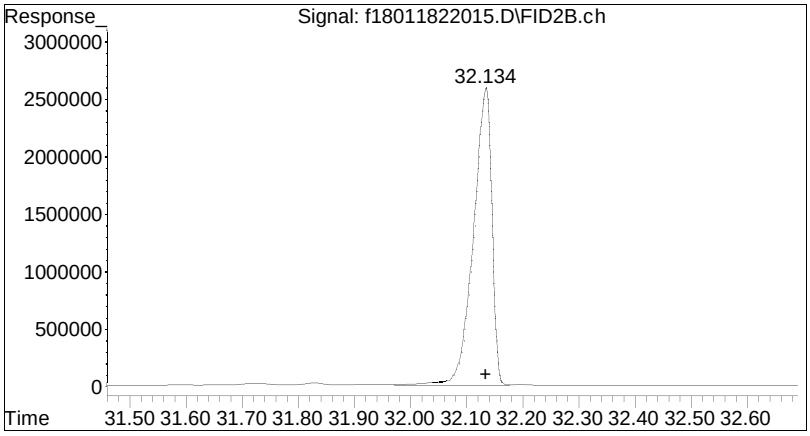
#18 n-Nonadecane (C19)

R.T.: 29.000 min
Delta R.T.: 0.000 min
Response: 56677032
Conc: 51.66 ug/mL M4



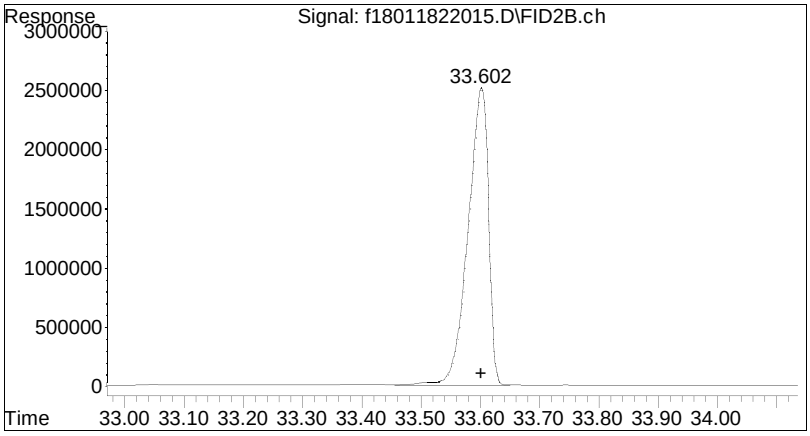
#20 n-Eicosane (C20)

R.T.: 30.601 min
Delta R.T.: 0.000 min
Response: 57469859
Conc: 51.95 ug/mL M4



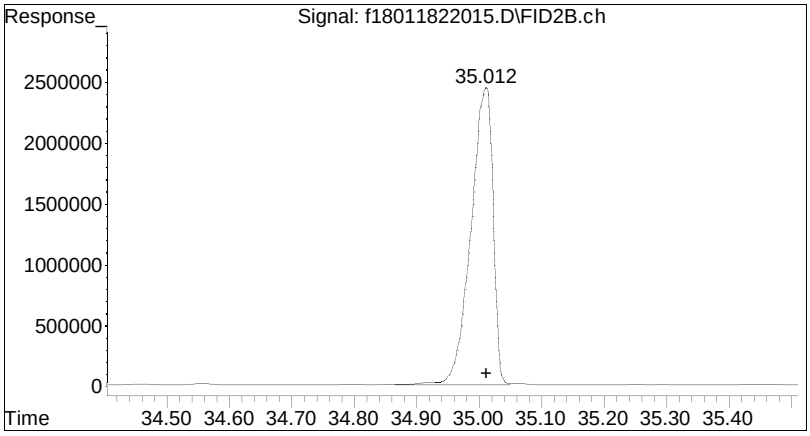
#21 n-Heneicosane (C21)

R.T.: 32.134 min
Delta R.T.: 0.000 min
Response: 57346014
Conc: 51.46 ug/mL M4



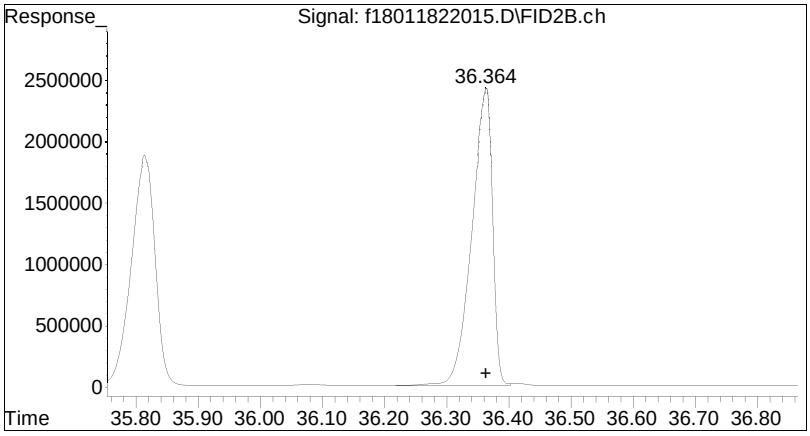
#22 n-Docosane (C22)

R.T.: 33.602 min
Delta R.T.: 0.000 min
Response: 58341706
Conc: 52.10 ug/mL M4



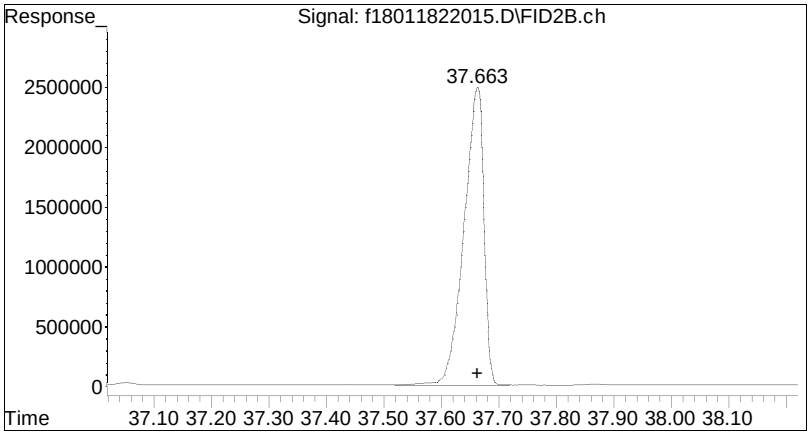
#23 n-Tricosane (C23)

R.T.: 35.012 min
Delta R.T.: 0.000 min
Response: 58468244
Conc: 52.33 ug/mL M4



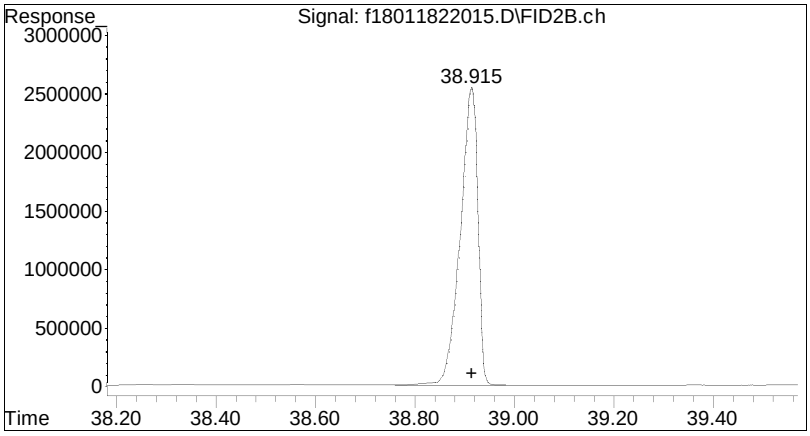
#25 n-Tetracosane (C24)

R.T.: 36.364 min
Delta R.T.: 0.000 min
Response: 55727825
Conc: 50.38 ug/mL M4



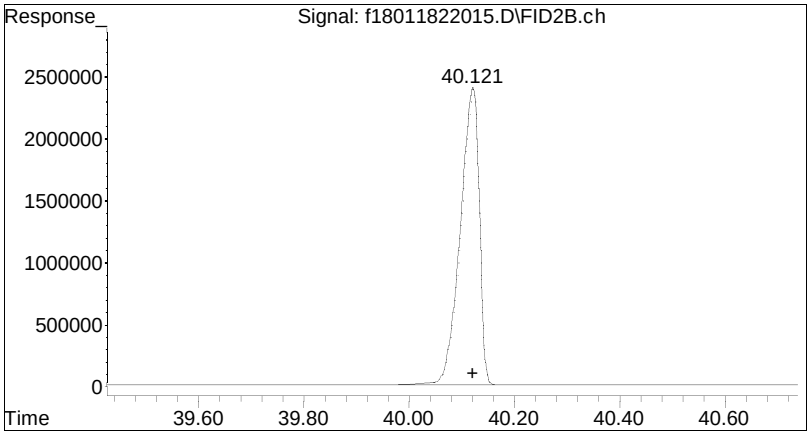
#26 n-Pentacosane (C25)

R.T.: 37.663 min
Delta R.T.: 0.000 min
Response: 57834702
Conc: 52.64 ug/mL M4



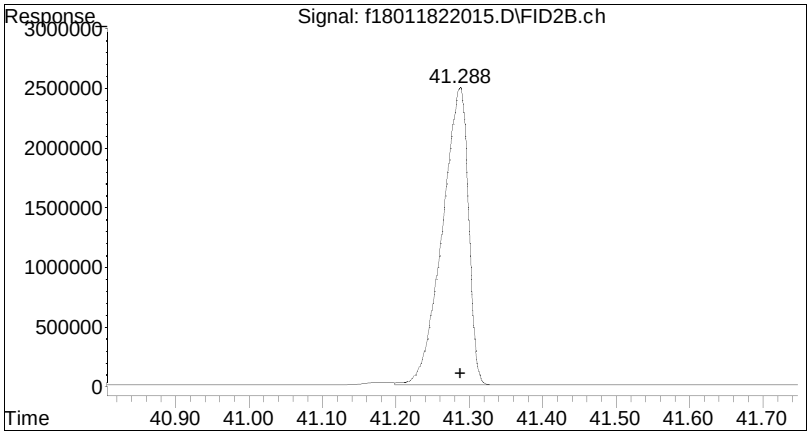
#27 n-Hexacosane (C26)

R.T.: 38.915 min
Delta R.T.: 0.000 min
Response: 59769841
Conc: 52.92 ug/mL M4



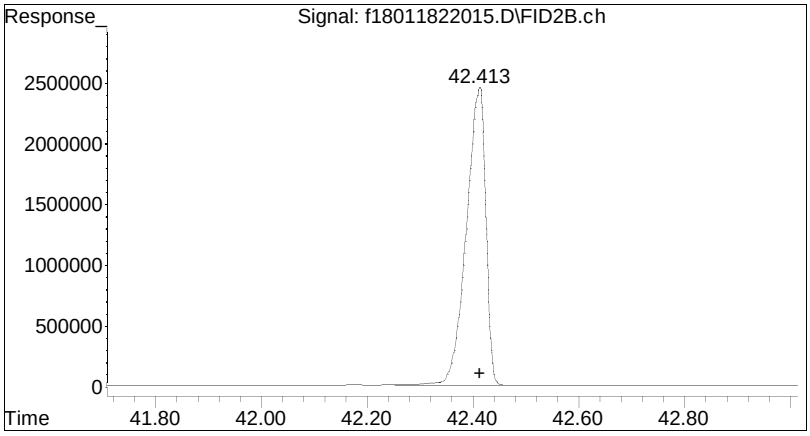
#28 n-Heptacosane (C27)

R.T.: 40.121 min
Delta R.T.: 0.000 min
Response: 57808919
Conc: 51.31 ug/mL M4



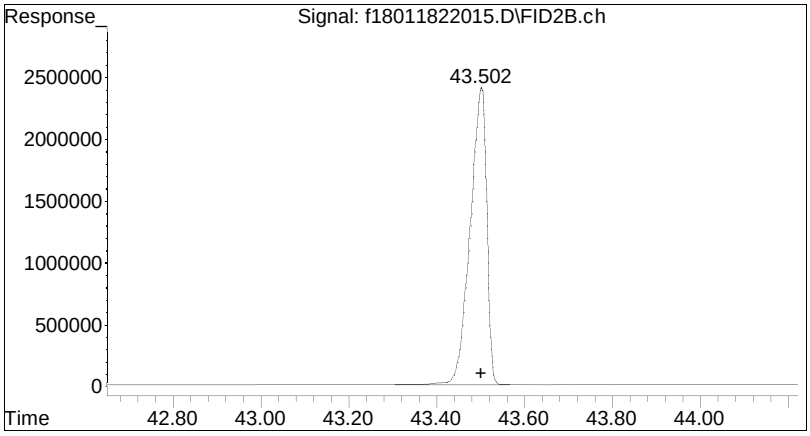
#29 n-Octacosane (C28)

R.T.: 41.288 min
Delta R.T.: 0.000 min
Response: 60281562
Conc: 52.32 ug/mL M4



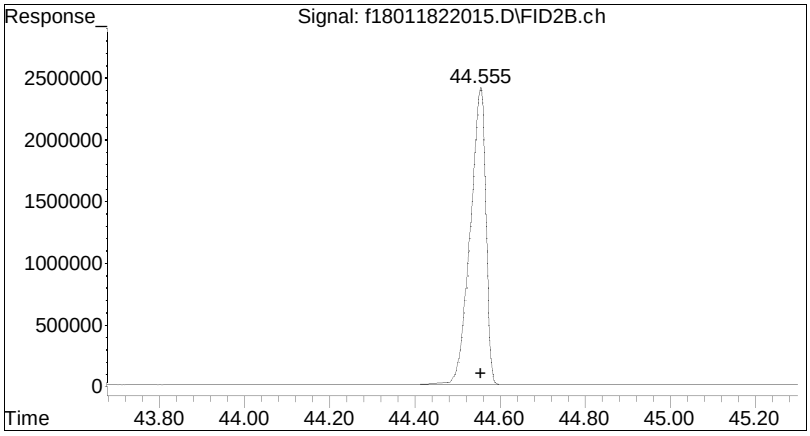
#30 n-Nonacosane (C29)

R.T.: 42.413 min
Delta R.T.: 0.000 min
Response: 60338341
Conc: 52.51 ug/mL M4



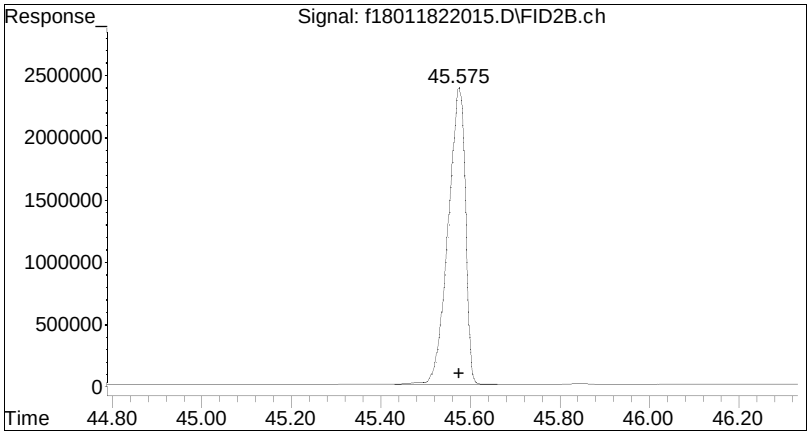
#31 n-Triacontane (C30)

R.T.: 43.502 min
Delta R.T.: 0.000 min
Response: 60735595
Conc: 52.59 ug/mL M4



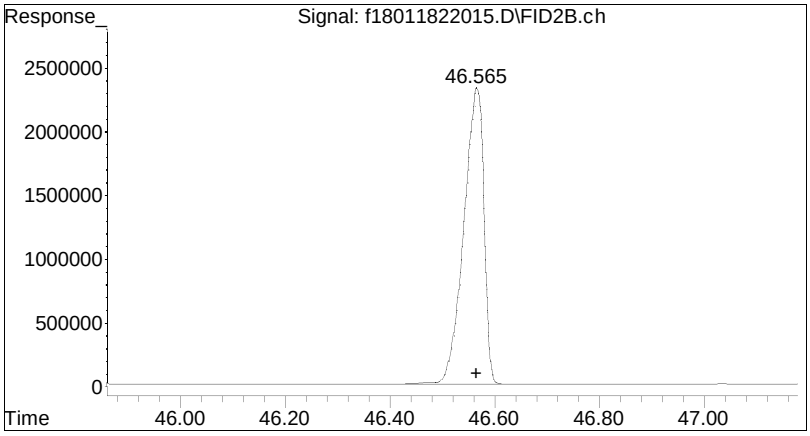
#32 n-Hentriacontane (C31)

R.T.: 44.555 min
Delta R.T.: 0.000 min
Response: 59137471
Conc: 52.73 ug/mL M4



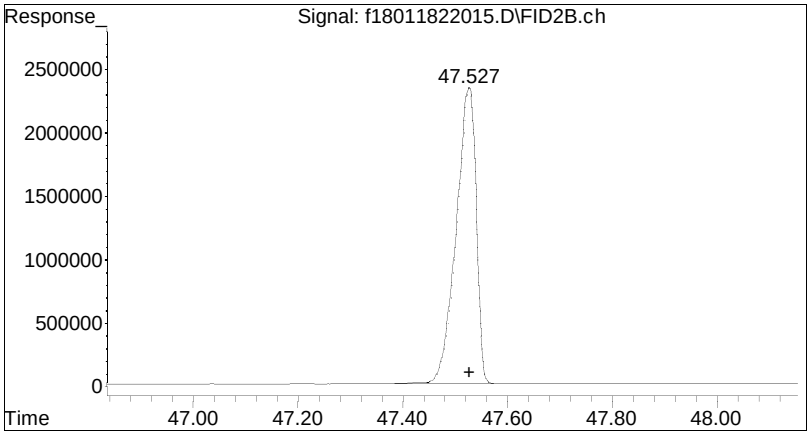
#33 n-Dotriacontane (C32)

R.T.: 45.575 min
Delta R.T.: 0.000 min
Response: 62175919
Conc: 52.92 ug/mL M4



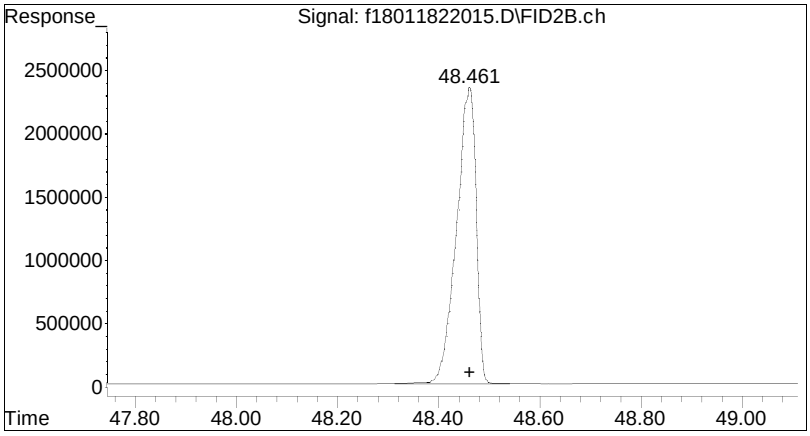
#34 n-Tritriacontane (C33)

R.T.: 46.565 min
Delta R.T.: 0.000 min
Response: 60232569
Conc: 52.75 ug/mL M4



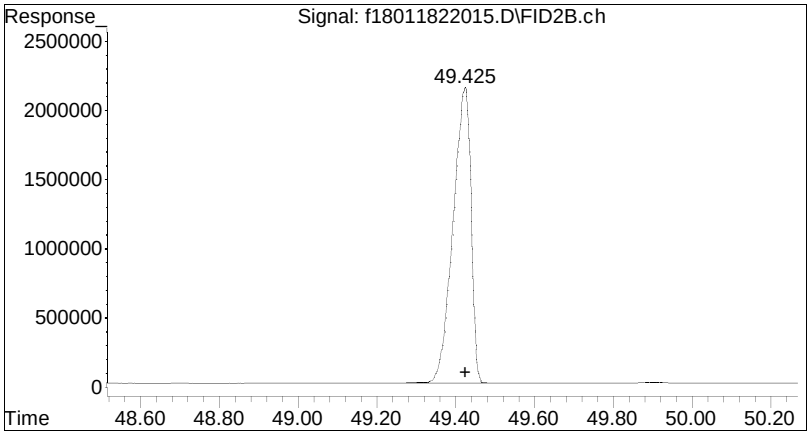
#35 n-tetratriacontane (C34)

R.T.: 47.527 min
Delta R.T.: 0.000 min
Response: 60274959
Conc: 52.93 ug/mL M4



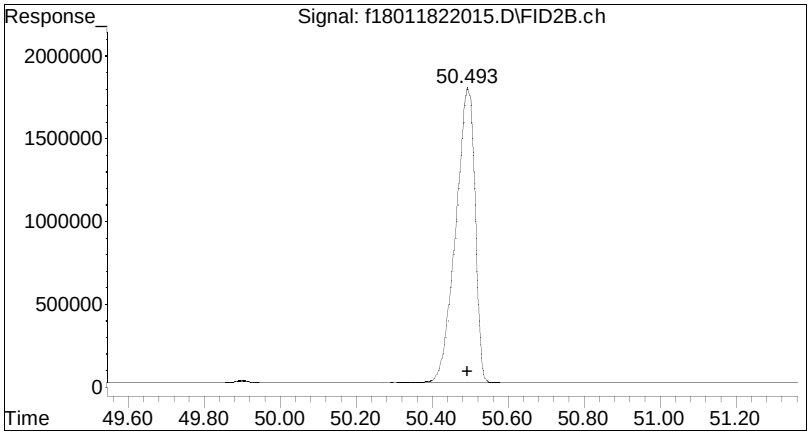
#36 n-Pentatriacontane (C35)

R.T.: 48.461 min
Delta R.T.: 0.000 min
Response: 61045645
Conc: 56.16 ug/mL M4



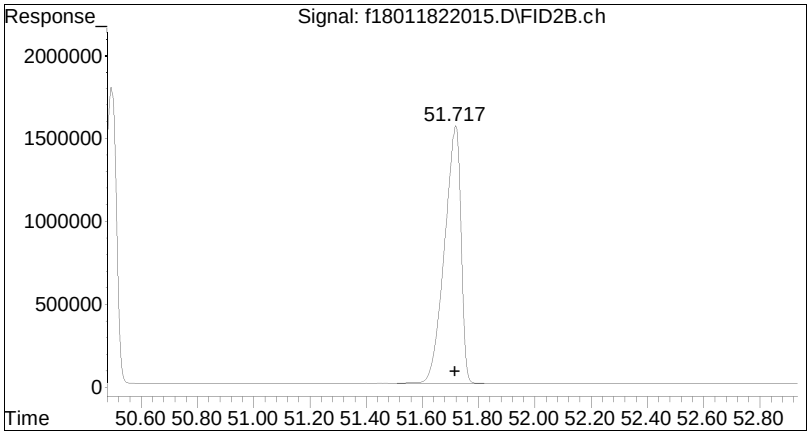
#37 n-Hexatriacontane (C36)

R.T.: 49.425 min
Delta R.T.: 0.000 min
Response: 65914564
Conc: 51.41 ug/mL M4



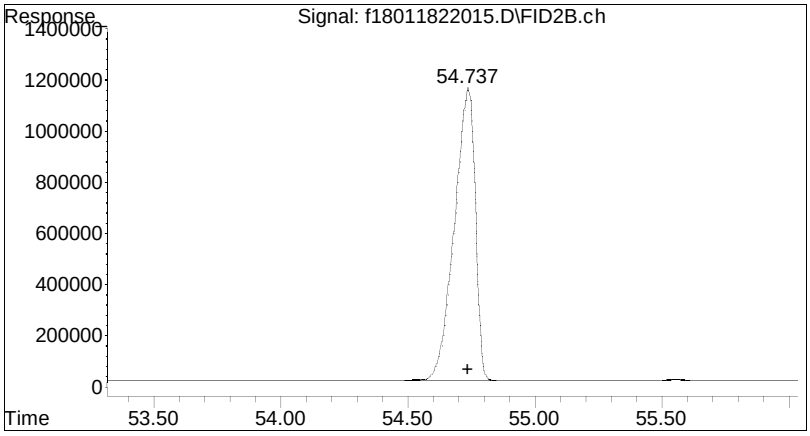
#38 n-Heptatriacontane (C37)

R.T.: 50.493 min
Delta R.T.: 0.000 min
Response: 60864270
Conc: 51.95 ug/mL M4



#39 n-Octatriacontane (C38)

R.T.: 51.717 min
Delta R.T.: 0.000 min
Response: 63094899
Conc: 52.92 ug/mL M4



#41 n-Tetracontane (C40)

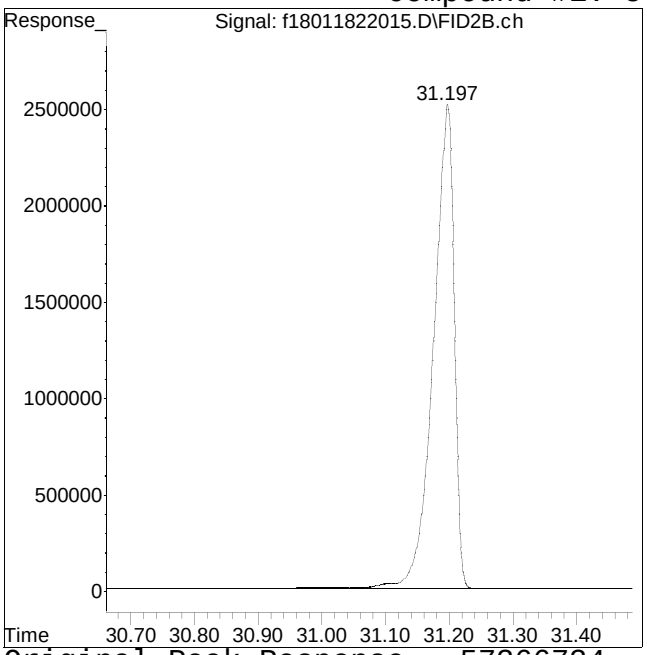
R.T.: 54.737 min
Delta R.T.: 0.000 min
Response: 63634369
Conc: 53.68 ug/mL M4

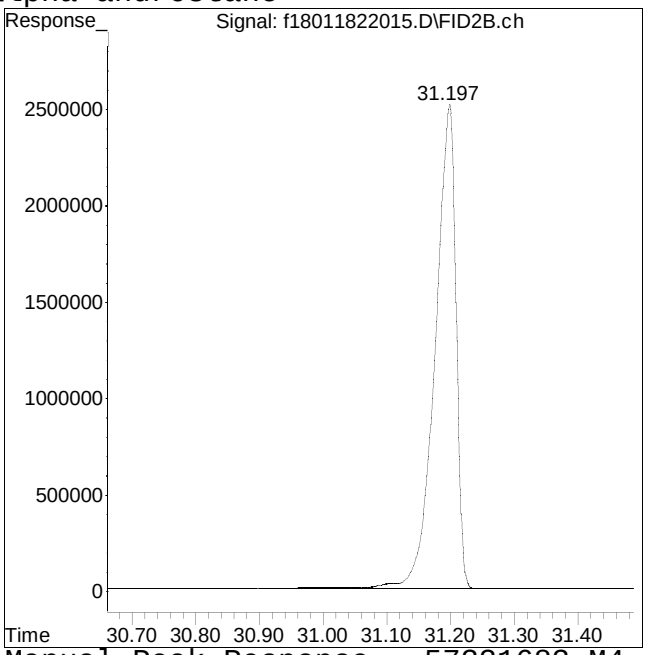
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #1: 5-alpha-androstane





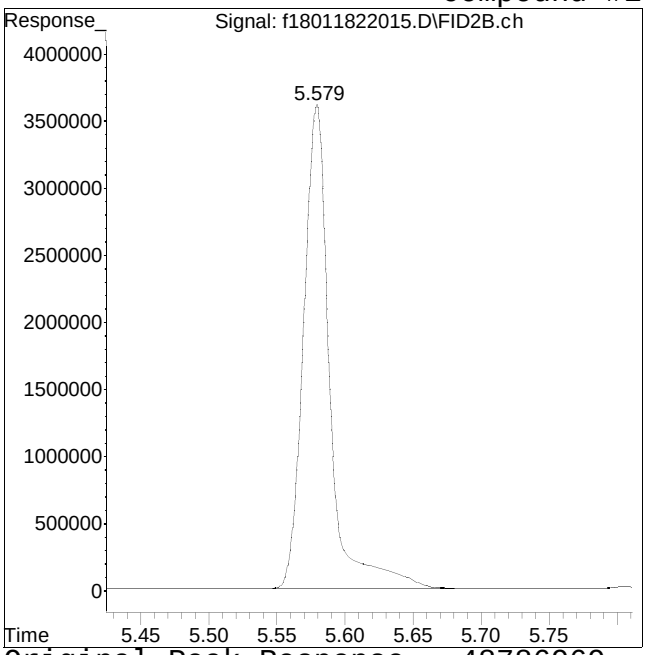
Original Peak Response = 57366734 Manual Peak Response = 57331683 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

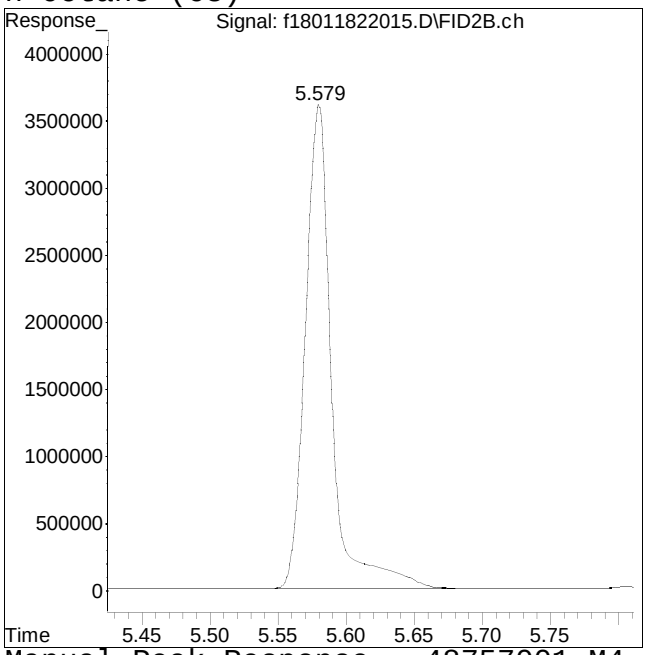
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #2: n-Octane (C8)



Original Peak Response = 48786969



Manual Peak Response = 48757001 M4

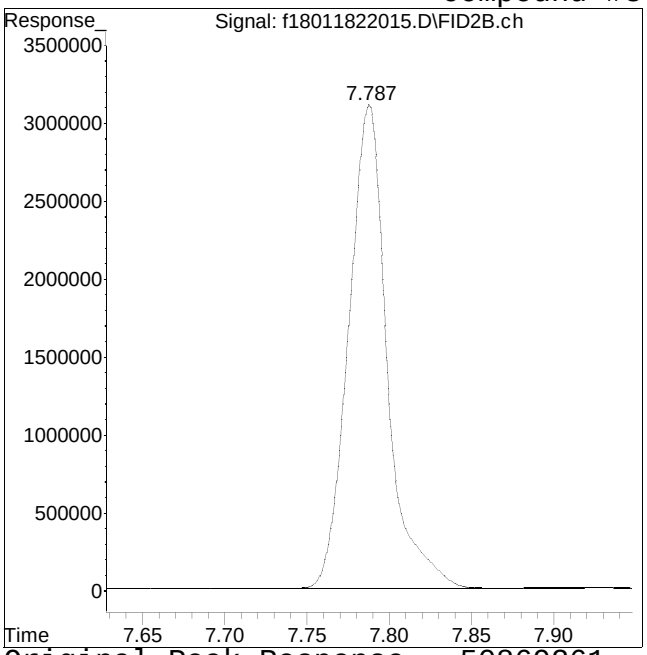
M4 = Poor automated baseline construction.

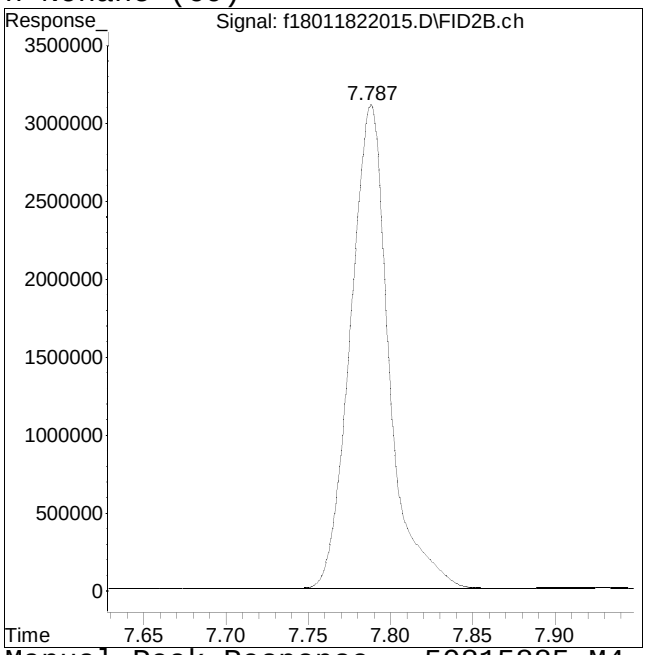
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #3: n-Nonane (C9)





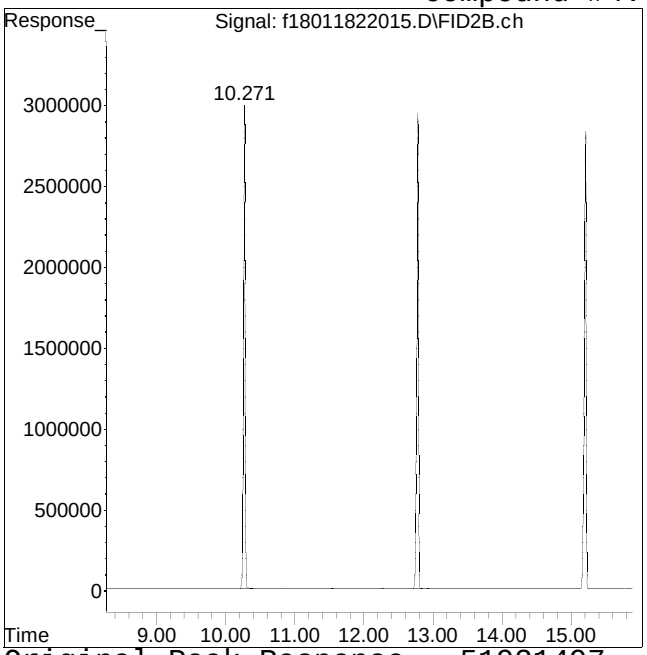
Original Peak Response = 50869261 Manual Peak Response = 50815885 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

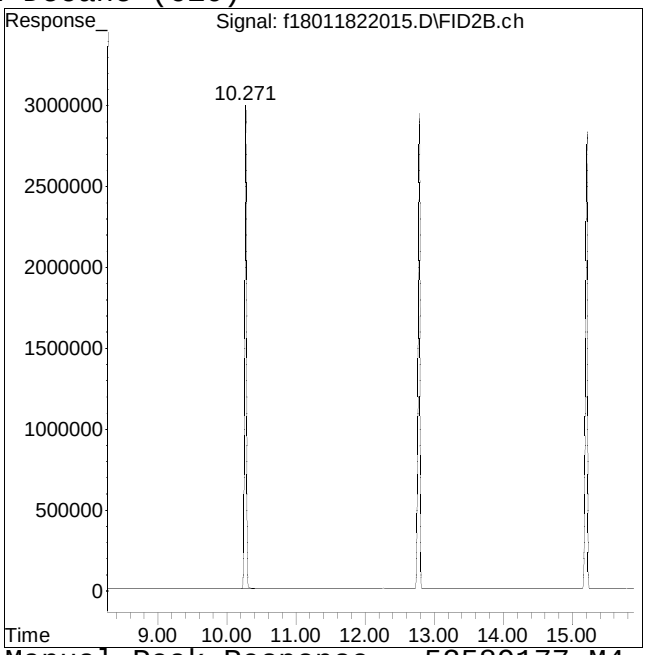
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #4: n-Decane (C10)



Original Peak Response = 51921497



Manual Peak Response = 52589177 M4

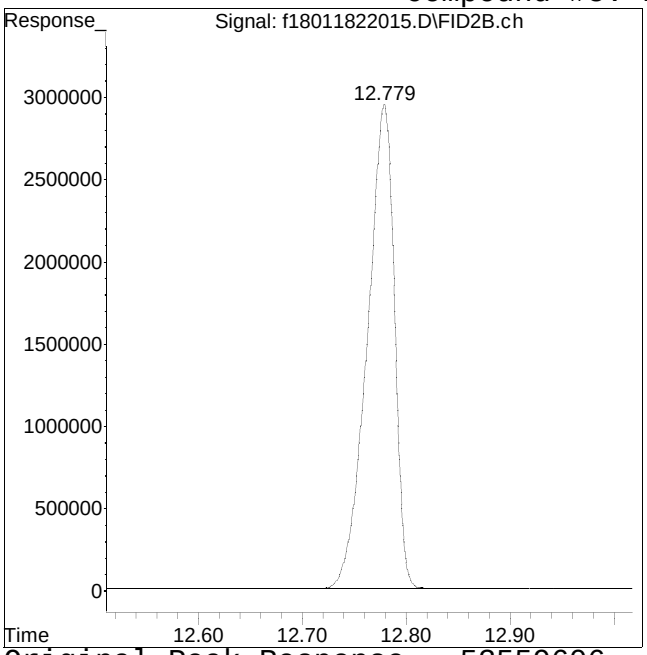
M4 = Poor automated baseline construction.

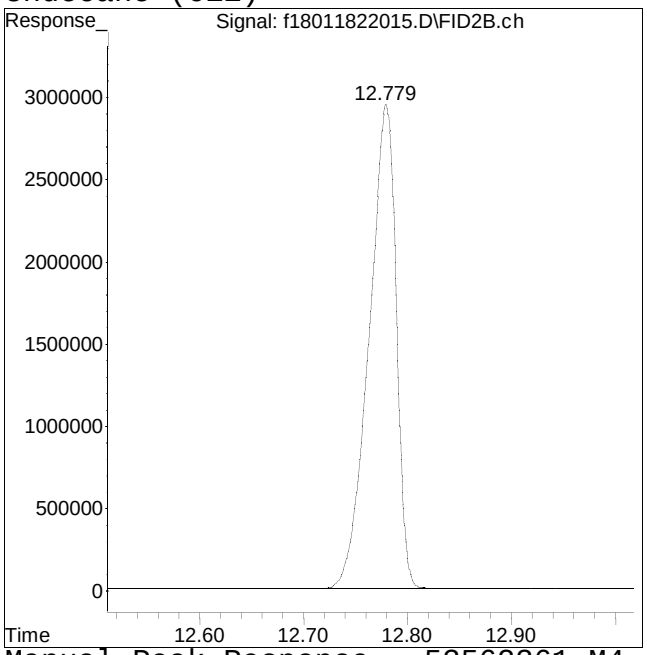
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #5: n-Undecane (C11)





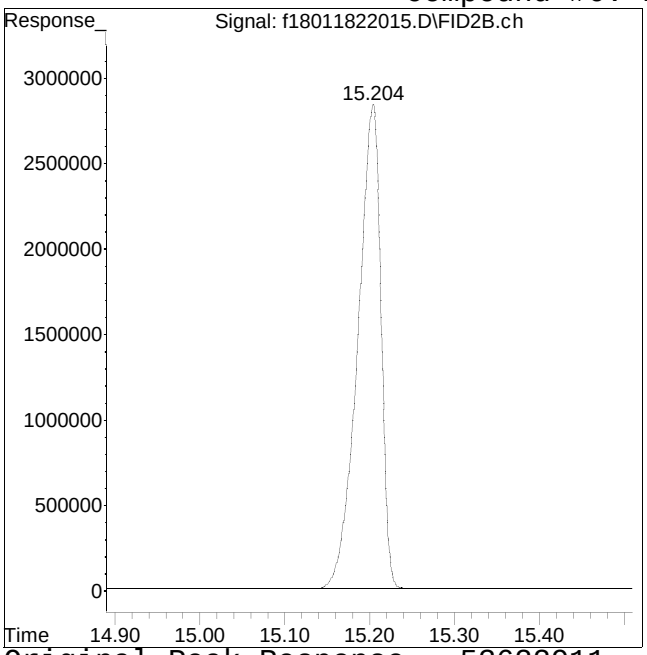
Original Peak Response = 53559606 Manual Peak Response = 53562361 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

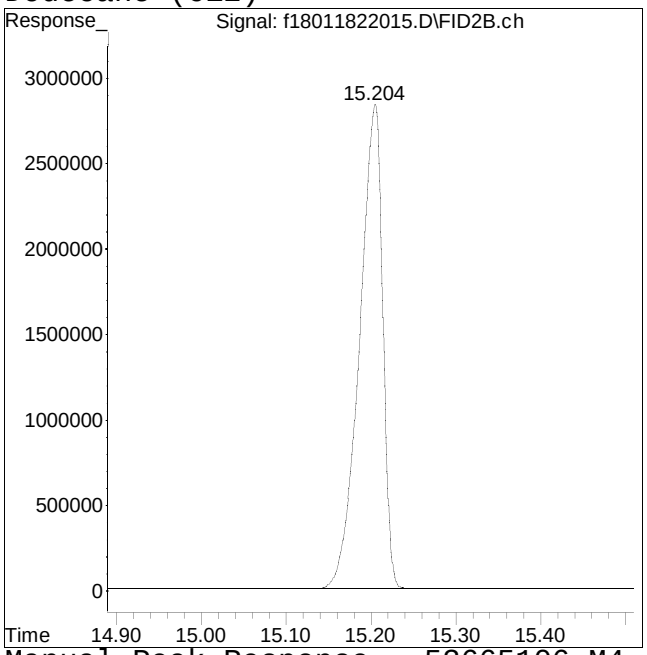
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #6: n-Dodecane (C12)



Original Peak Response = 53622911



Manual Peak Response = 53665106 M4

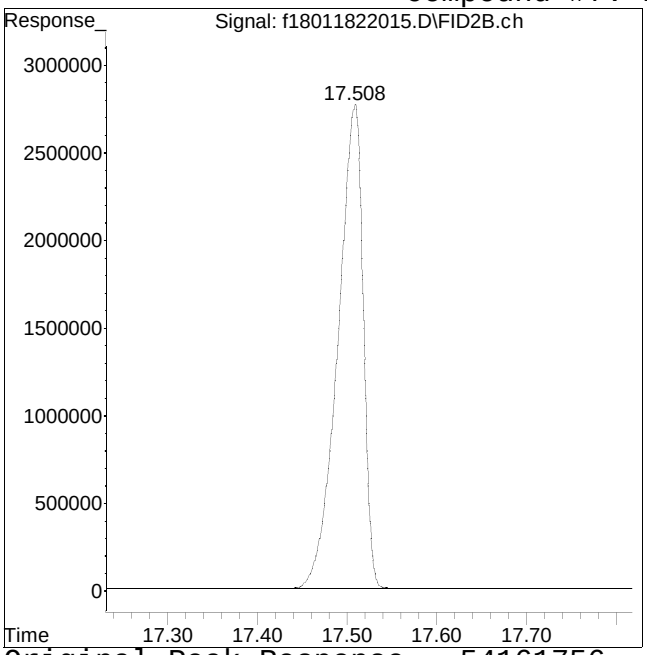
M4 = Poor automated baseline construction.

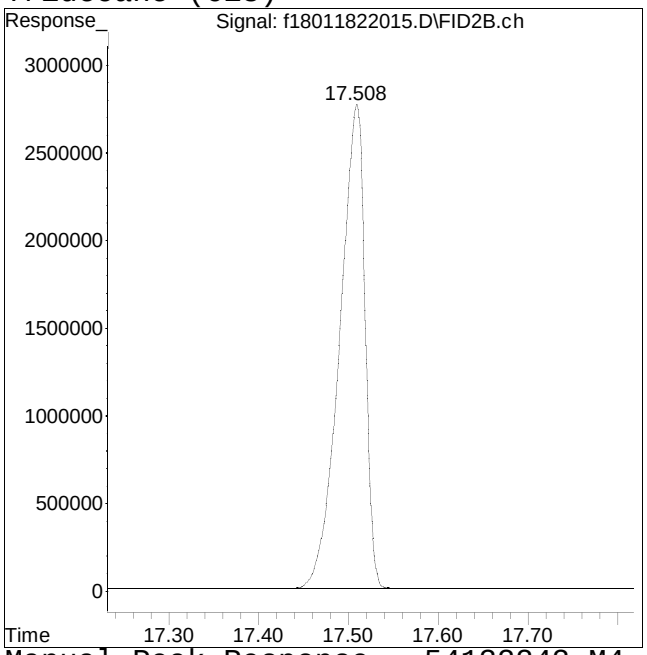
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #7: n-Tridecane (C13)





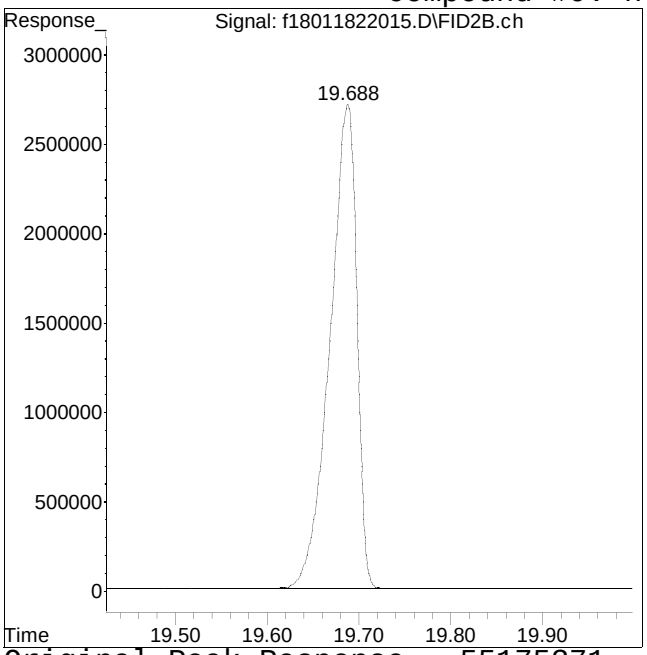
Original Peak Response = 54161756 Manual Peak Response = 54132242 M4
M4 = Poor automated baseline construction.

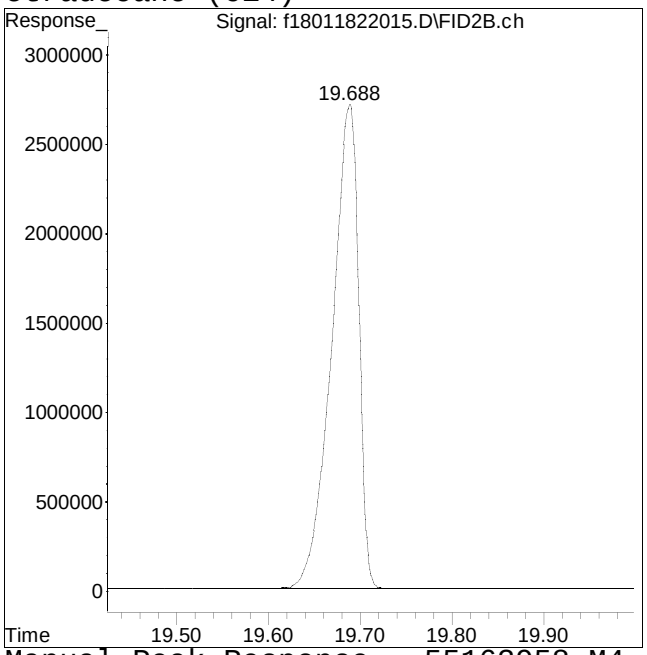
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #9: n-Tetradecane (C14)





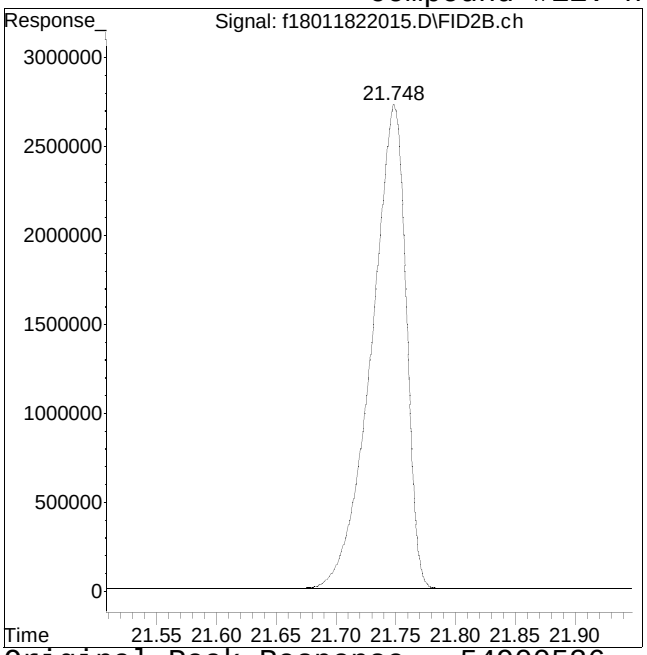
Original Peak Response = 55175371 Manual Peak Response = 55163958 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

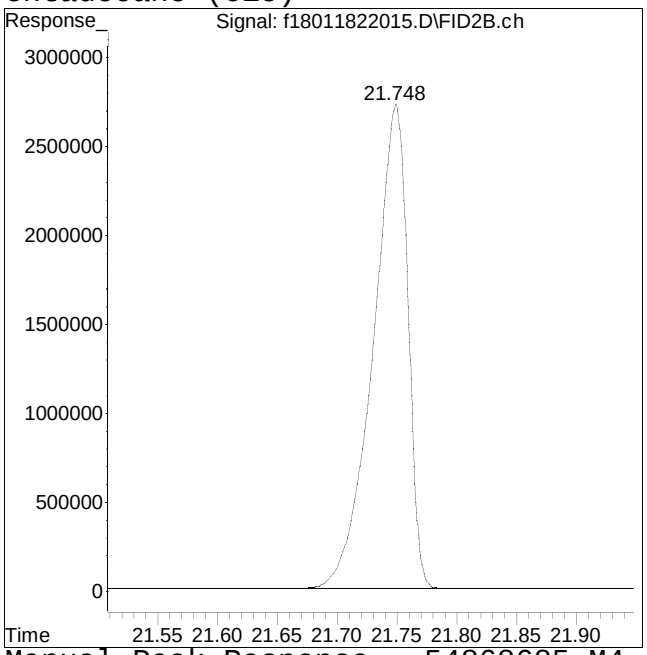
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #11: n-Pentadecane (C15)



Original Peak Response = 54900536



Manual Peak Response = 54868685 M4

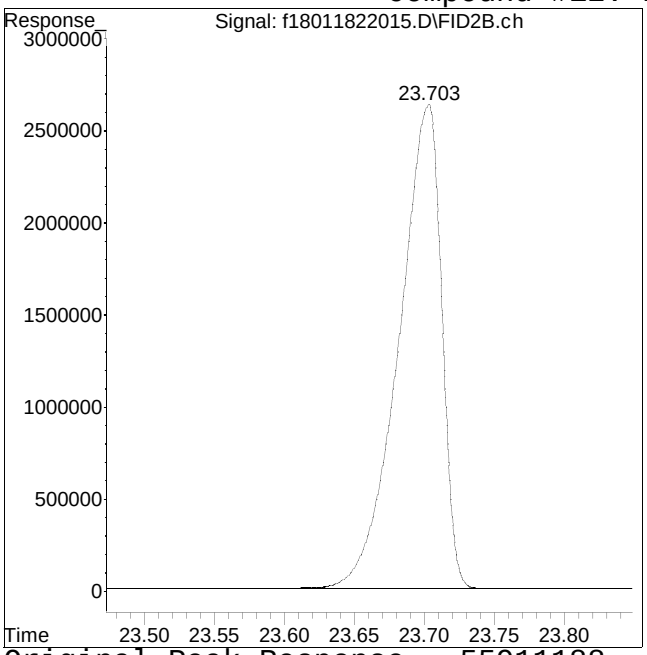
M4 = Poor automated baseline construction.

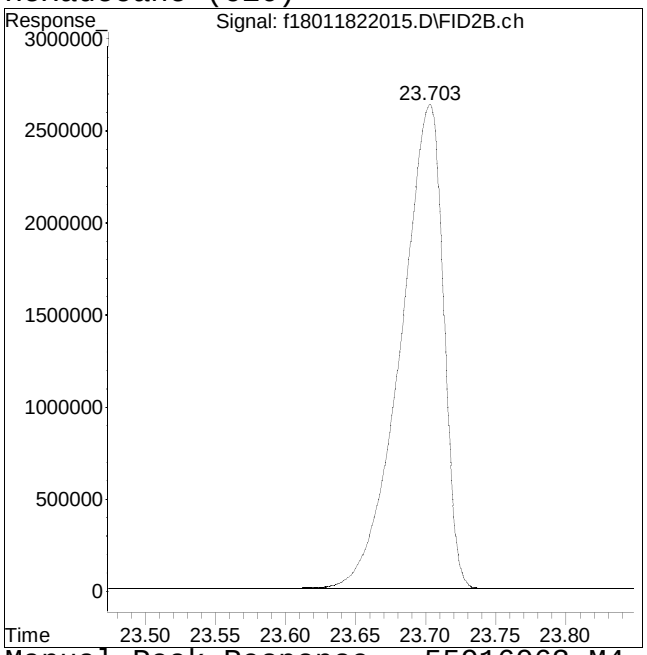
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #12: n-Hexadecane (C16)





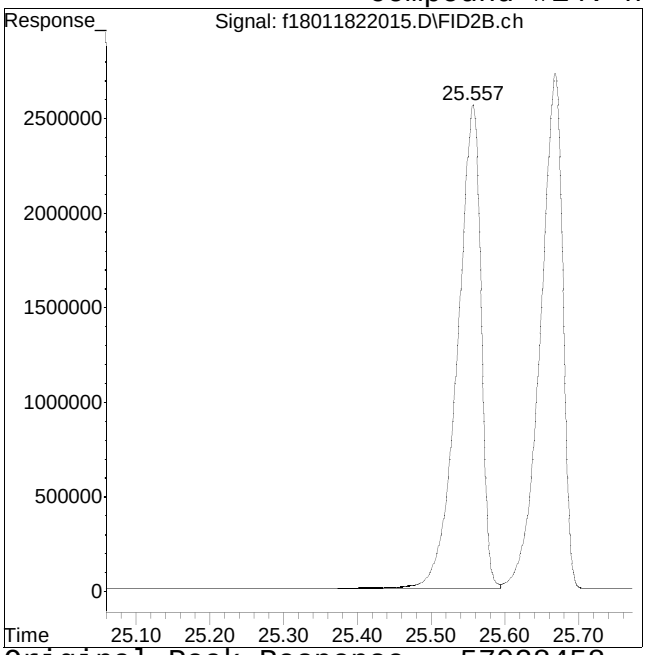
Original Peak Response = 55911188 Manual Peak Response = 55916063 M4
M4 = Poor automated baseline construction.

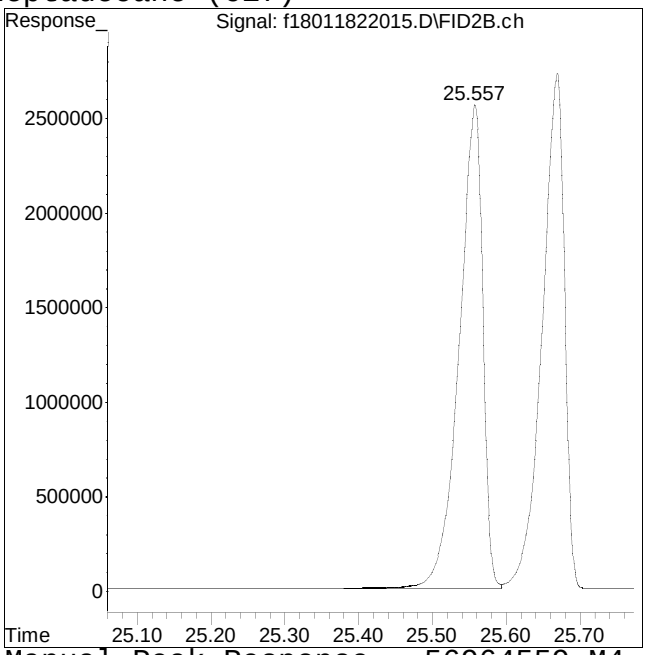
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #14: n-Heptadecane (C17)





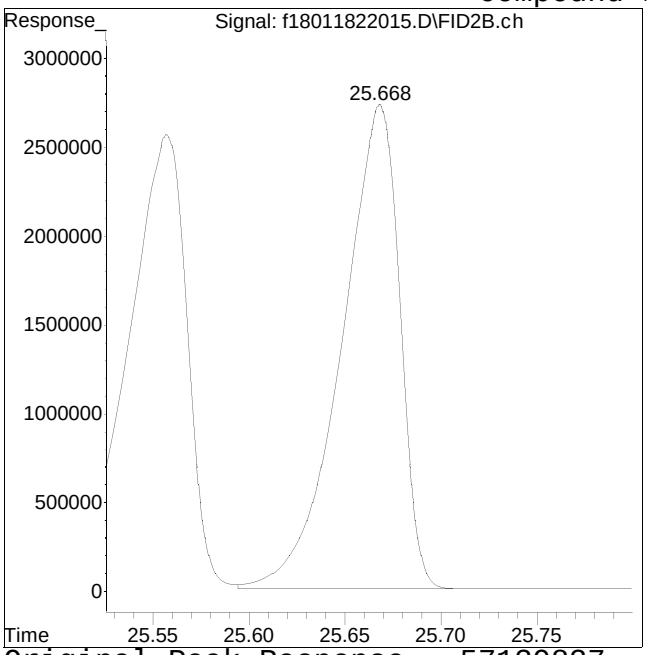
Original Peak Response = 57028458 Manual Peak Response = 56964559 M4
M4 = Poor automated baseline construction.

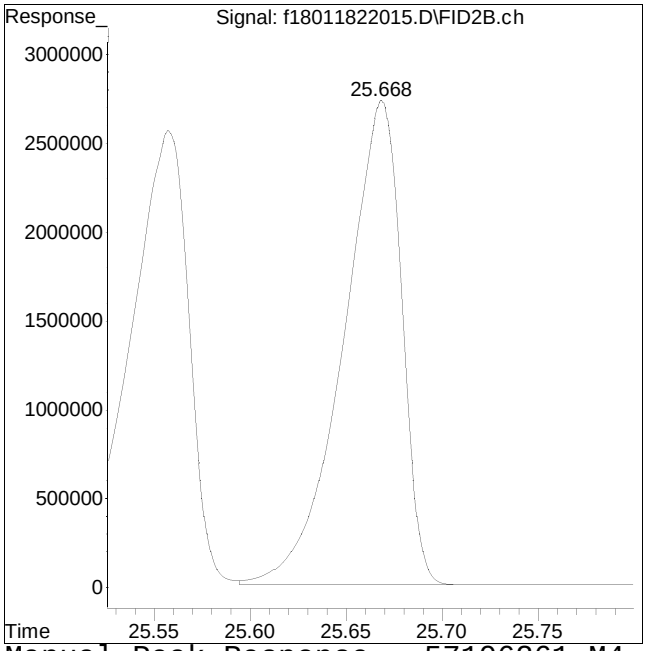
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #15: Pristane





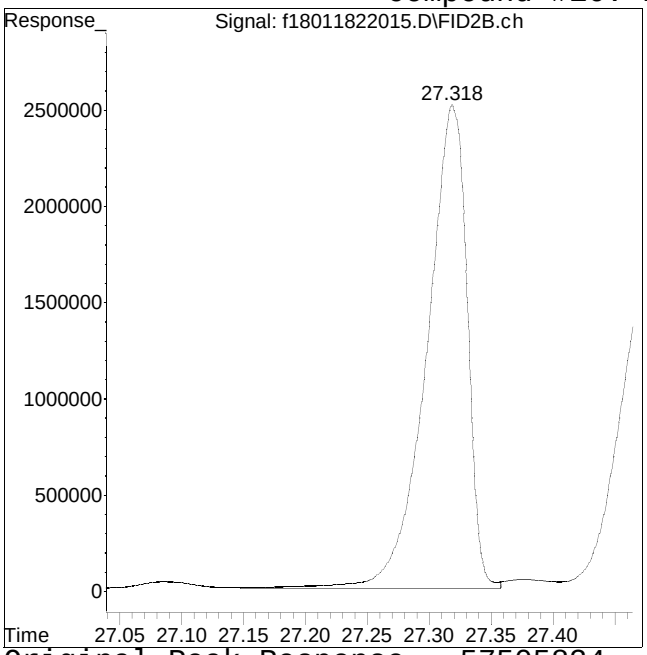
Original Peak Response = 57139837 Manual Peak Response = 57106261 M4
M4 = Poor automated baseline construction.

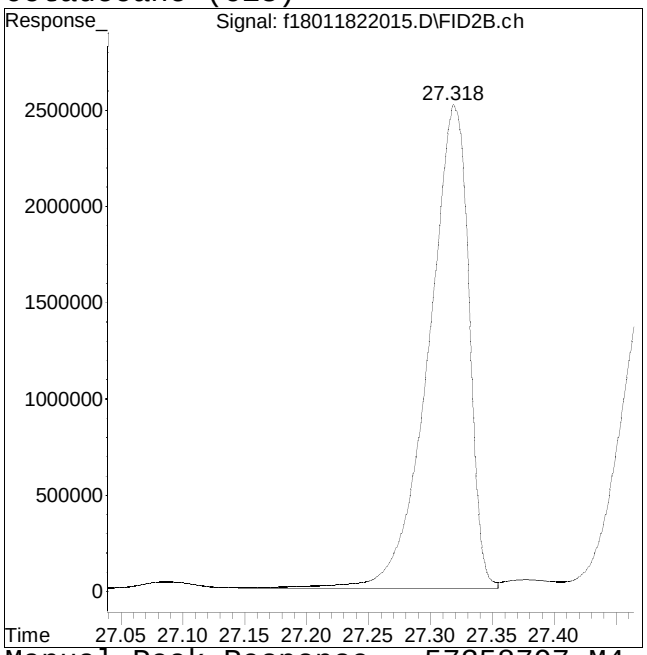
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #16: n-Octadecane (C18)





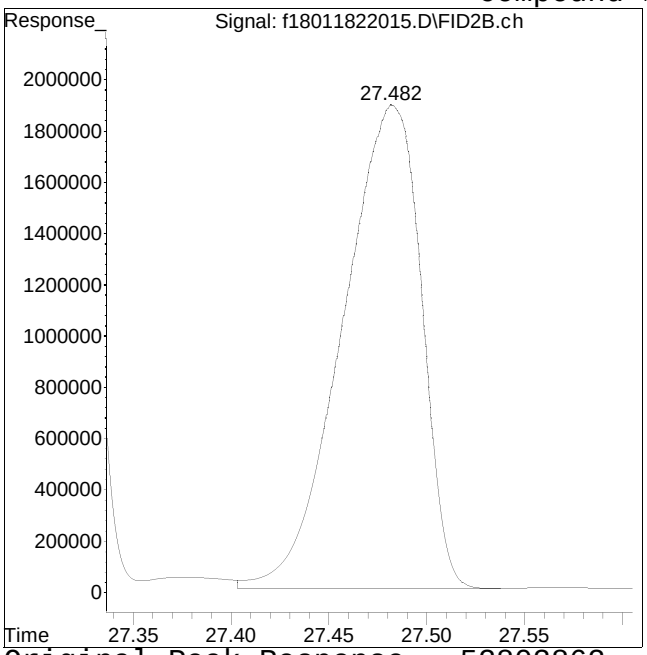
Original Peak Response = 57505834 Manual Peak Response = 57358797 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

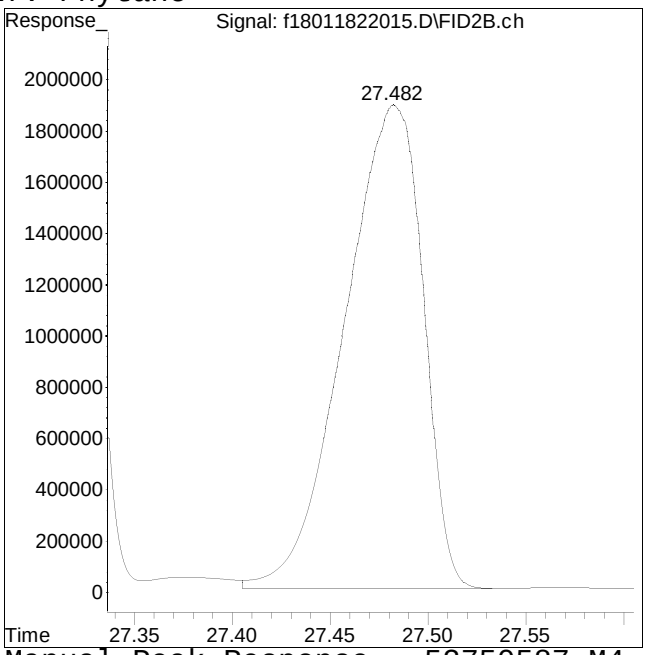
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #17: Phytane



Original Peak Response = 52803862



Manual Peak Response = 52750587 M4

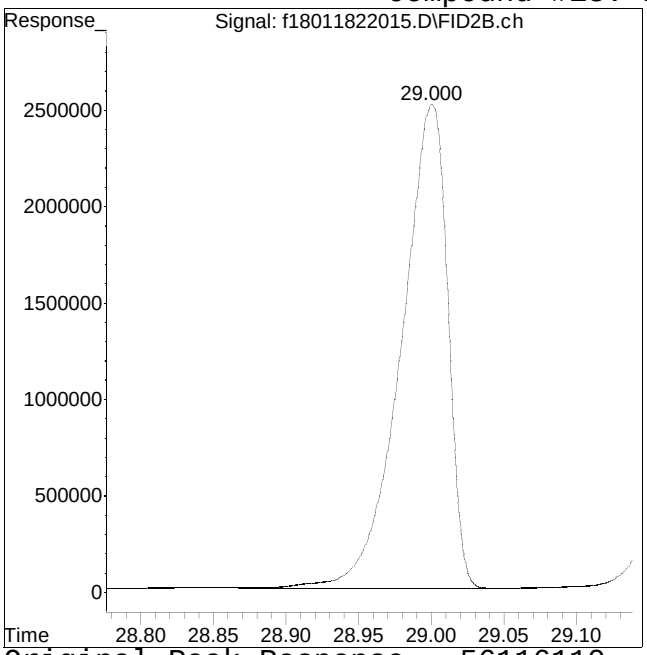
M4 = Poor automated baseline construction.

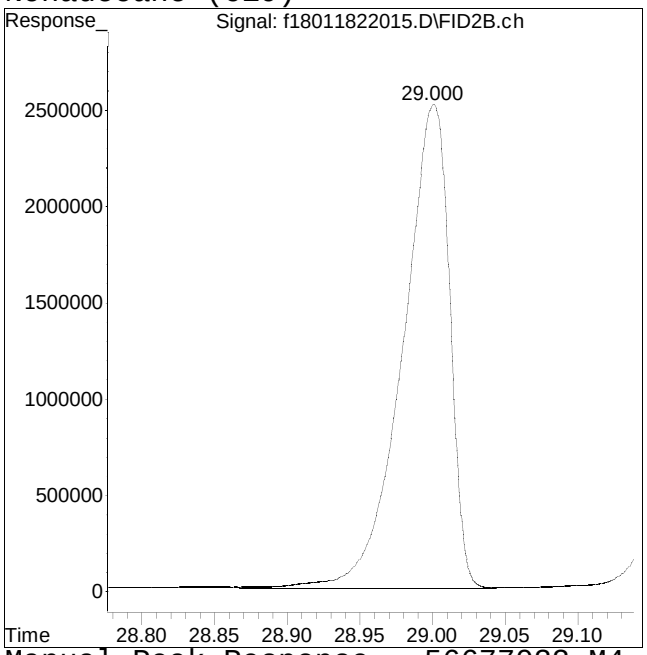
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #18: n-Nonadecane (C19)





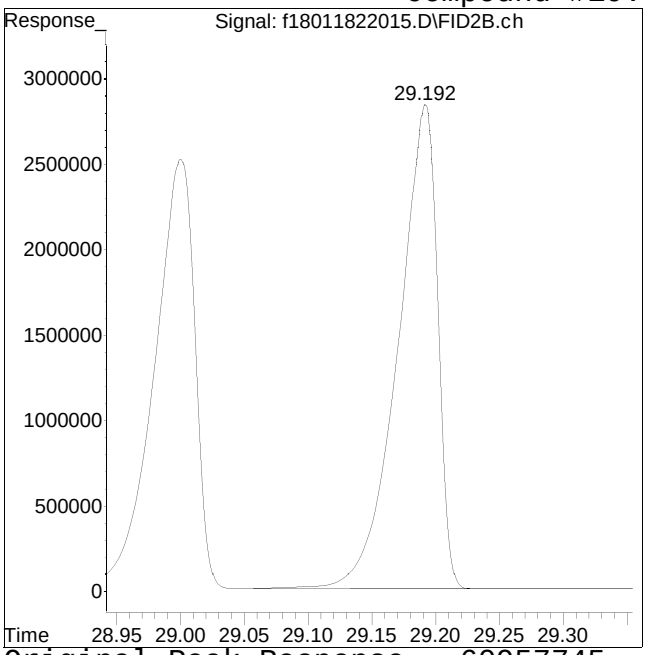
Original Peak Response = 56116110 Manual Peak Response = 56677032 M4
M4 = Poor automated baseline construction.

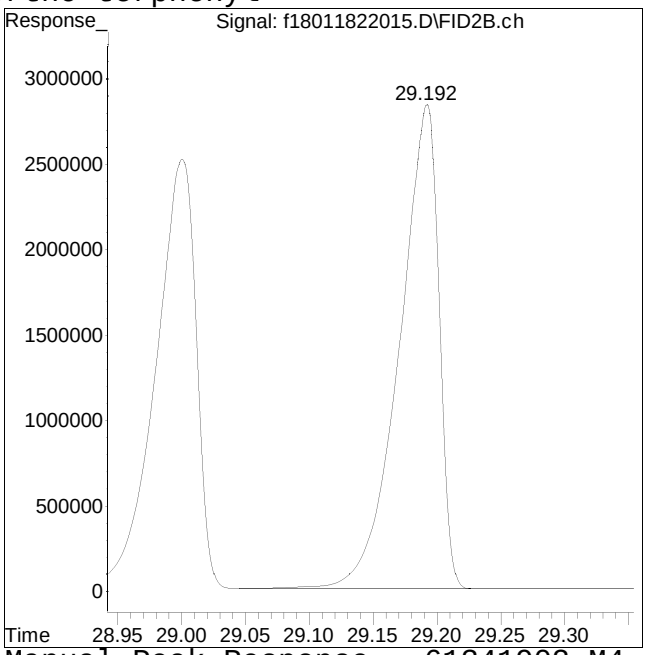
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #19: ortho-terphenyl





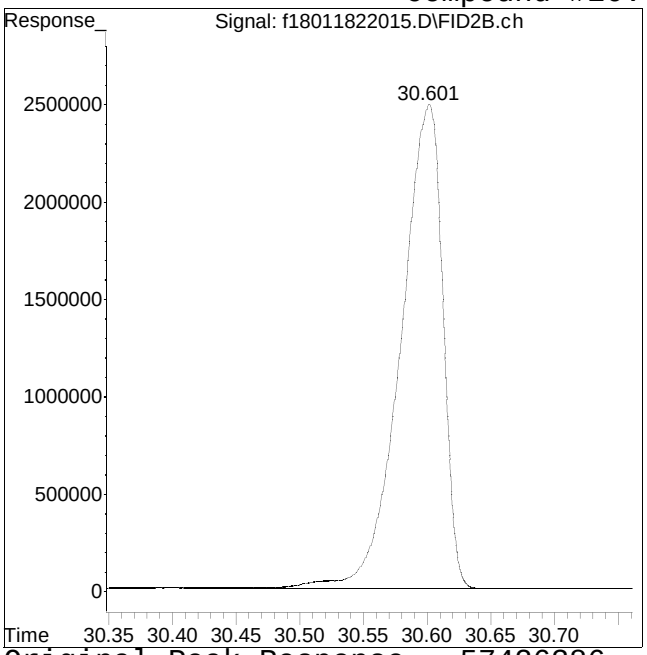
Original Peak Response = 60957745 Manual Peak Response = 61341902 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

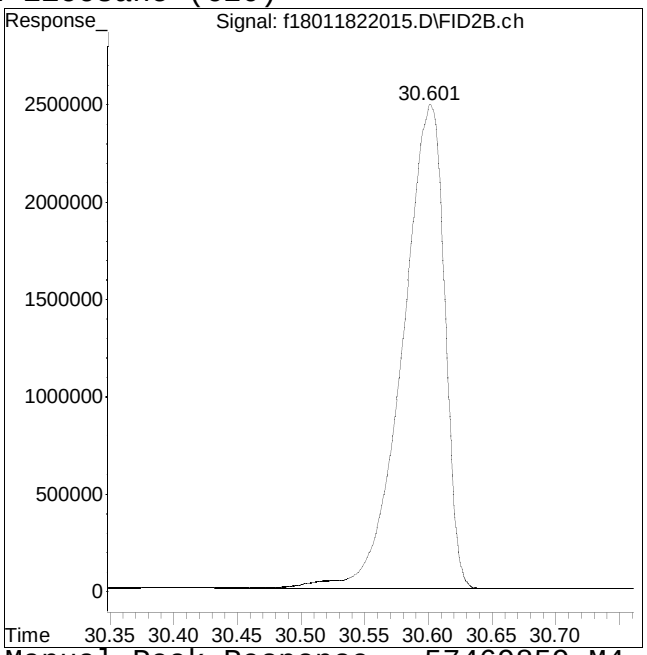
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #20: n-Eicosane (C20)



Original Peak Response = 57426386



Manual Peak Response = 57469859 M4

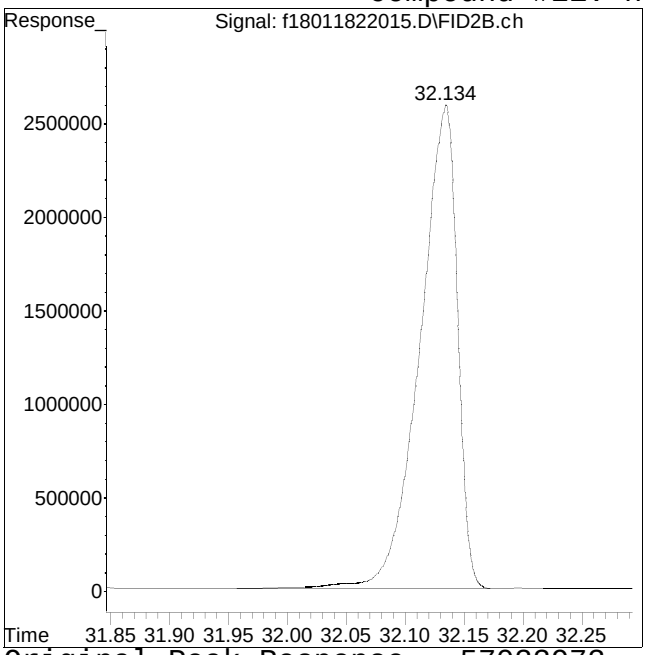
M4 = Poor automated baseline construction.

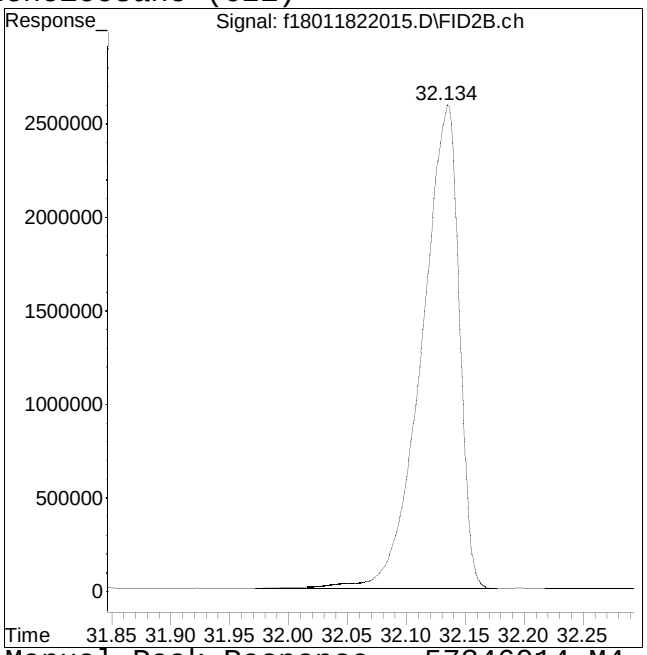
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #21: n-Heneicosane (C21)





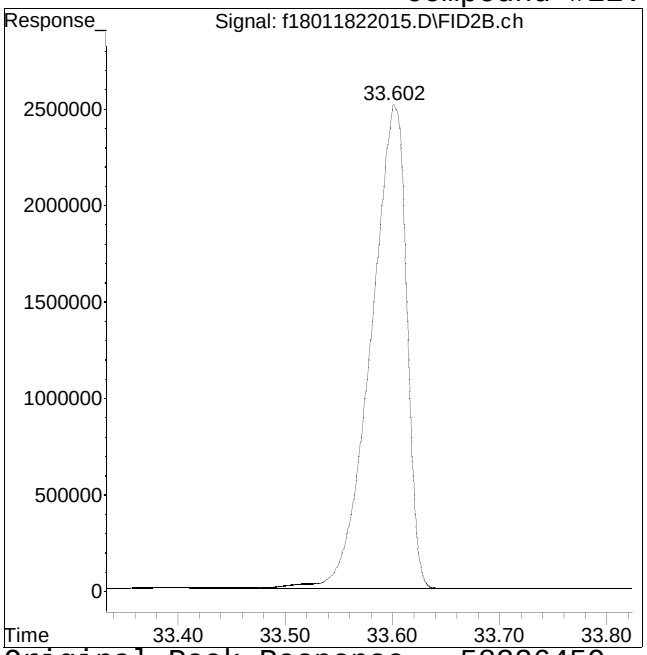
Original Peak Response = 57033973 Manual Peak Response = 57346014 M4
M4 = Poor automated baseline construction.

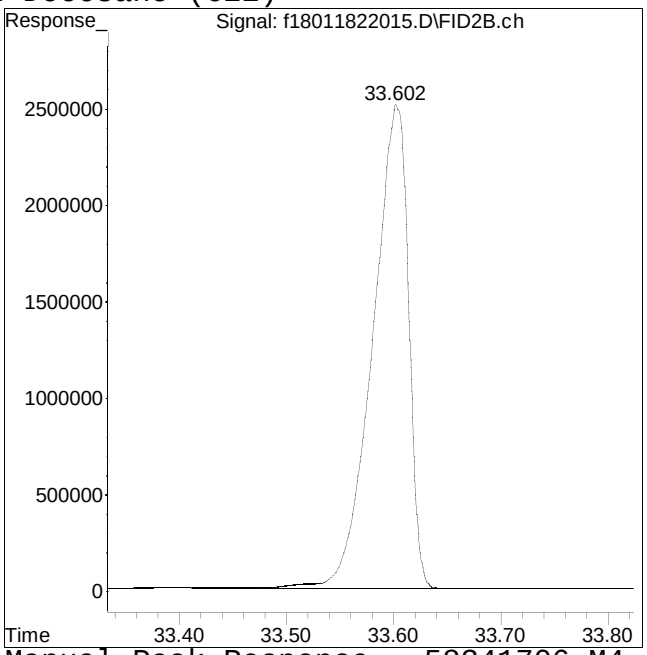
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #22: n-Docosane (C22)





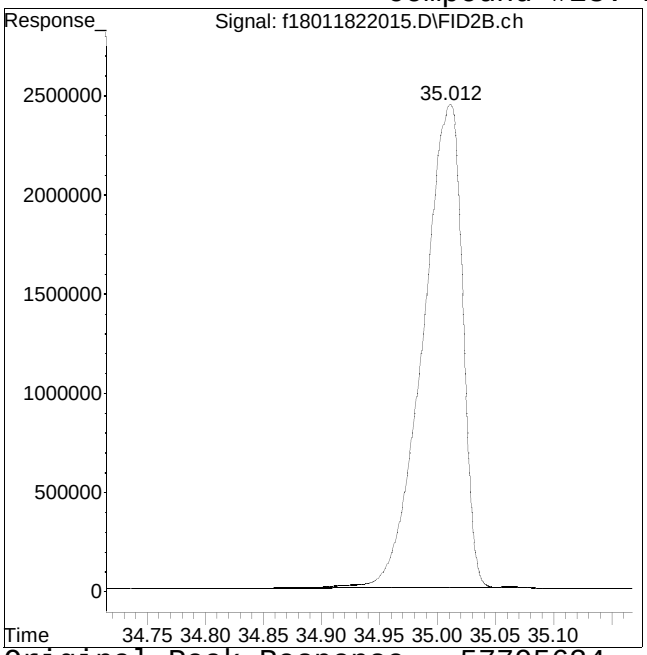
Original Peak Response = 58336459 Manual Peak Response = 58341706 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

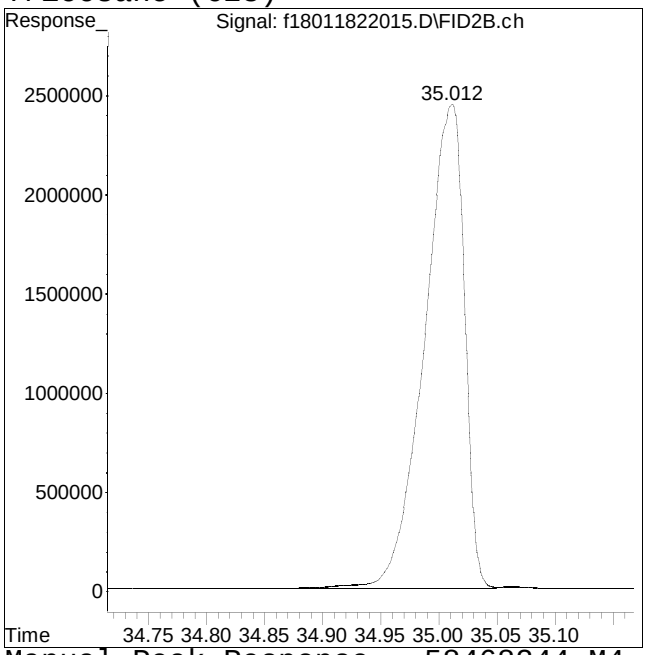
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #23: n-Tricosane (C23)



Original Peak Response = 57795634



Manual Peak Response = 58468244 M4

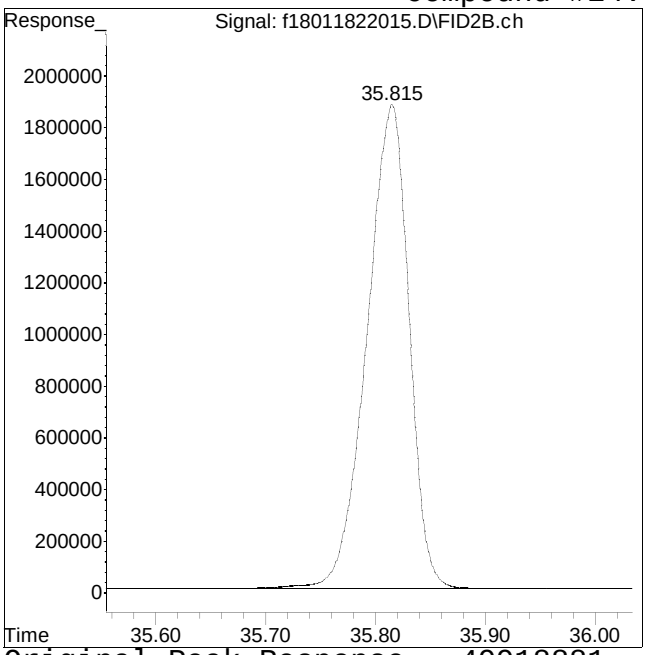
M4 = Poor automated baseline construction.

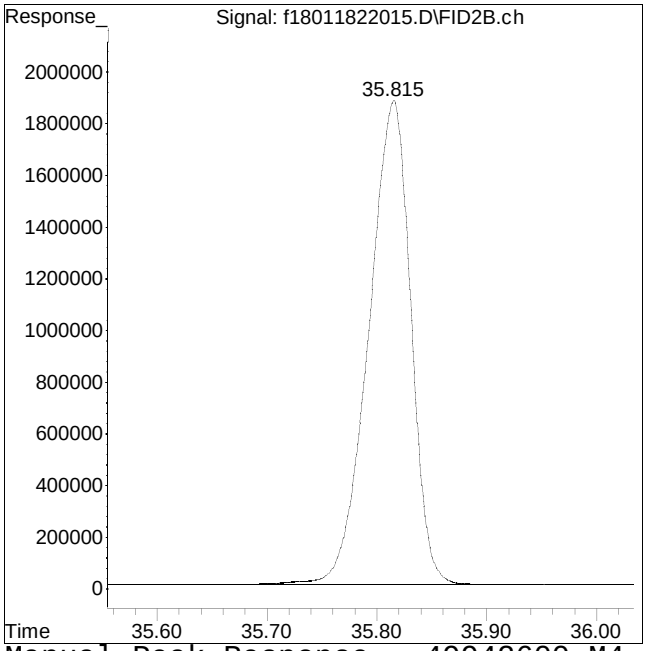
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #24: d50-Tetracosane





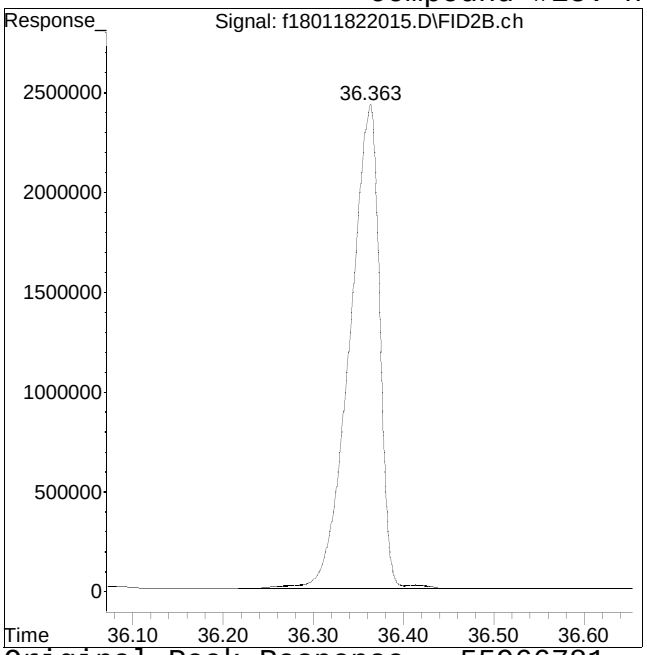
Original Peak Response = 49918881 Manual Peak Response = 49942600 M4
M4 = Poor automated baseline construction.

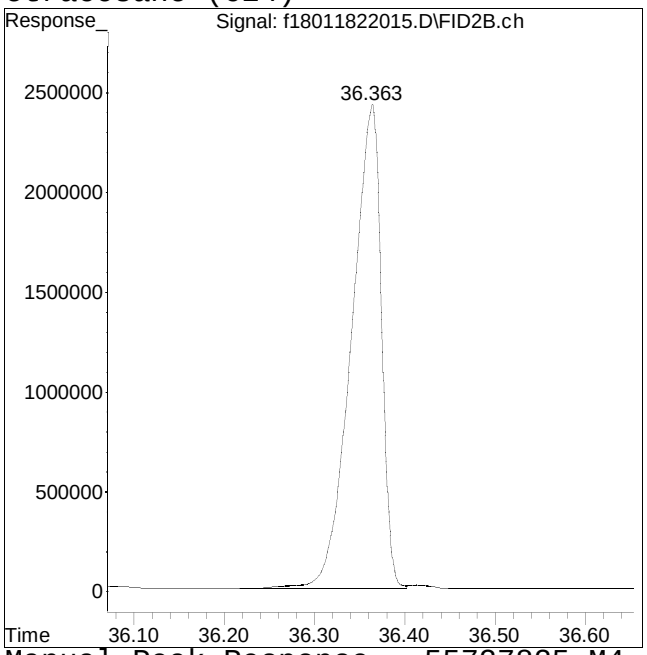
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #25: n-Tetracosane (C24)





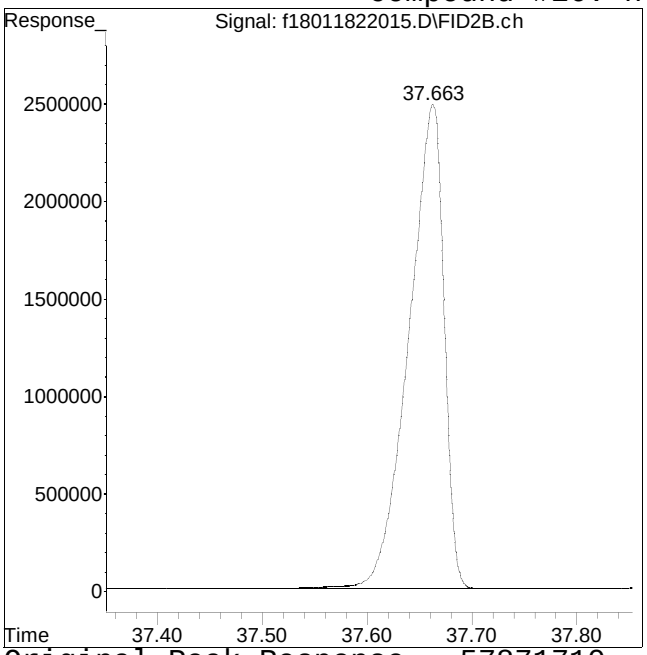
Original Peak Response = 55966781 Manual Peak Response = 55727825 M4
M4 = Poor automated baseline construction.

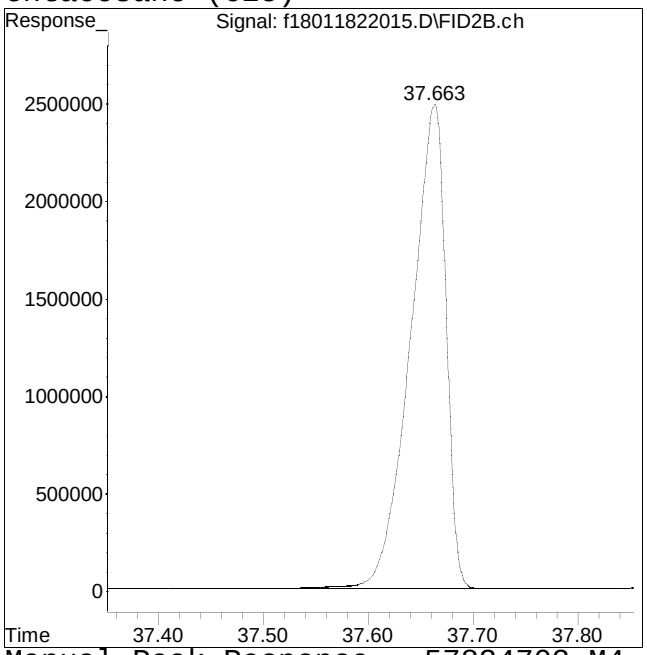
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #26: n-Pentacosane (C25)





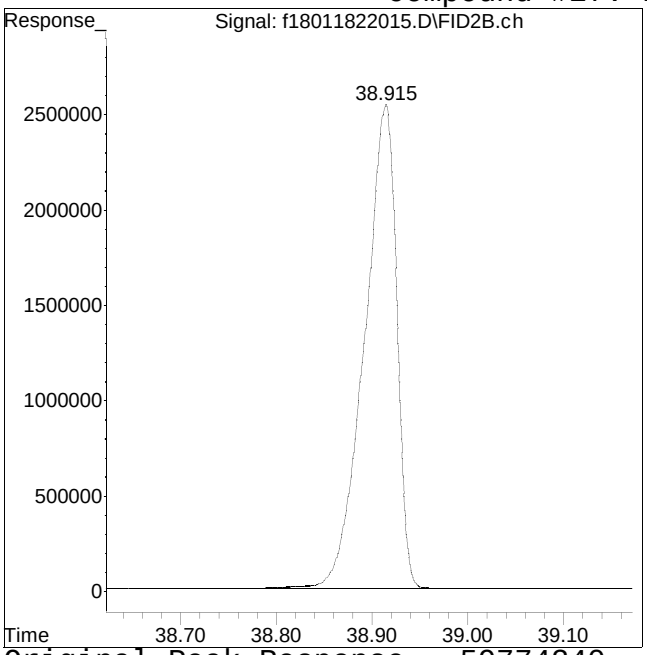
Original Peak Response = 57871710 Manual Peak Response = 57834702 M4
M4 = Poor automated baseline construction.

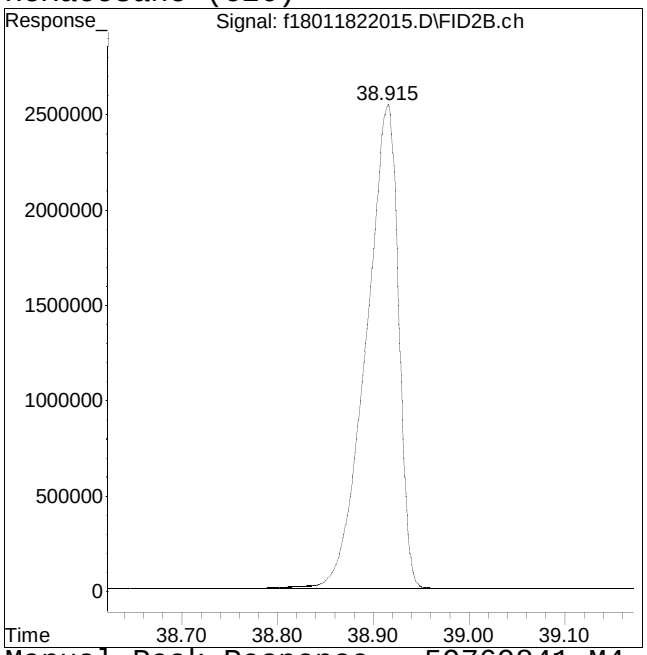
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #27: n-Hexacosane (C26)





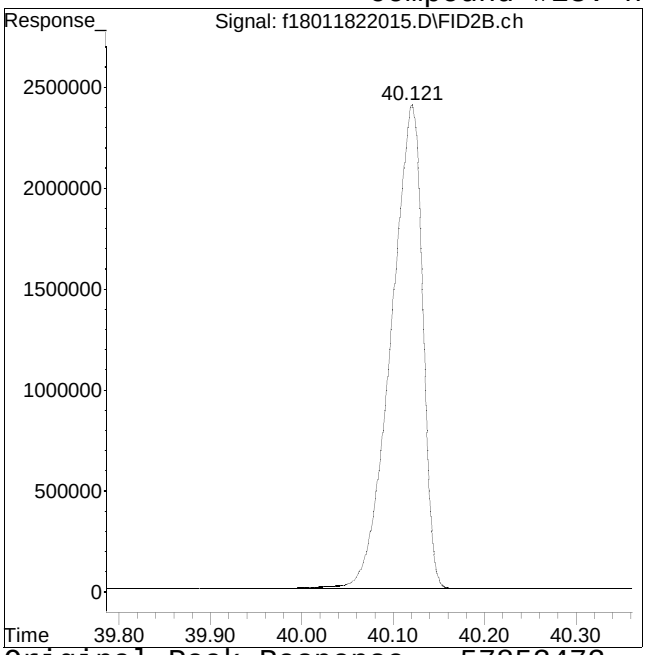
Original Peak Response = 59774240 Manual Peak Response = 59769841 M4
M4 = Poor automated baseline construction.

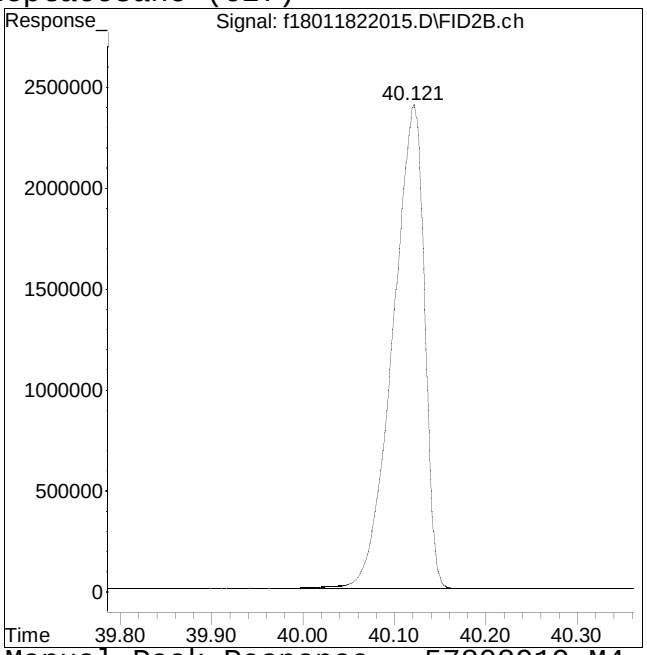
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #28: n-Heptacosane (C27)





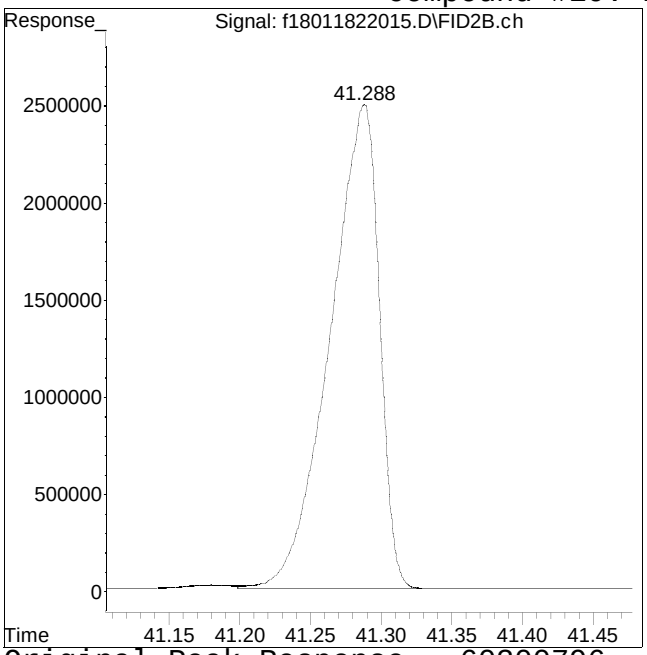
Original Peak Response = 57853473 Manual Peak Response = 57808919 M4
M4 = Poor automated baseline construction.

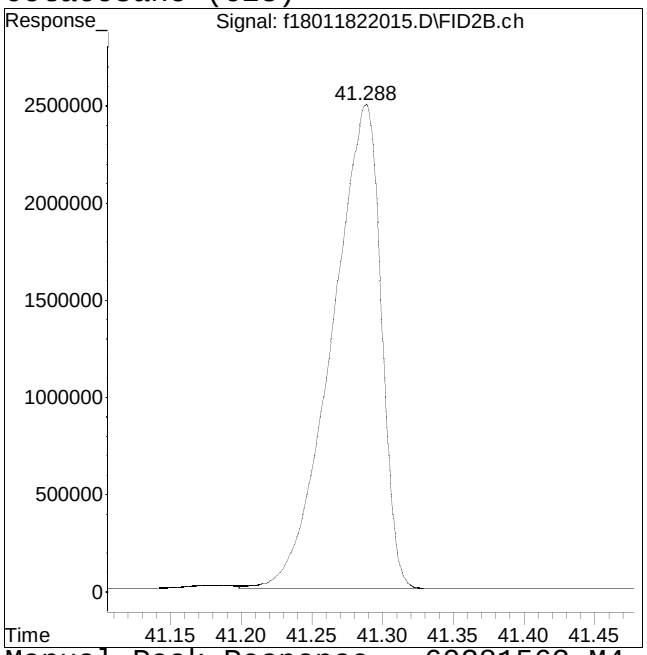
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #29: n-Octacosane (C28)





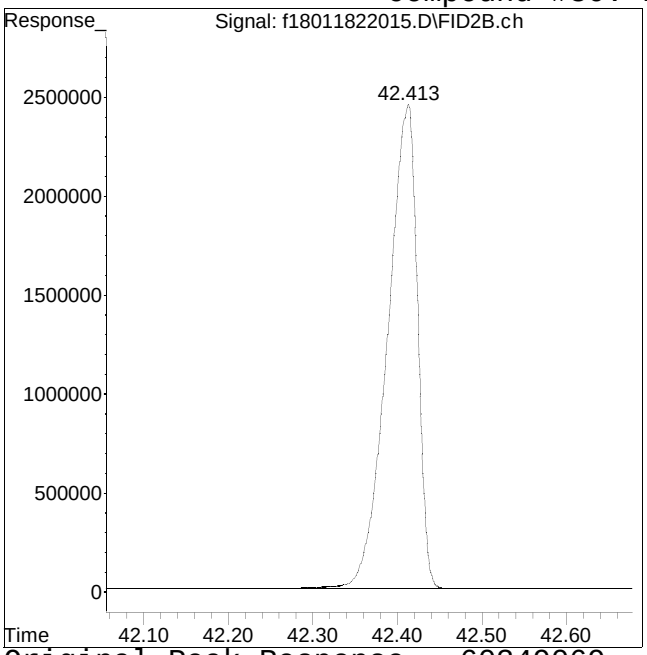
Original Peak Response = 60300796 Manual Peak Response = 60281562 M4
M4 = Poor automated baseline construction.

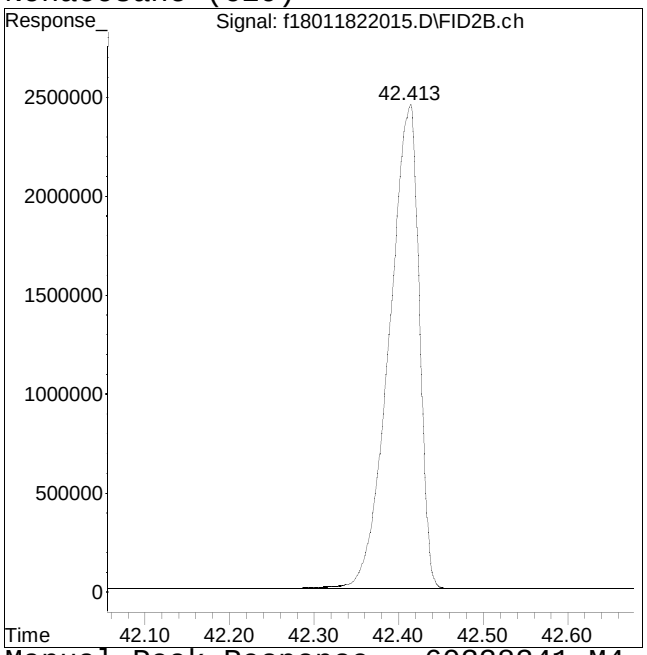
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #30: n-Nonacosane (C29)





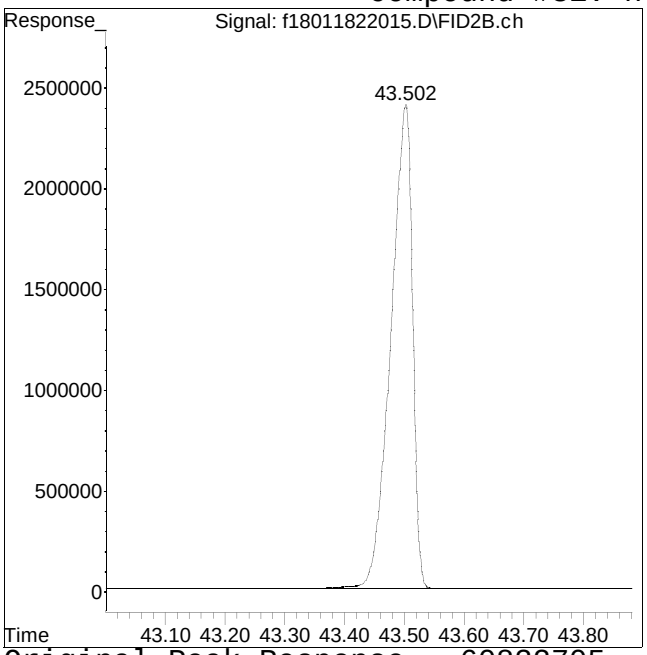
Original Peak Response = 60349069 Manual Peak Response = 60338341 M4
M4 = Poor automated baseline construction.

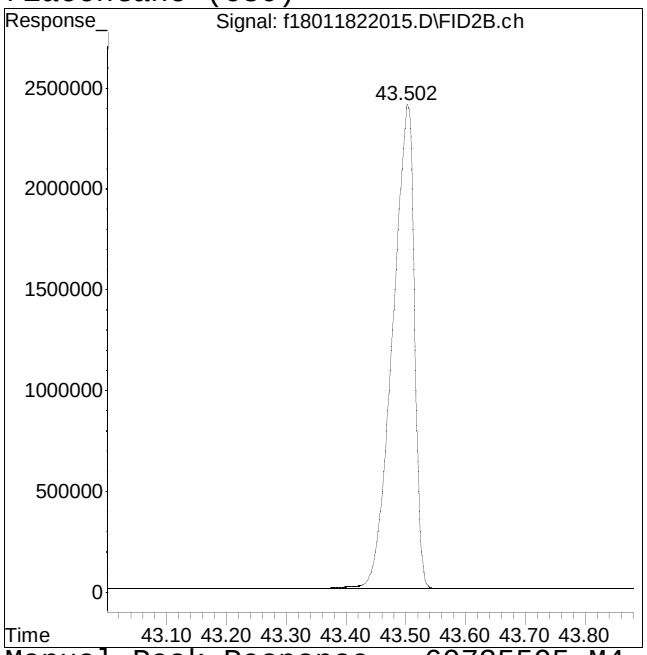
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #31: n-Triacontane (C30)





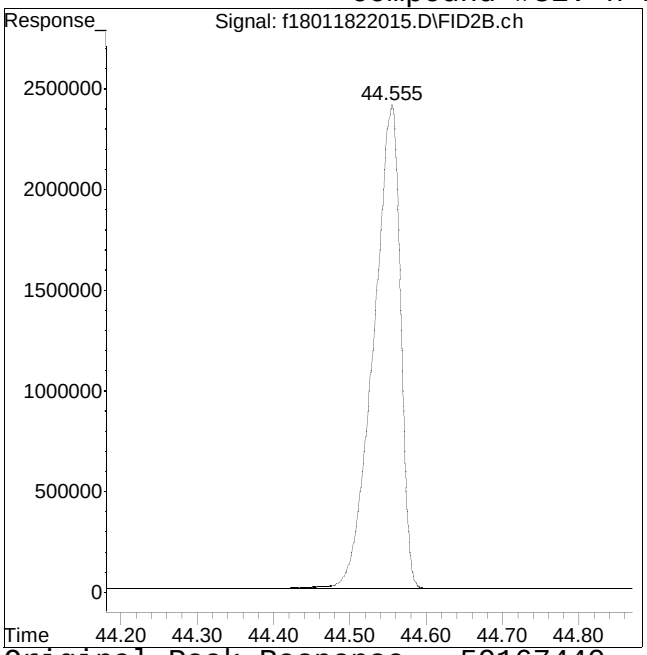
Original Peak Response = 60832705 Manual Peak Response = 60735595 M4
M4 = Poor automated baseline construction.

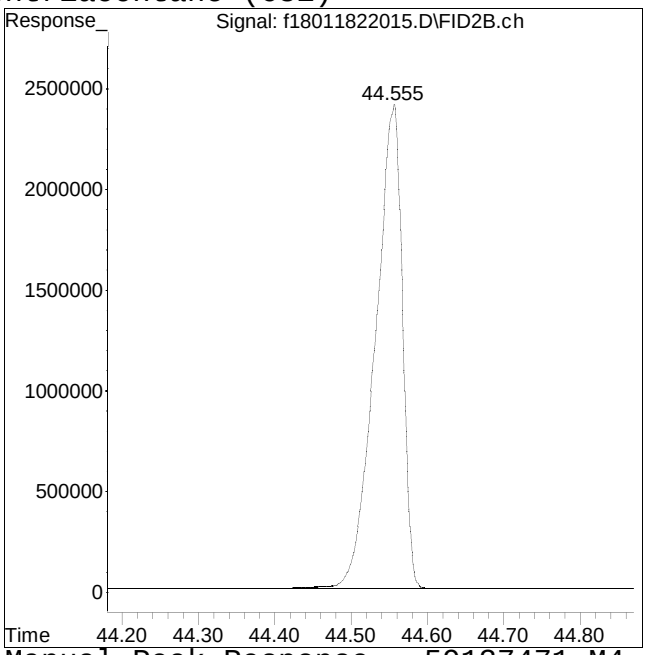
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #32: n-Hentriacontane (C31)





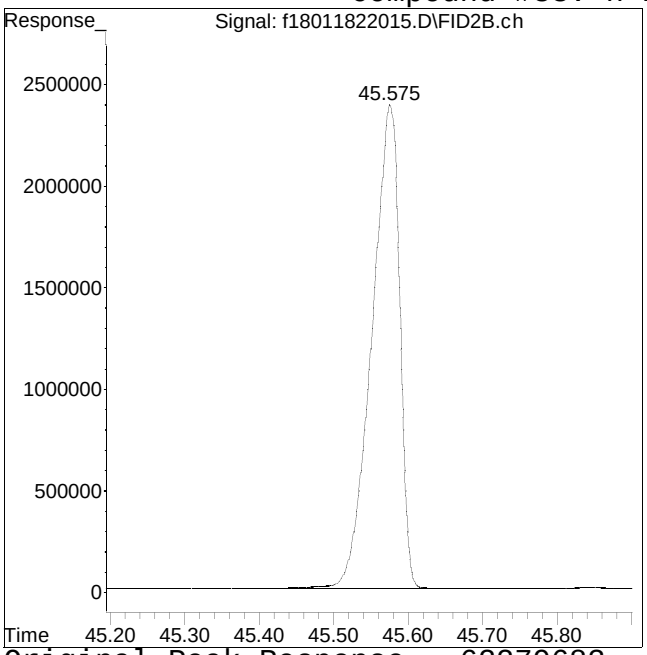
Original Peak Response = 59167440 Manual Peak Response = 59137471 M4
M4 = Poor automated baseline construction.

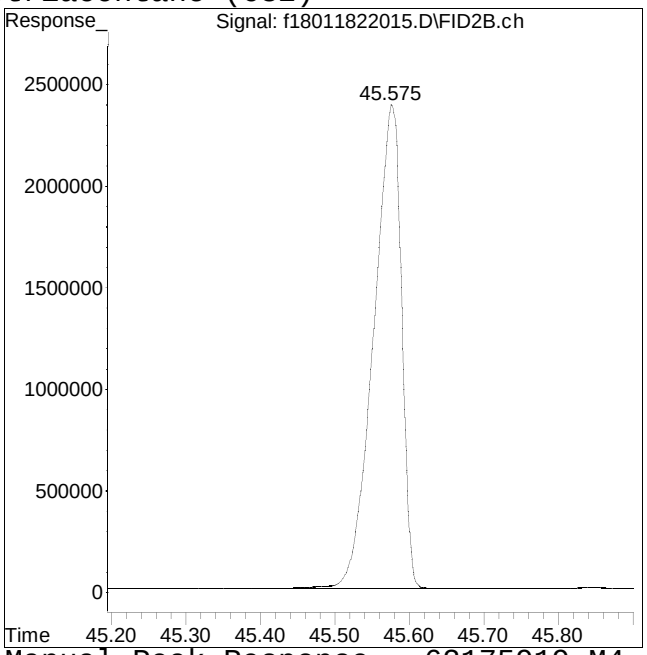
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #33: n-Dotriacontane (C32)





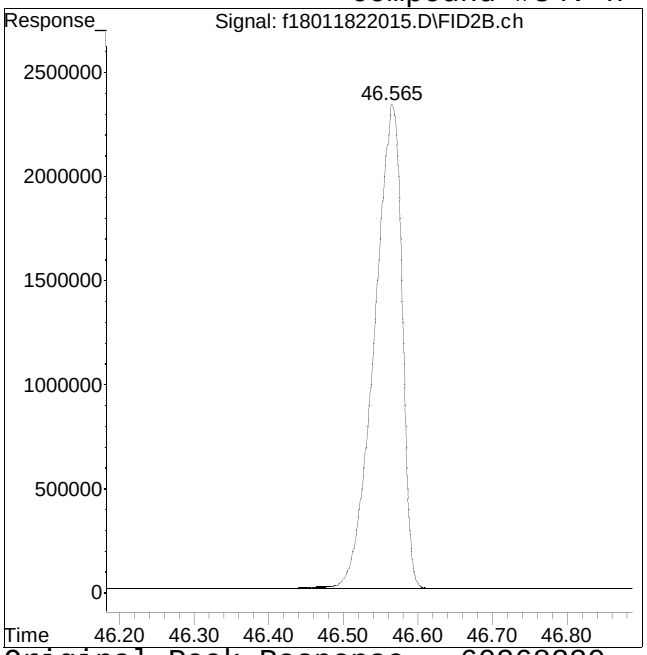
Original Peak Response = 62279683 Manual Peak Response = 62175919 M4
M4 = Poor automated baseline construction.

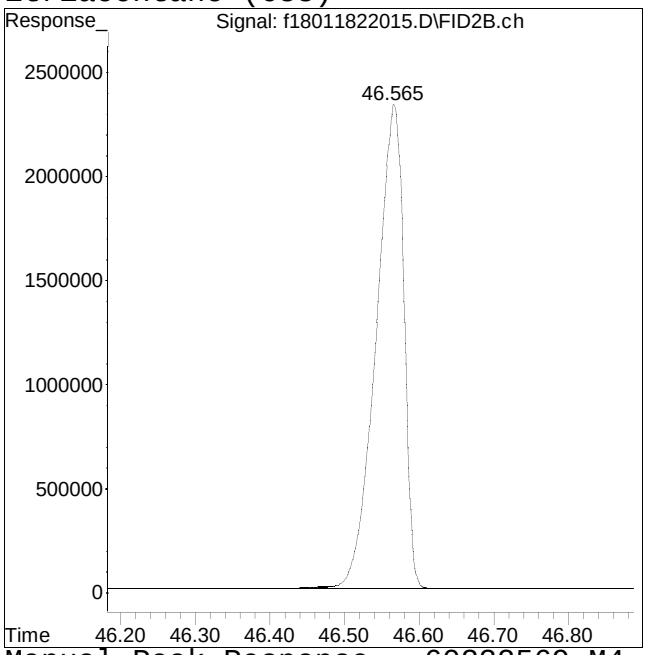
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #34: n-Tritriacontane (C33)





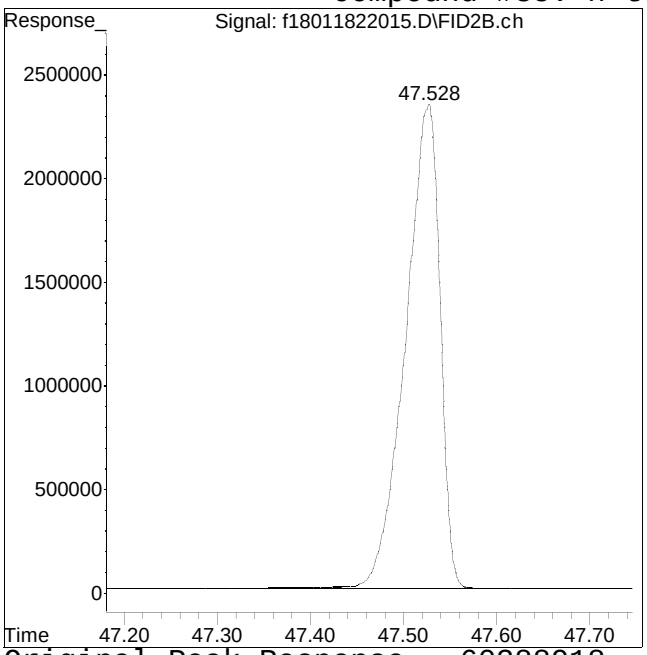
Original Peak Response = 60268230 Manual Peak Response = 60232569 M4
M4 = Poor automated baseline construction.

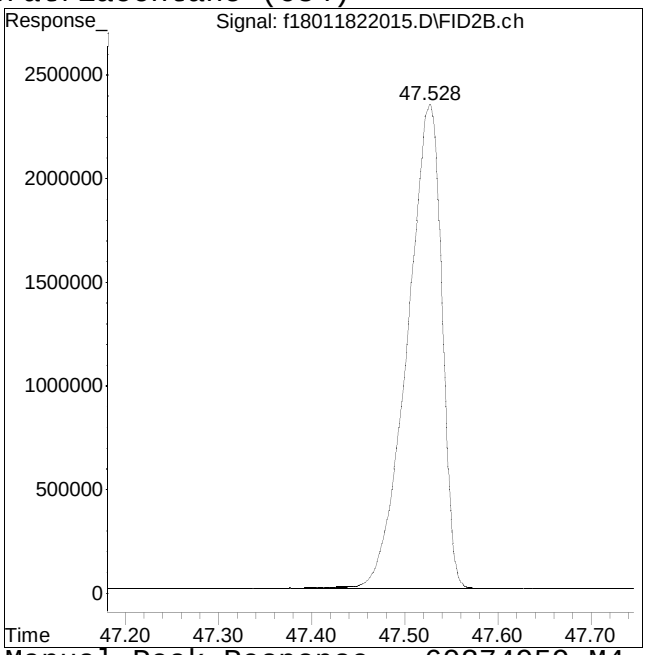
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #35: n-tetratriacontane (C34)





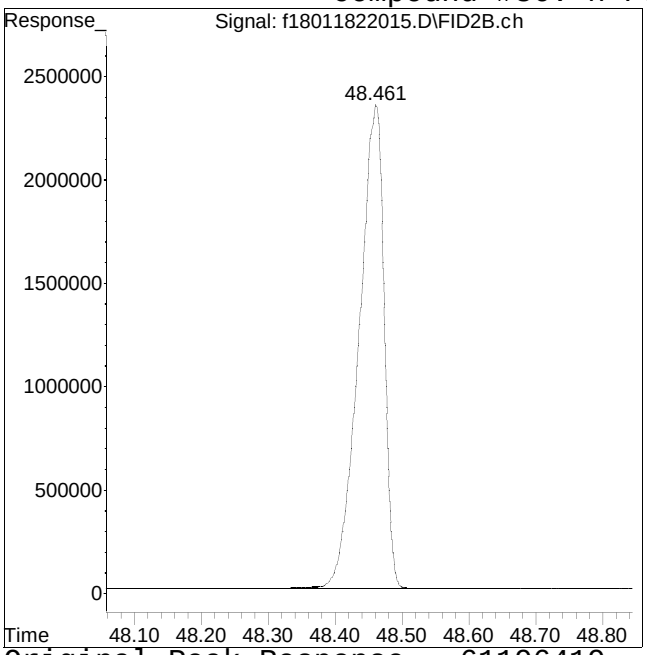
Original Peak Response = 60388918 Manual Peak Response = 60274959 M4
M4 = Poor automated baseline construction.

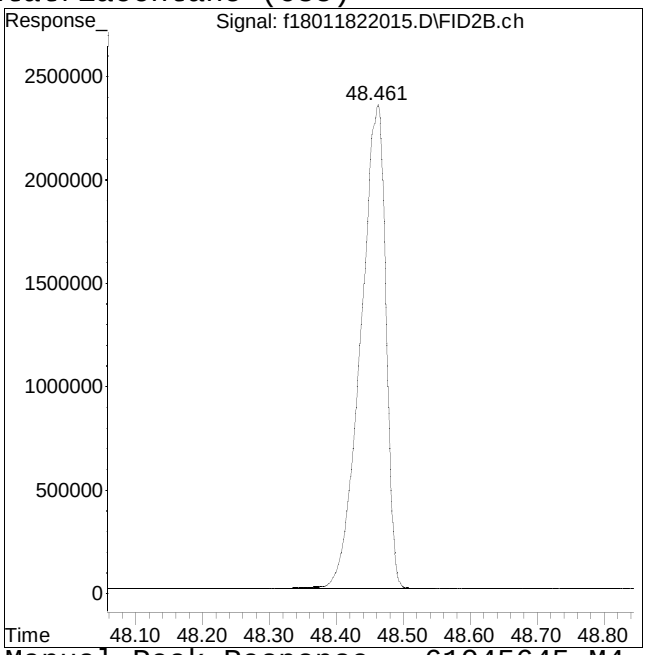
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #36: n-Pentatriacontane (C35)





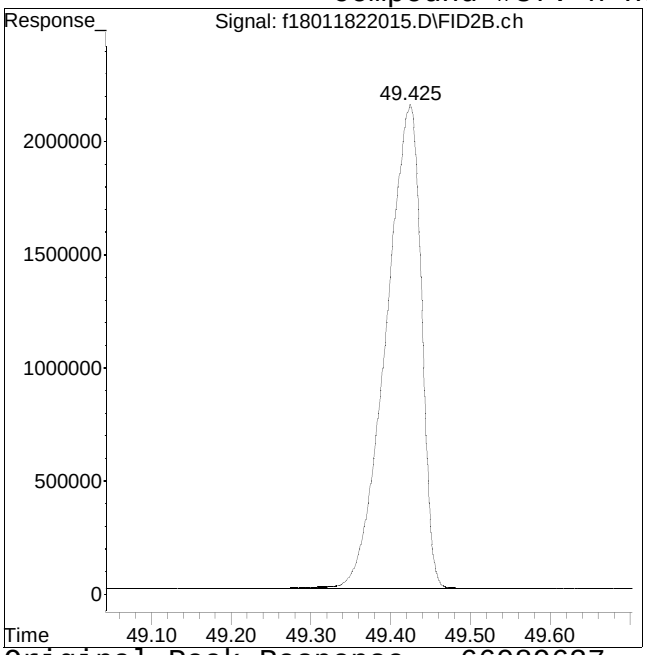
Original Peak Response = 61196419 Manual Peak Response = 61045645 M4
M4 = Poor automated baseline construction.

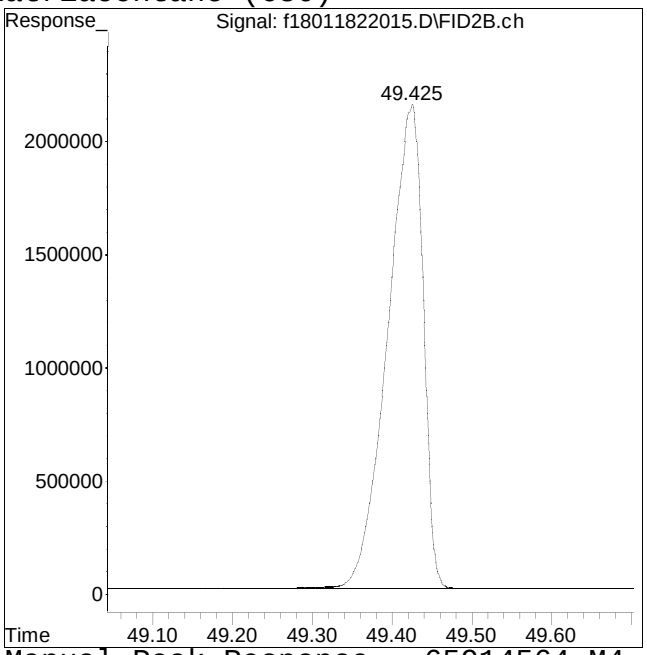
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #37: n-Hexatriacontane (C36)





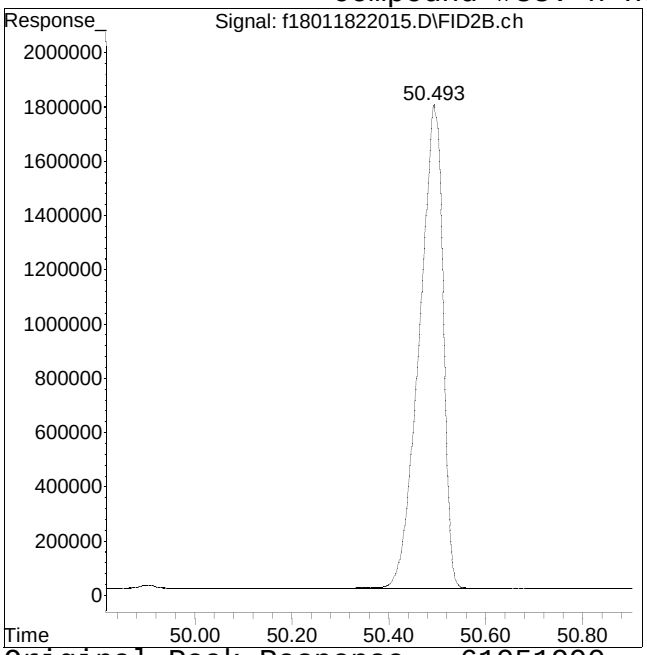
Original Peak Response = 66089637 Manual Peak Response = 65914564 M4
M4 = Poor automated baseline construction.

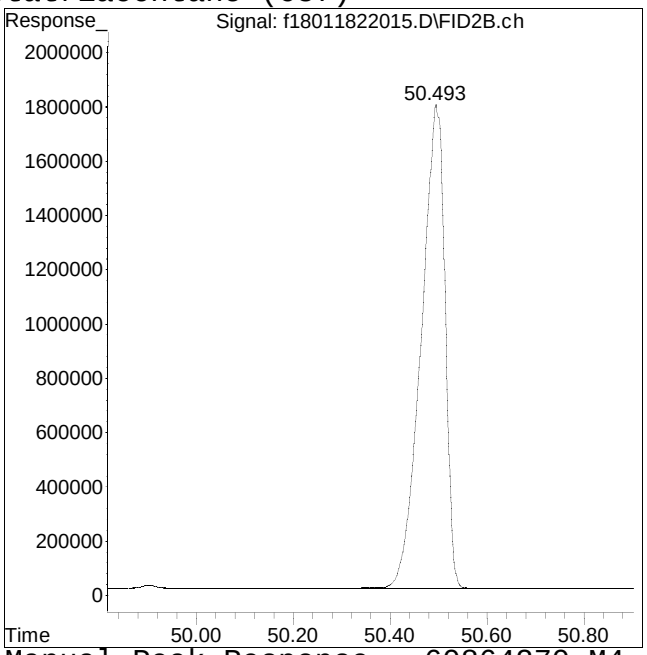
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #38: n-Heptatriacontane (C37)





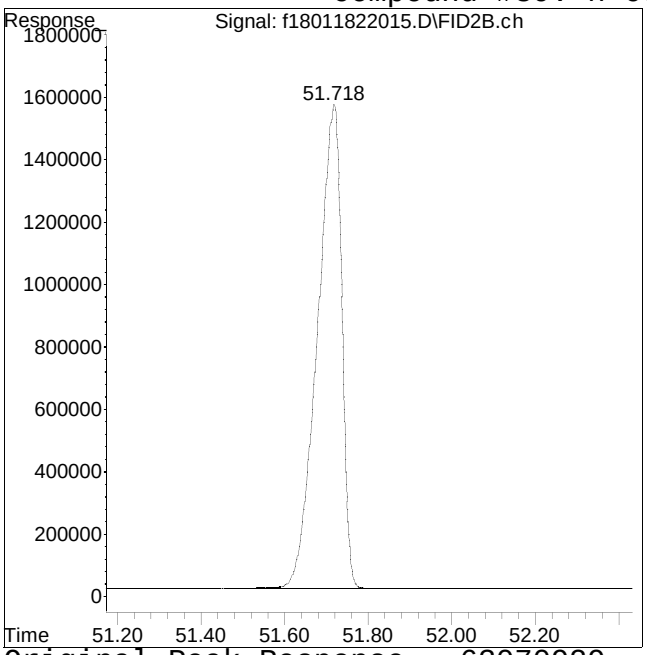
Original Peak Response = 61051990 Manual Peak Response = 60864270 M4
M4 = Poor automated baseline construction.

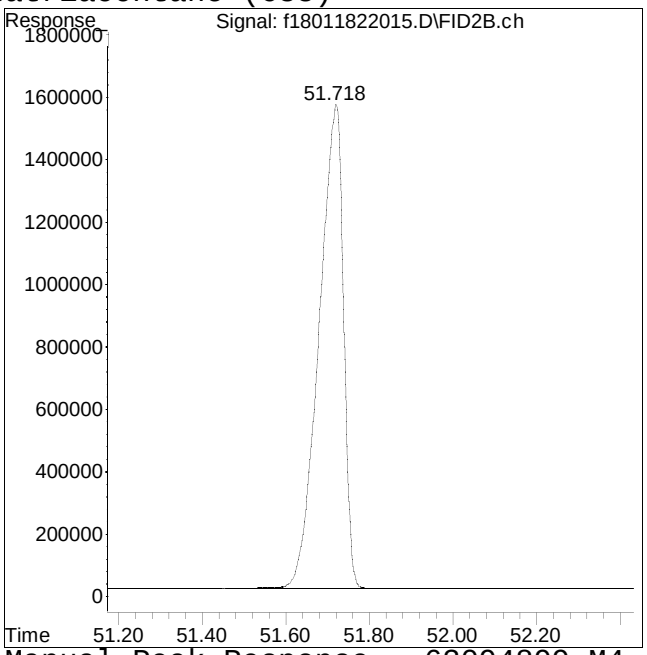
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #39: n-Octatriacontane (C38)





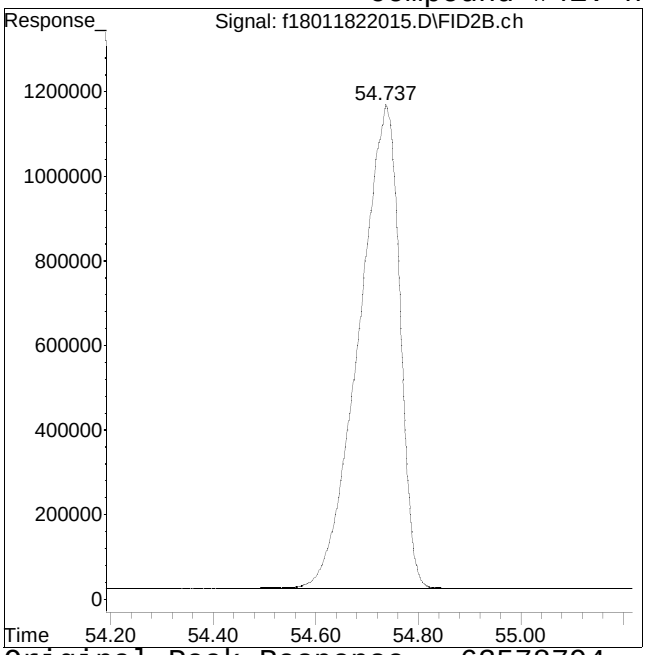
Original Peak Response = 63070929 Manual Peak Response = 63094899 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

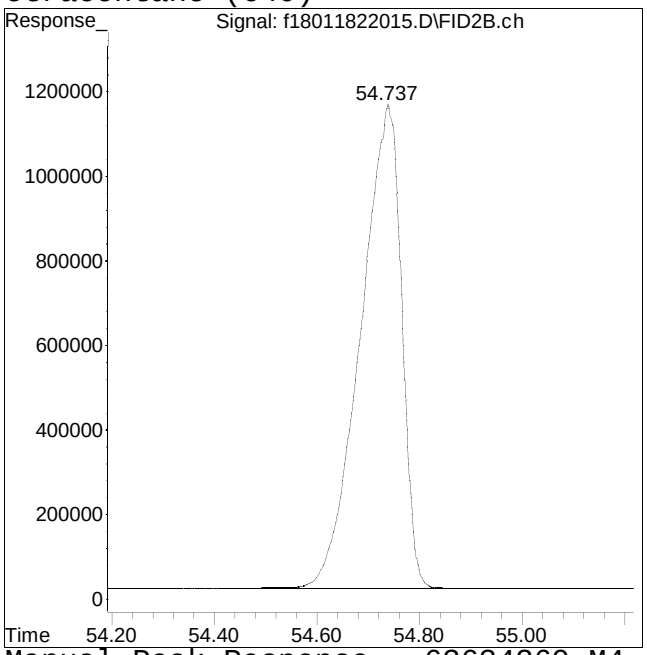
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822015.D
Date Inj'd : 1/18/2022 10:40 pm
Sample : I1801182203R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:02 pm

Compound #41: n-Tetracontane (C40)



Original Peak Response = 63578794



Manual Peak Response = 63634369 M4

M4 = Poor automated baseline construction.

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822017.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 12:06 am
Operator : FID18:WR
Sample : I1801182204R
Misc : WG1596727,FRBE51,100ug/ml
ALS Vial : 59 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 17:51:41 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:45:09 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	31.200	54980855	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	29.210	111924363	96.531 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 193.06%#	
24) s d50-Tetracosane	35.829	90941546	96.728 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 193.46%#	
Target Compounds			
2) t n-Octane (C8)	5.606	87042376	96.219 ug/mL M4
3) t n-Nonane (C9)	7.808	90584779	96.770 ug/mL M4
4) t n-Decane (C10)	10.285	95258299	98.370 ug/mL M4
5) t n-Undecane (C11)	12.792	95791388	98.329 ug/mL M4
6) t n-Dodecane (C12)	15.216	97140803	98.497 ug/mL M4
7) t n-Tridecane (C13)	17.520	97423175	97.887 ug/mL M4
9) t n-Tetradecane (C14)	19.702	100032169	97.523 ug/mL M4
11) t n-Pentadecane (C15)	21.763	100754080	97.389 ug/mL M4
12) t n-Hexadecane (C16)	23.715	100135991	96.227 ug/mL M4
14) t n-Heptadecane (C17)	25.573	101664003	95.950 ug/mL M4
15) t Pristane	25.684	103657945	96.455 ug/mL M4
16) t n-Octadecane (C18)	27.335	102890371	96.128 ug/mL M4
17) t Phytane	27.501	95474669	96.410 ug/mL M4
18) t n-Nonadecane (C19)	29.019	103753695	96.726 ug/mL M4
20) t n-Eicosane (C20)	30.618	104571095	96.438 ug/mL M4
21) t n-Heneicosane (C21)	32.151	105213664	96.294 ug/mL M4
22) t n-Docosane (C22)	33.617	105218374	95.586 ug/mL M4
23) t n-Tricosane (C23)	35.026	105474745	96.304 ug/mL M4
25) t n-Tetracosane (C24)	36.380	105244490	97.561 ug/mL M4
26) t n-Pentacosane (C25)	37.679	103184050	95.621 ug/mL M4
27) t n-Hexacosane (C26)	38.932	106026794	95.564 ug/mL M4
28) t n-Heptacosane (C27)	40.139	106111319	96.101 ug/mL M4
29) t n-Octacosane (C28)	41.305	108434600	96.022 ug/mL M4
30) t n-Nonacosane (C29)	42.432	108227126	96.111 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822017.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 12:06 am
Operator : FID18:WR
Sample : I1801182204R
Misc : WG1596727,FRBE51,100ug/ml
ALS Vial : 59 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 17:51:41 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:45:09 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

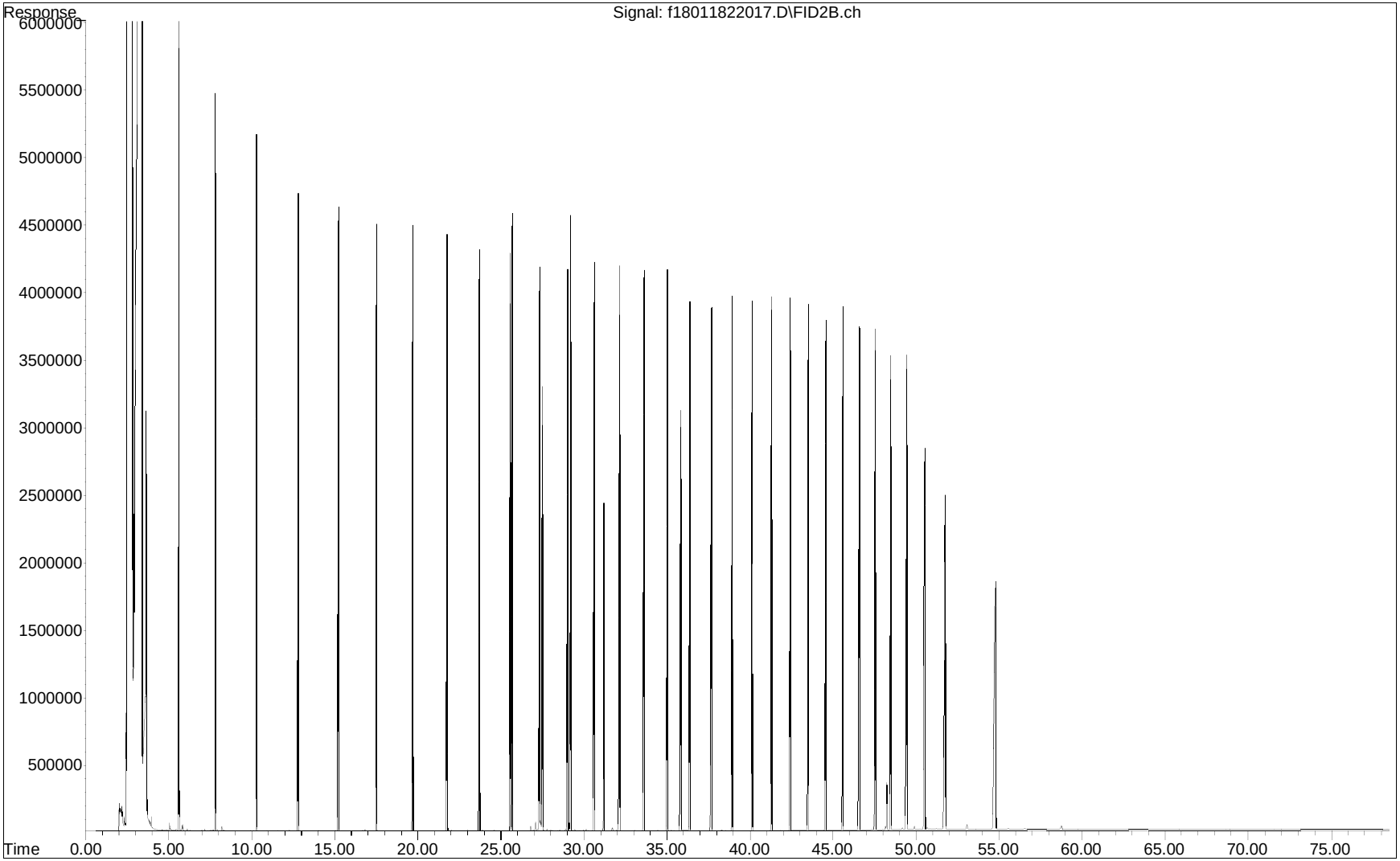
	Compound	R.T.	Response	Conc Units
31) t	n-Triacontane (C30)	43.520	108872477	96.270 ug/mL M4
32) t	n-Hentriacontane (C31)	44.574	105352087	95.703 ug/mL M4
33) t	n-Dotriacontane (C32)	45.598	110971728	96.570 ug/mL M4
34) t	n-Tritriacontane (C33)	46.584	108183789	97.042 ug/mL M4
35) t	n-tetratriacontane (C34)	47.545	108075013	97.346 ug/mL M4
36) t	n-Pentatriacontane (C35)	48.479	101186552	94.379 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.447	122465288	98.477 ug/mL M4
38) t	n-Heptatriacontane (C37)	50.522	111645029	98.117 ug/mL M4
39) t	n-Octatriacontane (C38)	51.750	113204374	97.597 ug/mL M4
41) t	n-Tetracontane (C40)	54.777	111953371	96.795 ug/mL M4

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\f18011822017.D
Operator : FID18:WR
Acquired : 19 Jan 2022 12:06 am using AcqMethod FID18.M
Sample Name: I1801182204R
Instrument: FID 18
Misc Info : WG1596727,FRBE51,100ug/ml
Vial Number: 59
CurrentMeth: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M

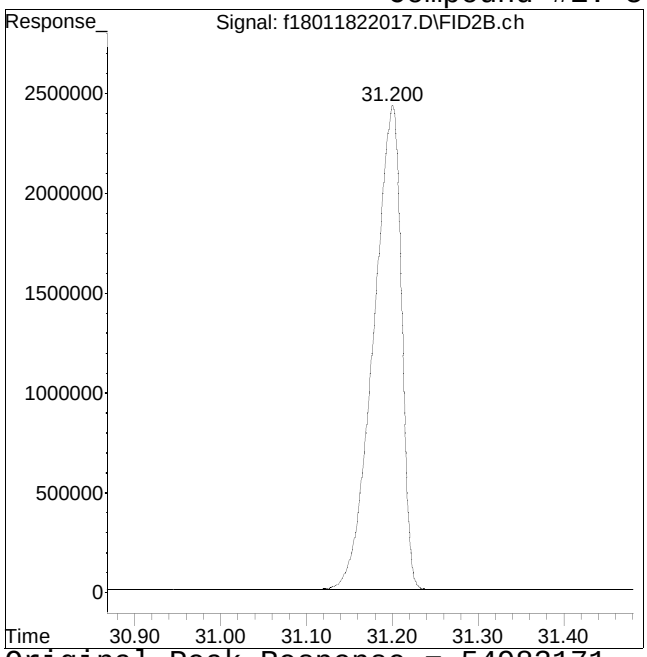


Manual Integration/Negative Proof Report

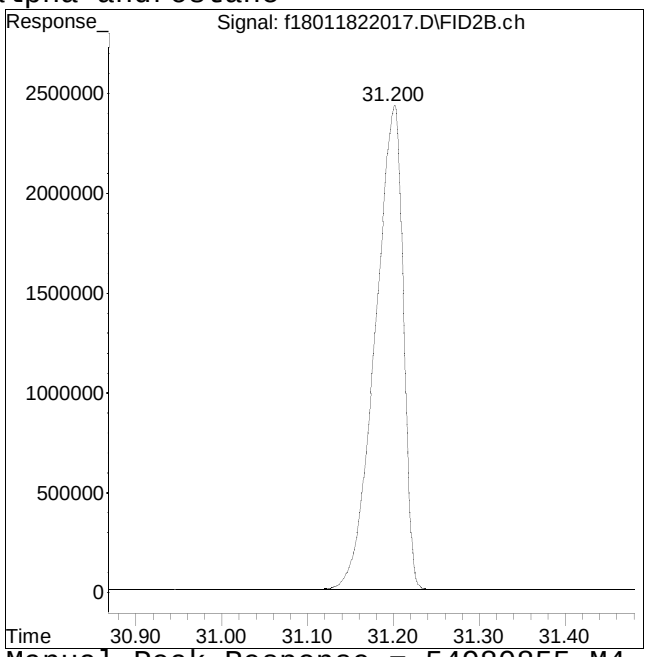
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #1: 5-alpha-androstane



Original Peak Response = 54983171



Manual Peak Response = 54980855 M4

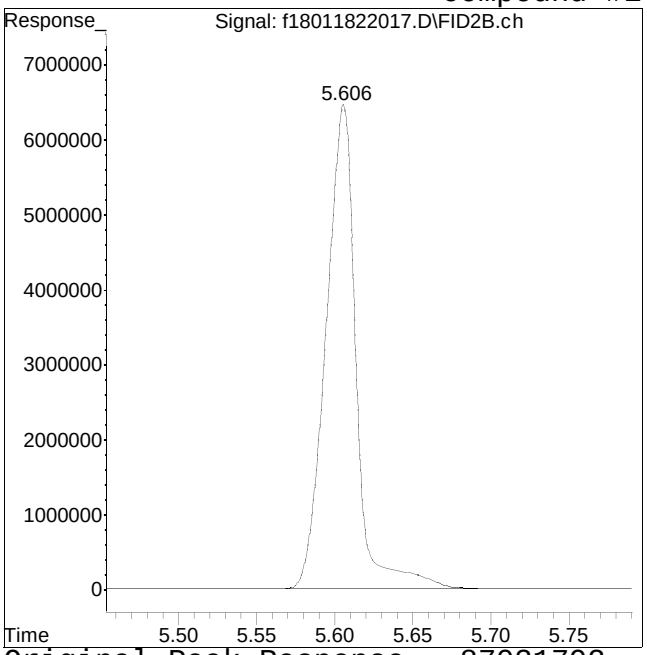
M4 = Poor automated baseline construction.

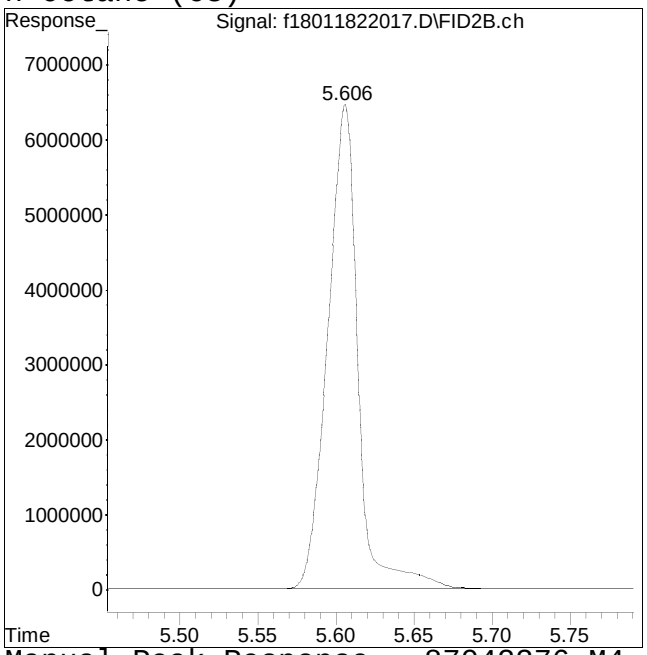
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #2: n-Octane (C8)





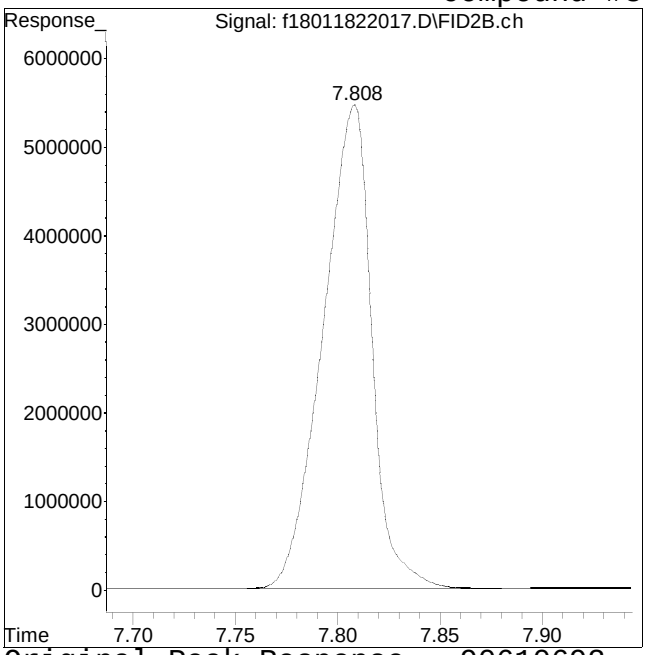
Original Peak Response = 87031792 Manual Peak Response = 87042376 M4
M4 = Poor automated baseline construction.

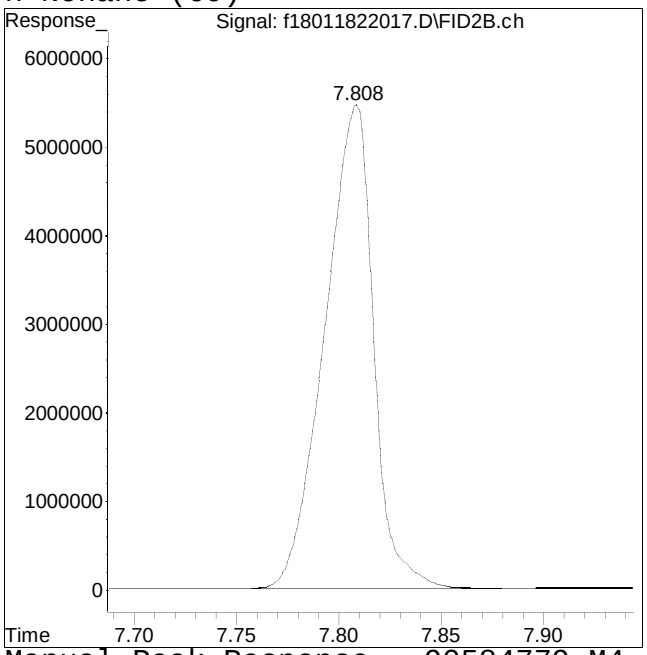
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #3: n-Nonane (C9)





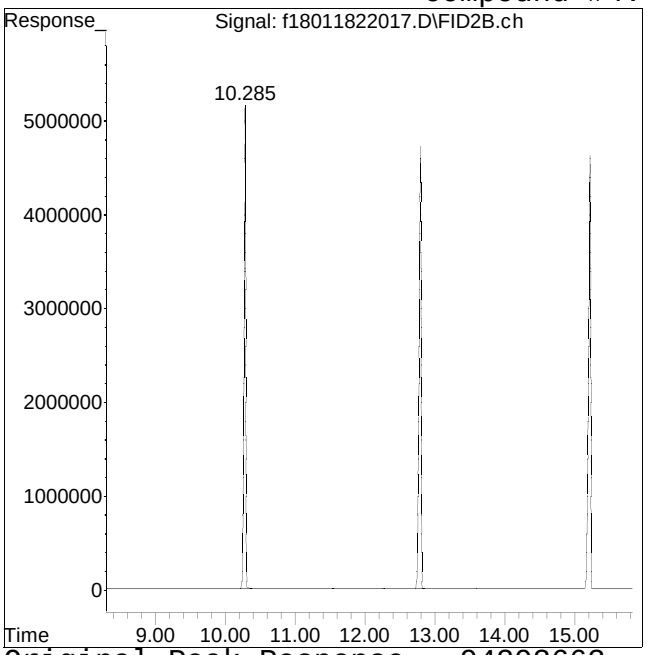
Original Peak Response = 90610692 Manual Peak Response = 90584779 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

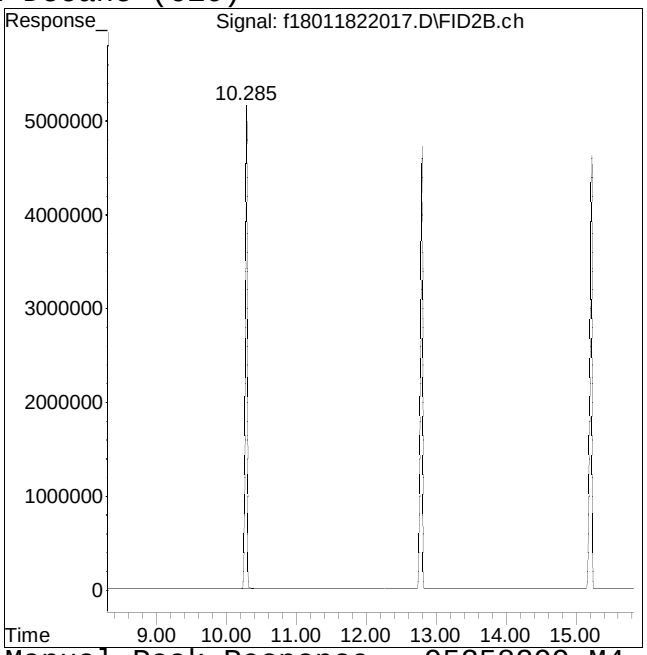
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #4: n-Decane (C10)



Original Peak Response = 94293663



Manual Peak Response = 95258299 M4

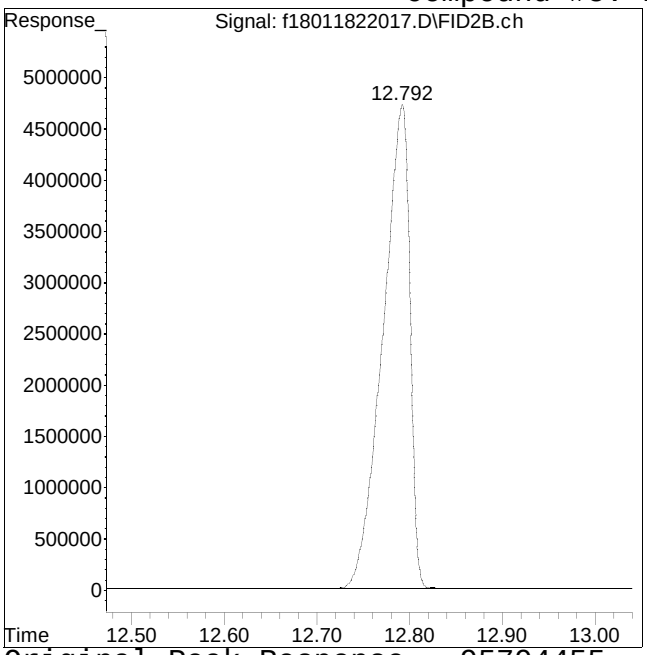
M4 = Poor automated baseline construction.

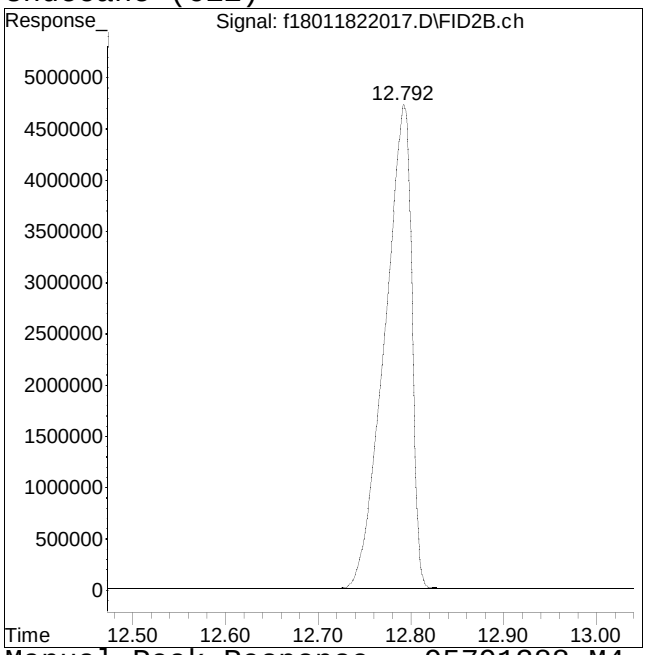
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #5: n-Undecane (C11)





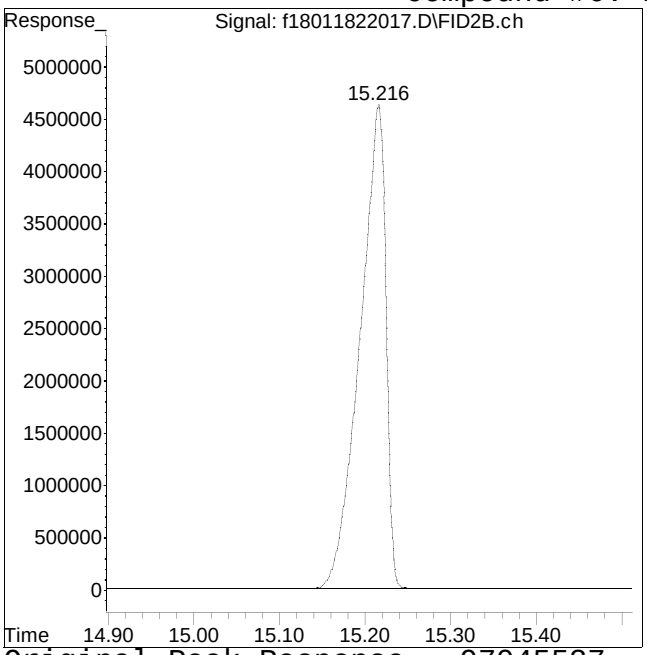
Original Peak Response = 95794455 Manual Peak Response = 95791388 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

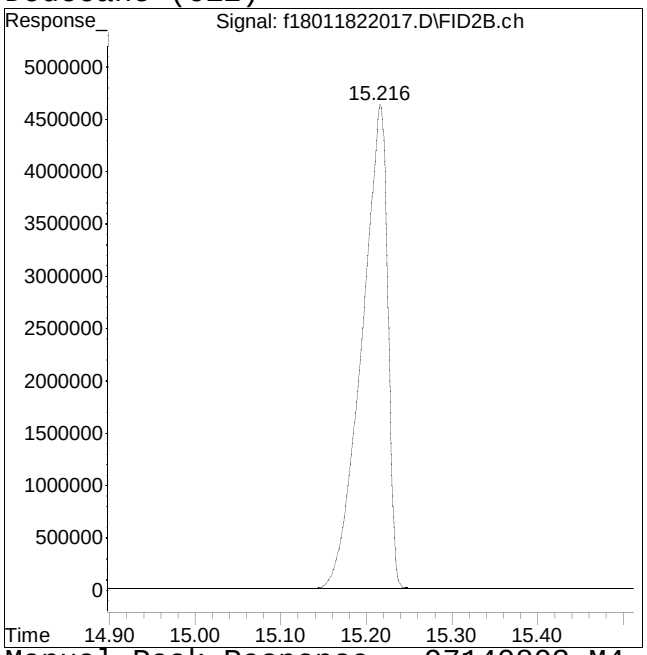
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #6: n-Dodecane (C12)



Original Peak Response = 97045537



Manual Peak Response = 97140803 M4

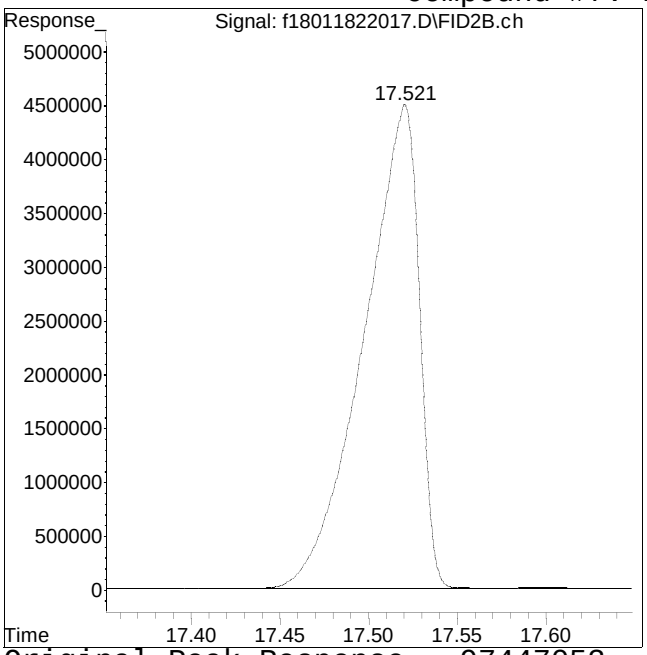
M4 = Poor automated baseline construction.

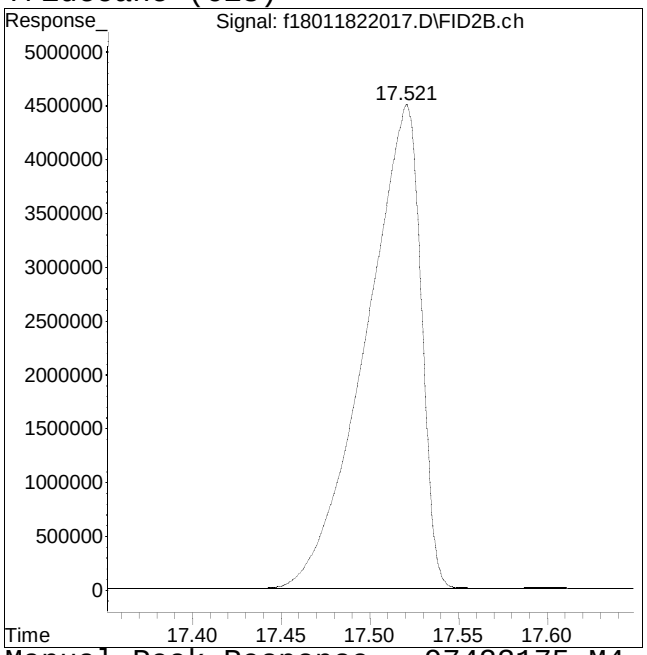
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #7: n-Tridecane (C13)





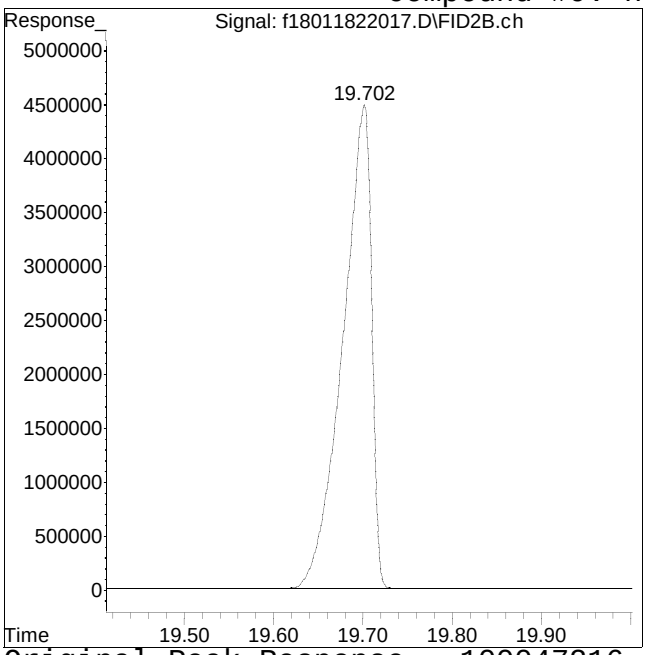
Original Peak Response = 97447053 Manual Peak Response = 97423175 M4
M4 = Poor automated baseline construction.

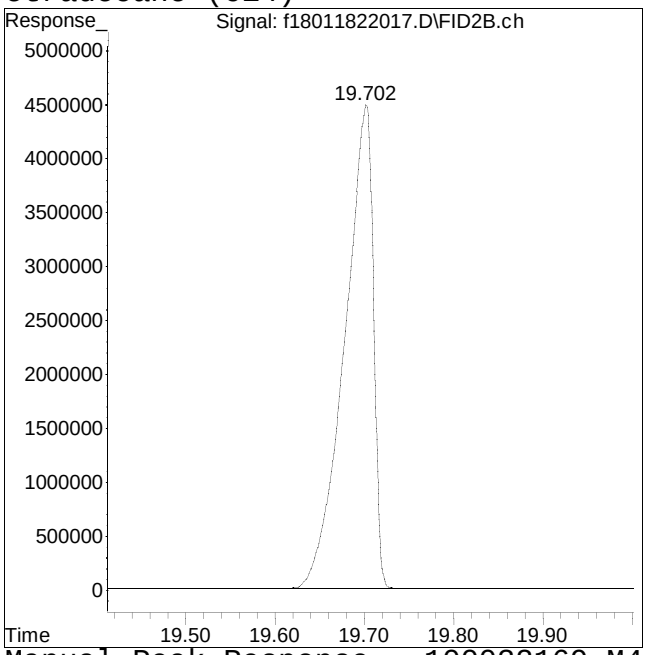
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #9: n-Tetradecane (C14)





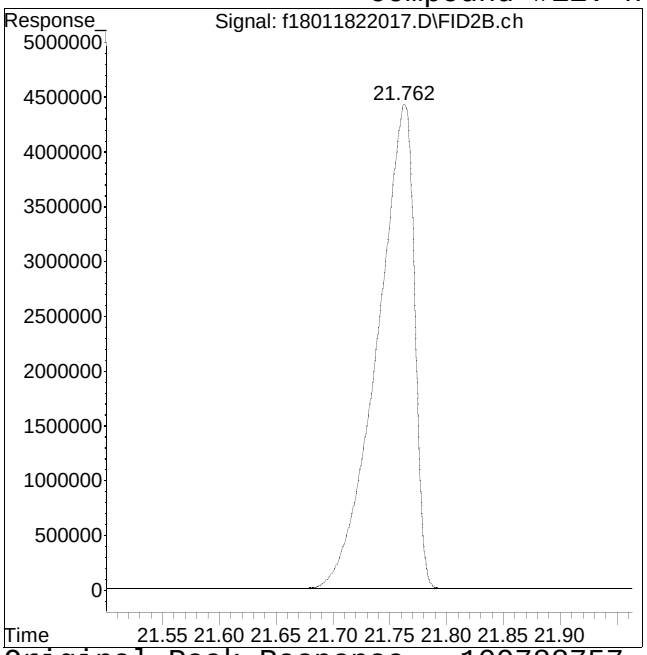
Original Peak Response = 100047216 Manual Peak Response = 100032169 M4
M4 = Poor automated baseline construction.

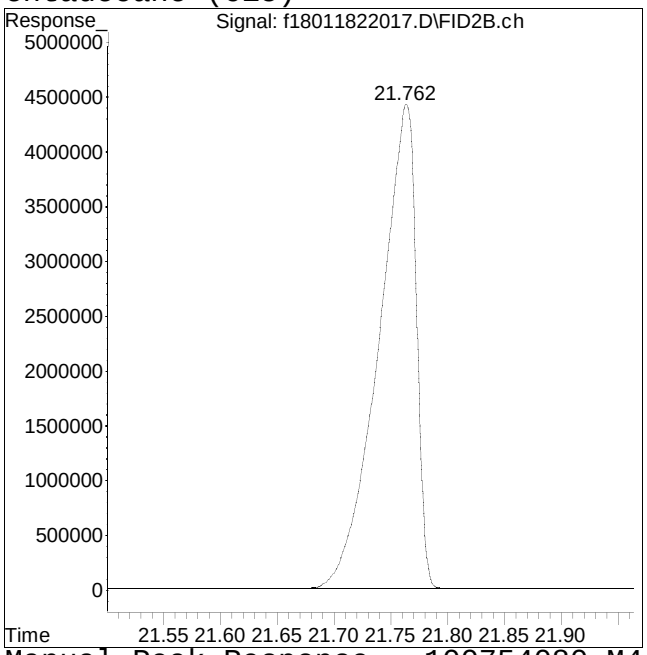
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #11: n-Pentadecane (C15)





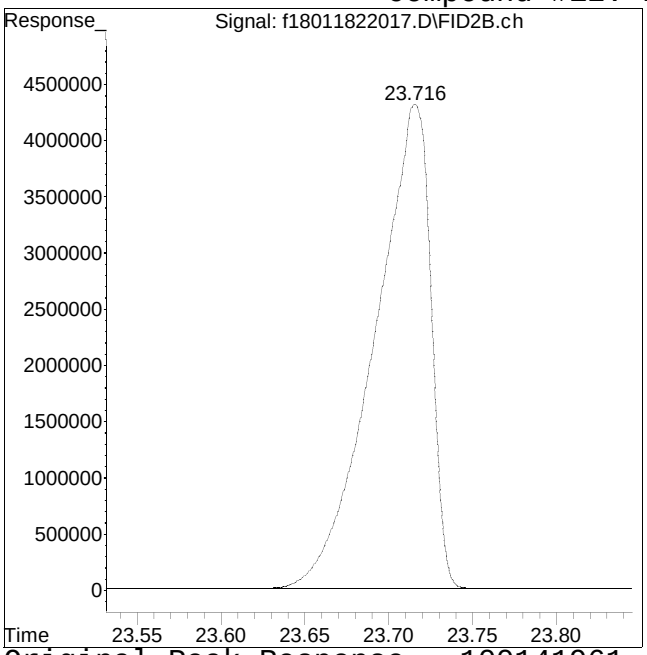
Original Peak Response = 100788757 Manual Peak Response = 100754080 M4
M4 = Poor automated baseline construction.

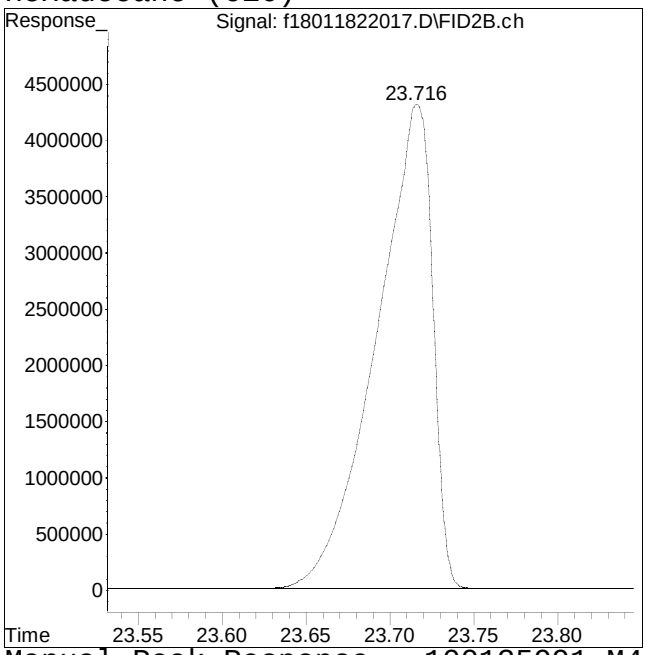
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #12: n-Hexadecane (C16)





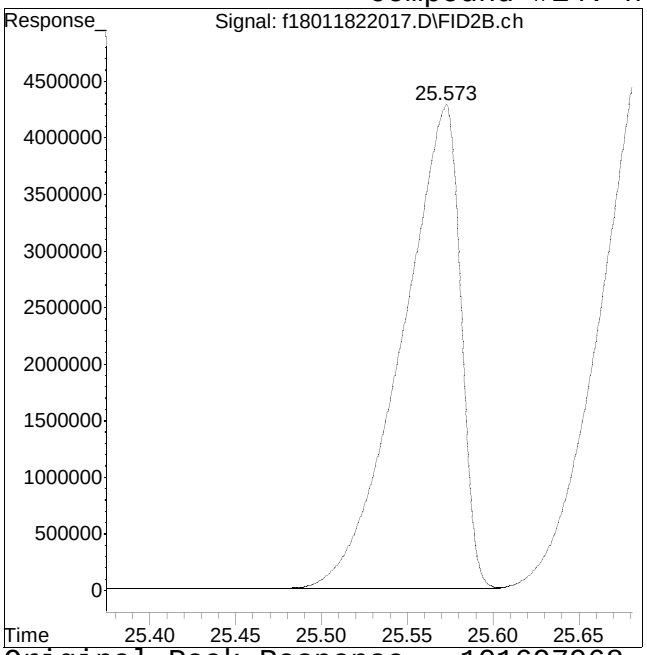
Original Peak Response = 100141961 Manual Peak Response = 100135991 M4
M4 = Poor automated baseline construction.

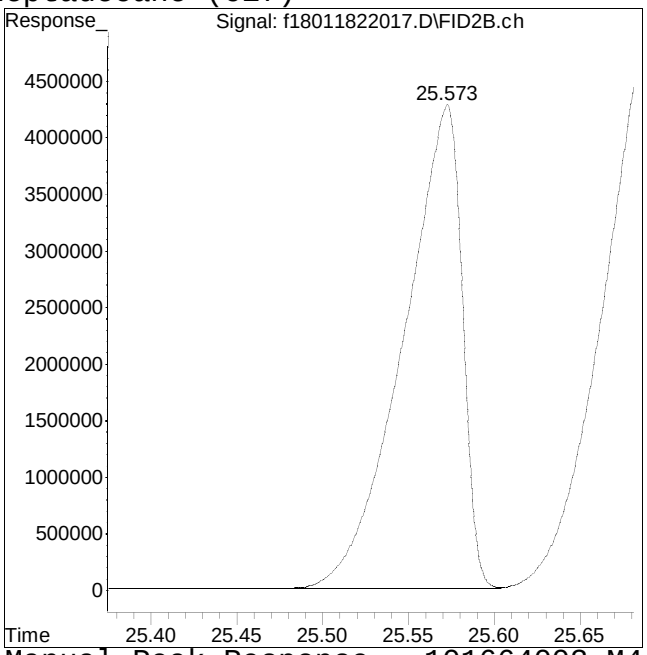
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #14: n-Heptadecane (C17)





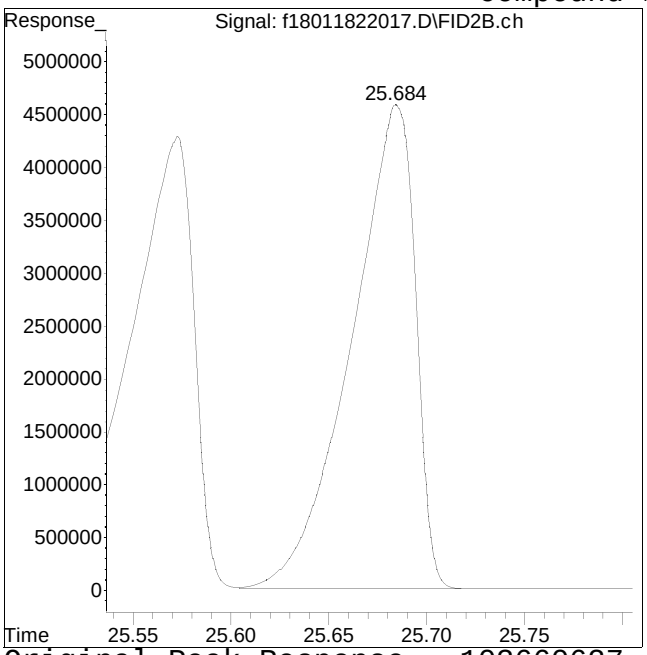
Original Peak Response = 101697968 Manual Peak Response = 101664003 M4
M4 = Poor automated baseline construction.

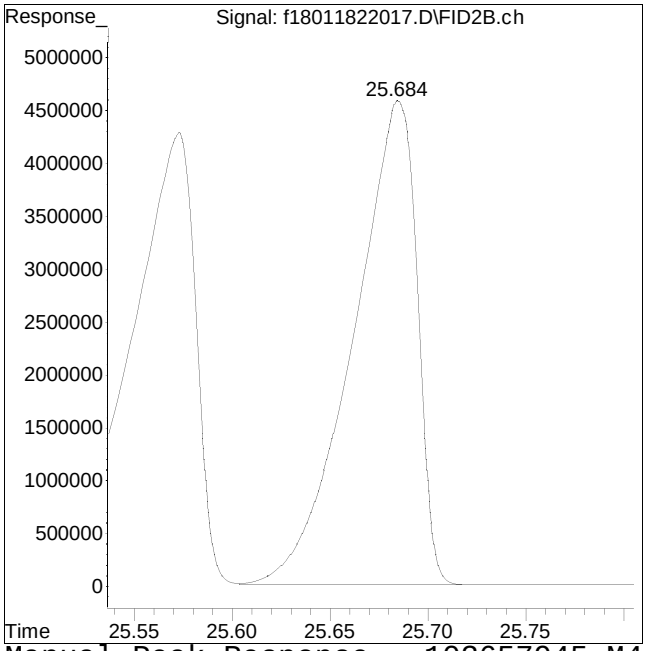
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #15: Pristane





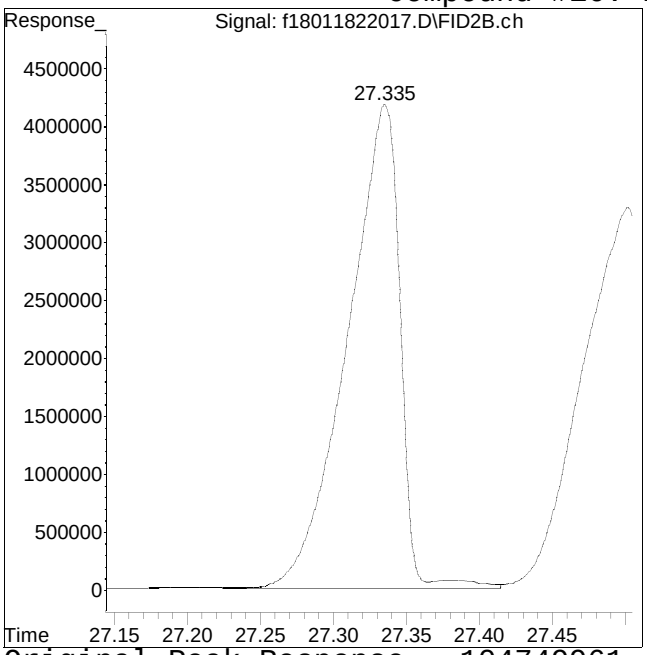
Original Peak Response = 103660627 Manual Peak Response = 103657945 M4
M4 = Poor automated baseline construction.

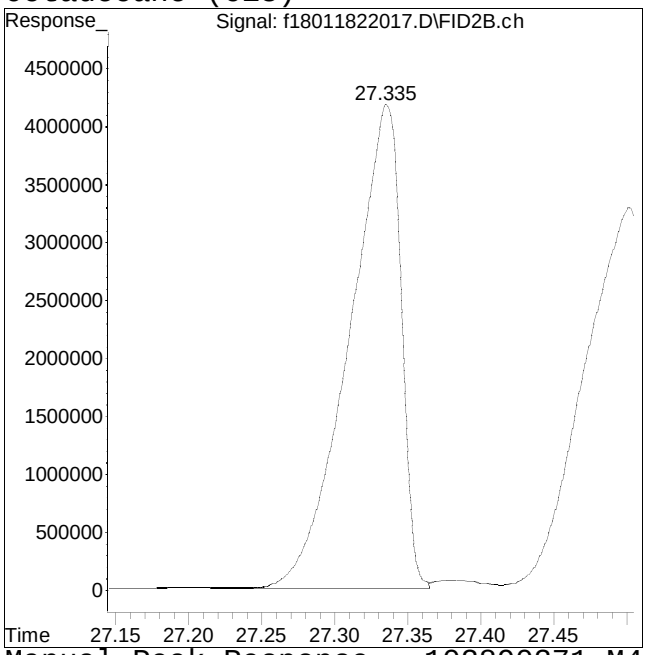
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #16: n-Octadecane (C18)





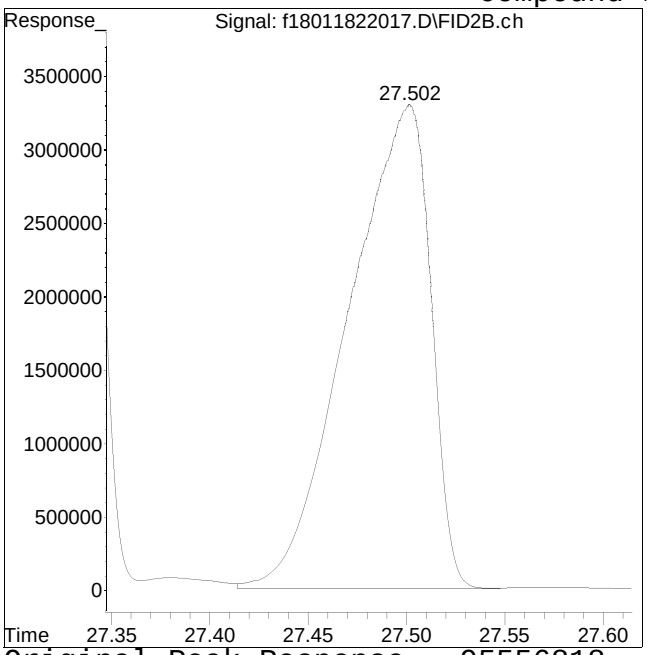
Original Peak Response = 104749961 Manual Peak Response = 102890371 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

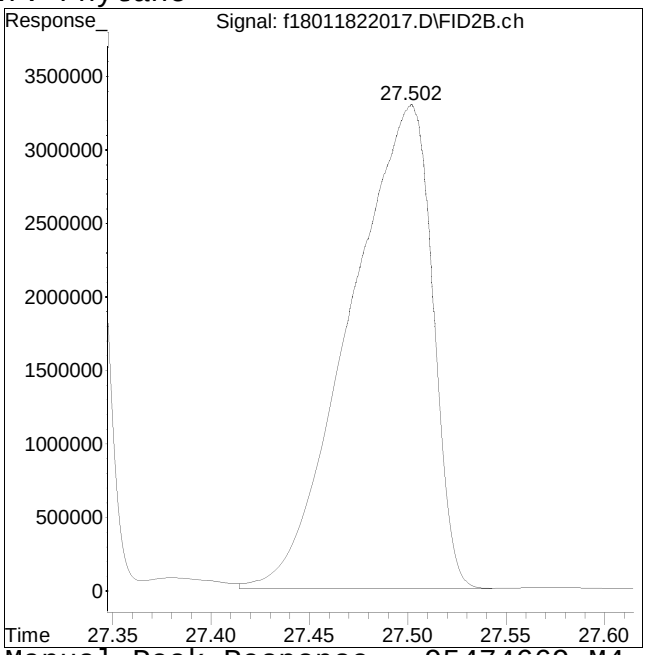
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #17: Phytane



Original Peak Response = 95556818



Manual Peak Response = 95474669 M4

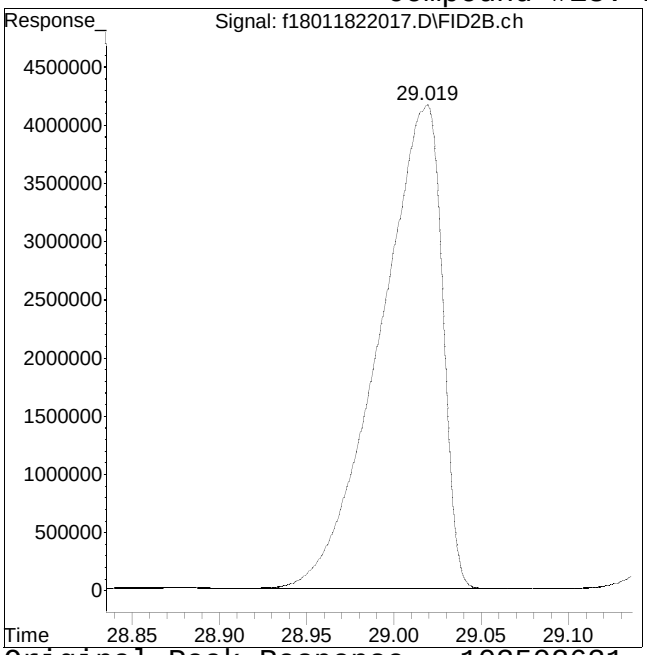
M4 = Poor automated baseline construction.

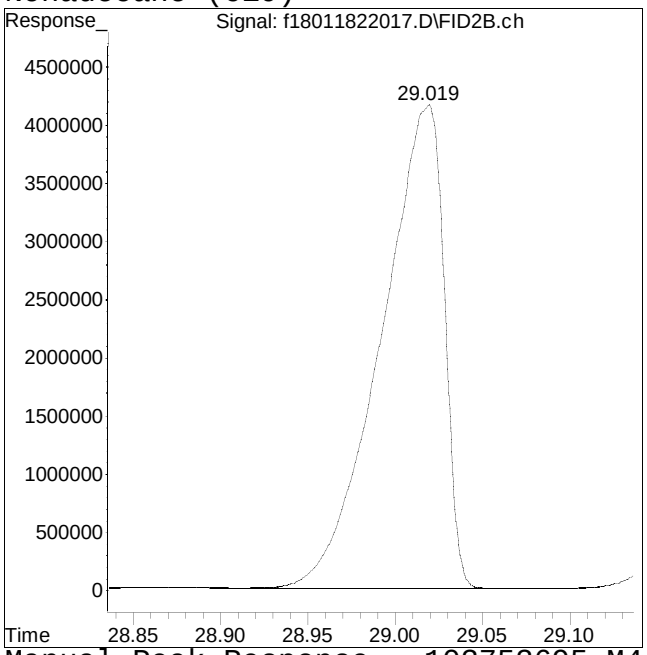
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #18: n-Nonadecane (C19)





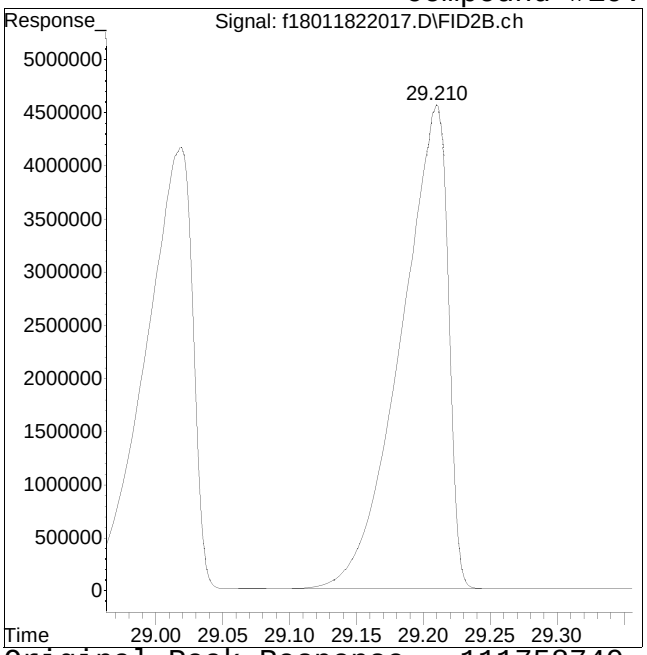
Original Peak Response = 103502631 Manual Peak Response = 103753695 M4
M4 = Poor automated baseline construction.

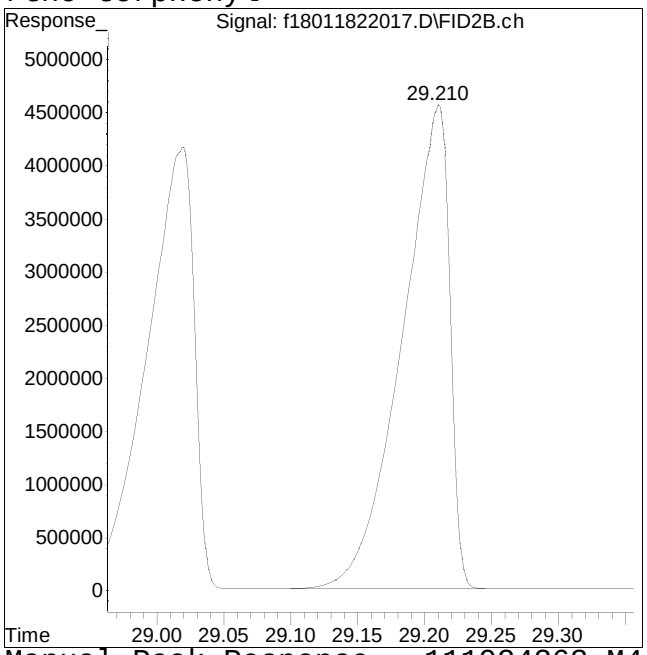
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #19: ortho-terphenyl





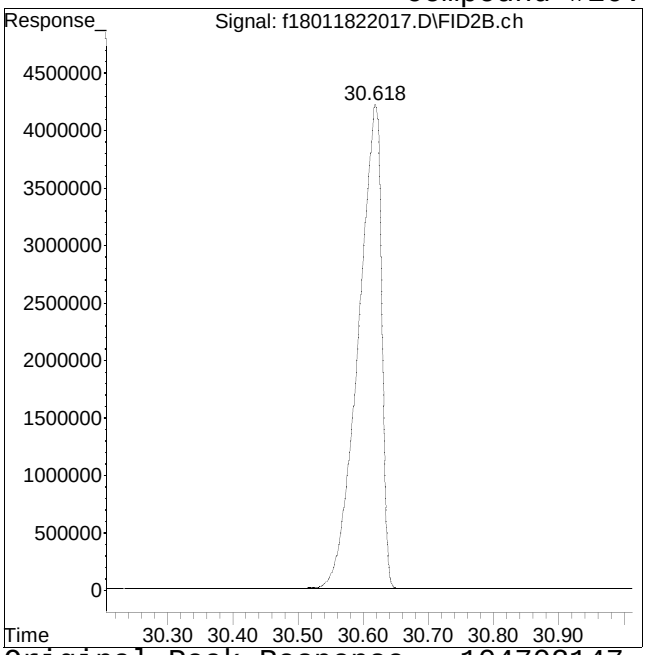
Original Peak Response = 111758740 Manual Peak Response = 111924363 M4
M4 = Poor automated baseline construction.

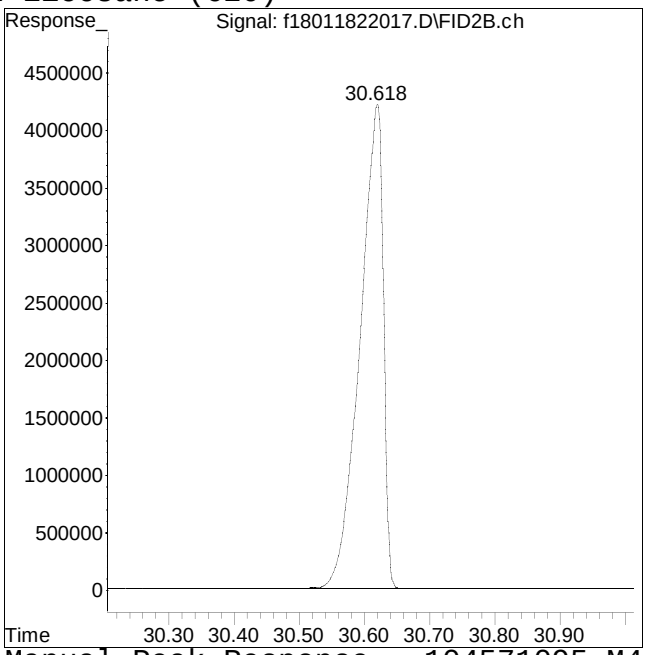
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #20: n-Eicosane (C20)





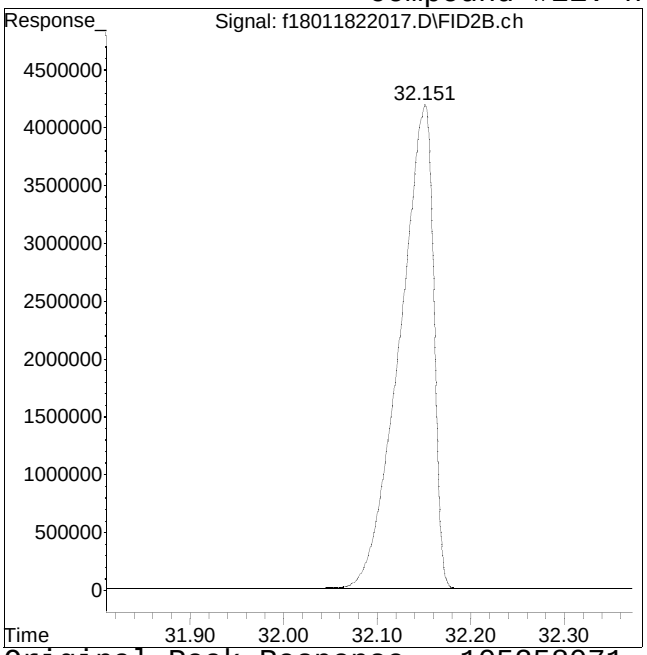
Original Peak Response = 104702147 Manual Peak Response = 104571095 M4
M4 = Poor automated baseline construction.

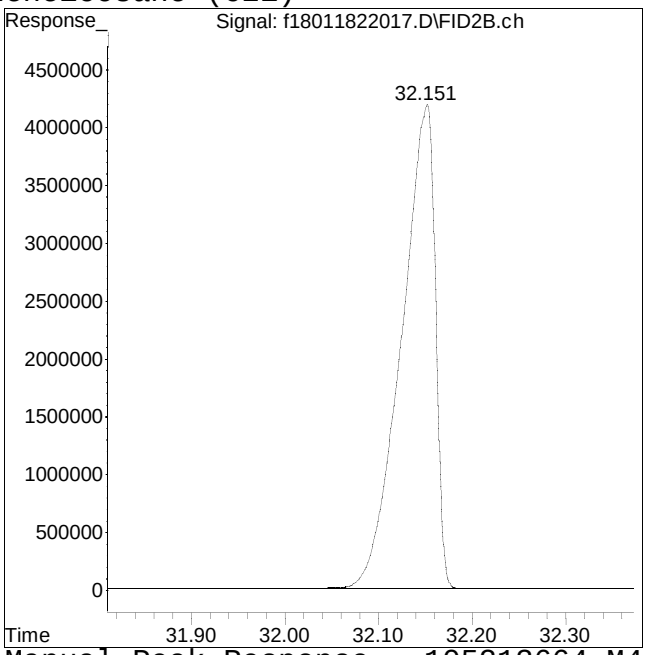
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #21: n-Heneicosane (C21)





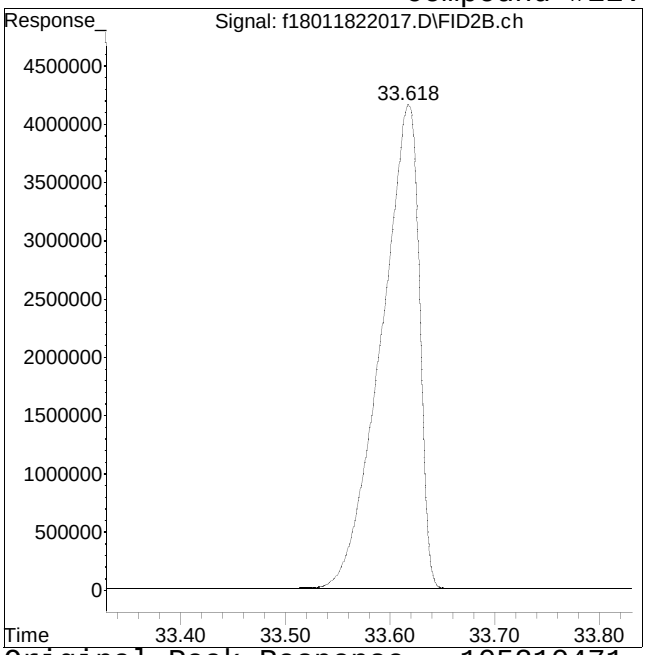
Original Peak Response = 105258071 Manual Peak Response = 105213664 M4
M4 = Poor automated baseline construction.

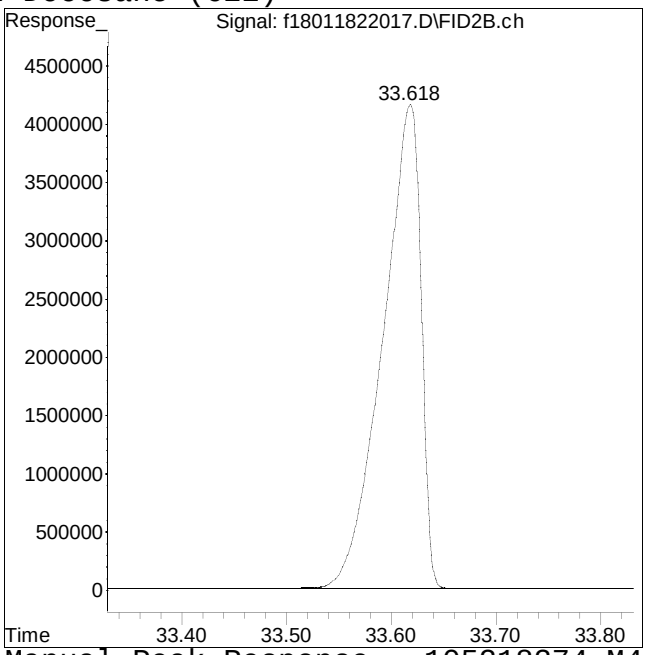
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #22: n-Docosane (C22)





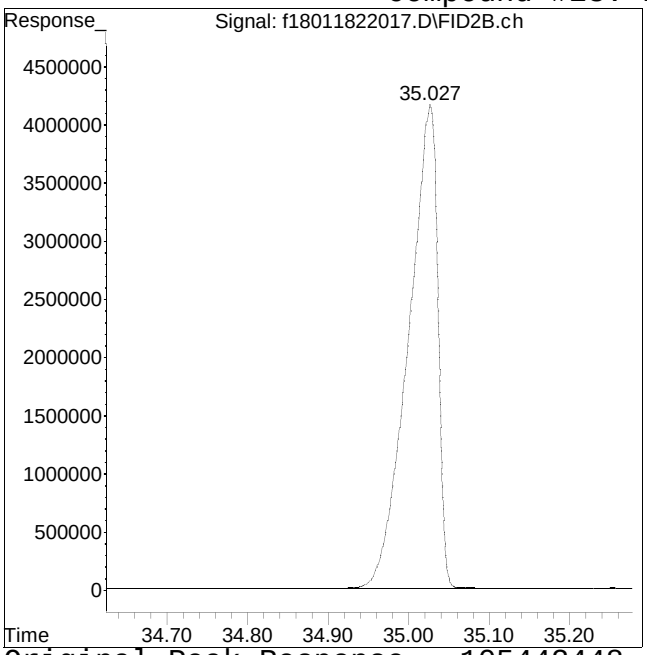
Original Peak Response = 105210471 Manual Peak Response = 105218374 M4
M4 = Poor automated baseline construction.

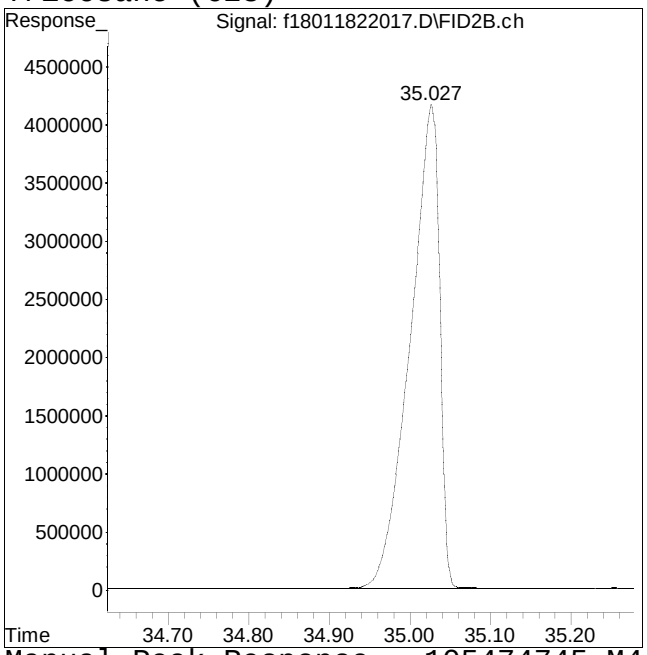
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #23: n-Tricosane (C23)





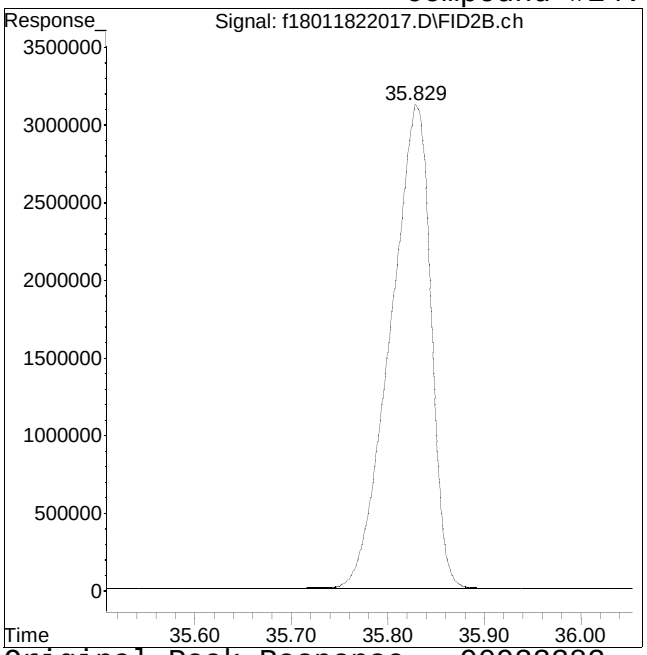
Original Peak Response = 105442448 Manual Peak Response = 105474745 M4
M4 = Poor automated baseline construction.

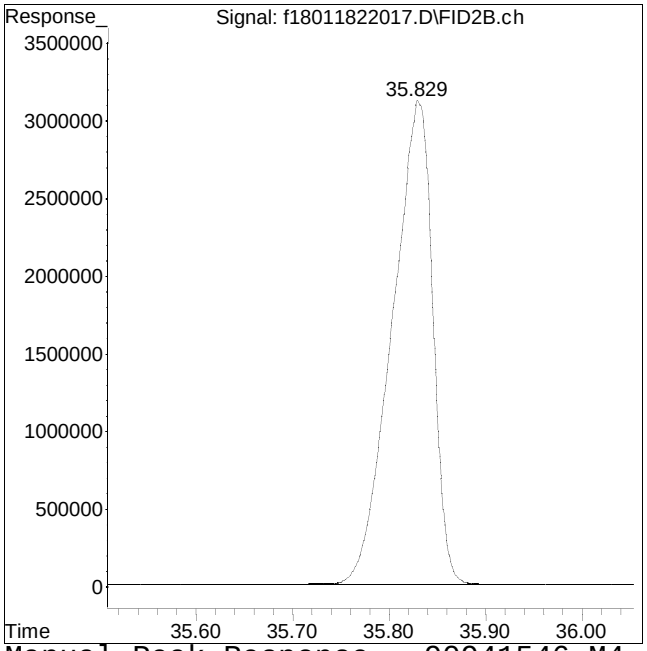
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #24: d50-Tetracosane





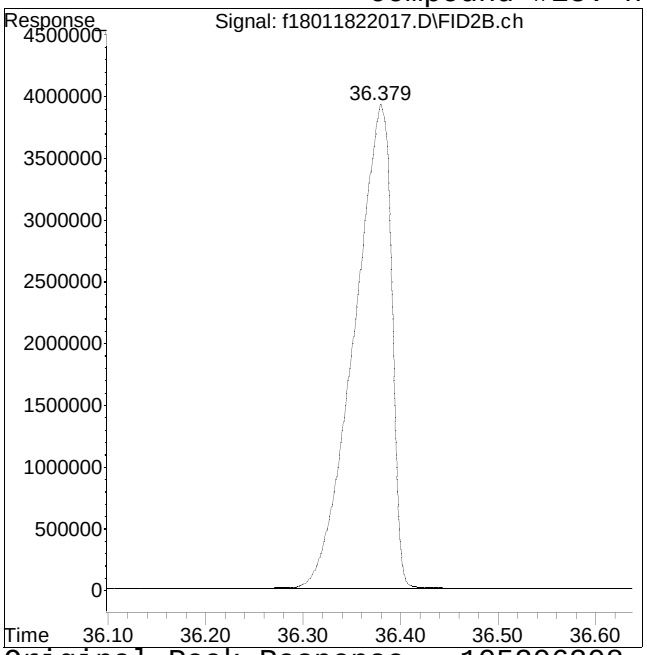
Original Peak Response = 90933383 Manual Peak Response = 90941546 M4
M4 = Poor automated baseline construction.

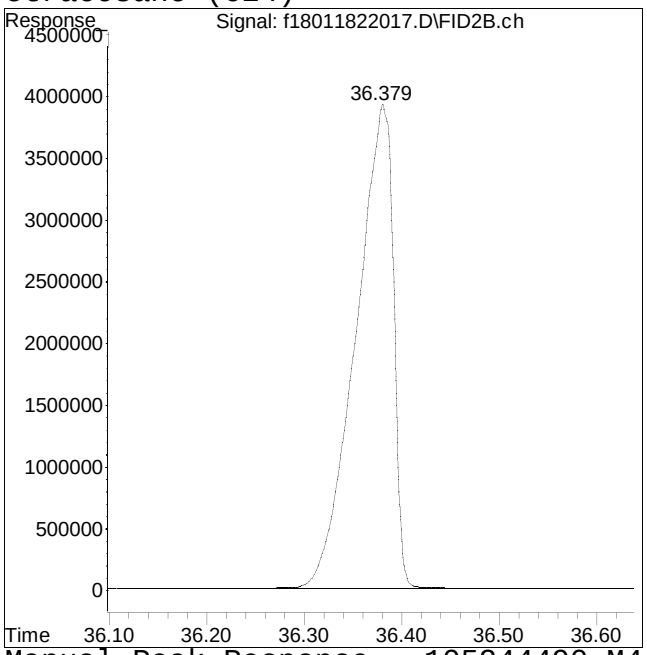
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #25: n-Tetracosane (C24)





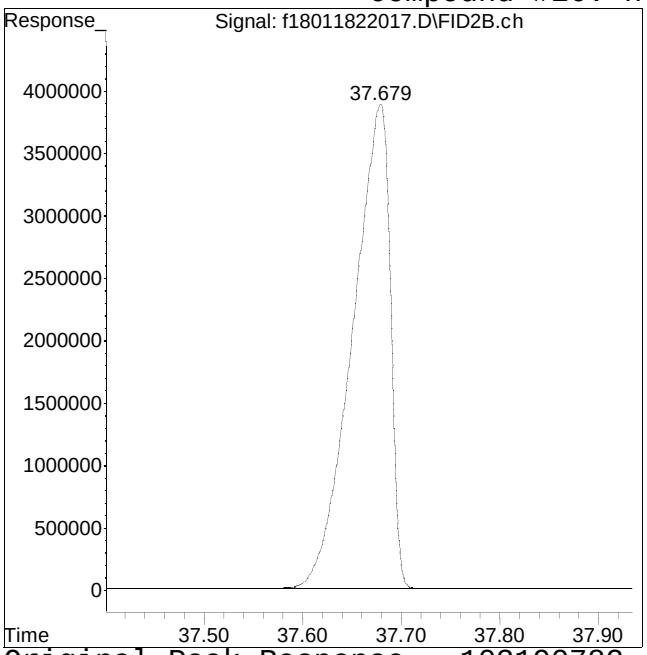
Original Peak Response = 105206308 Manual Peak Response = 105244490 M4
M4 = Poor automated baseline construction.

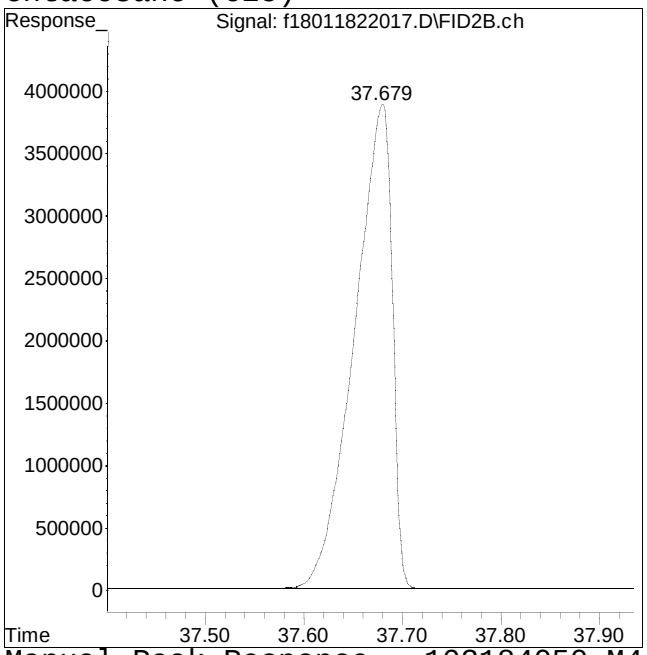
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #26: n-Pentacosane (C25)





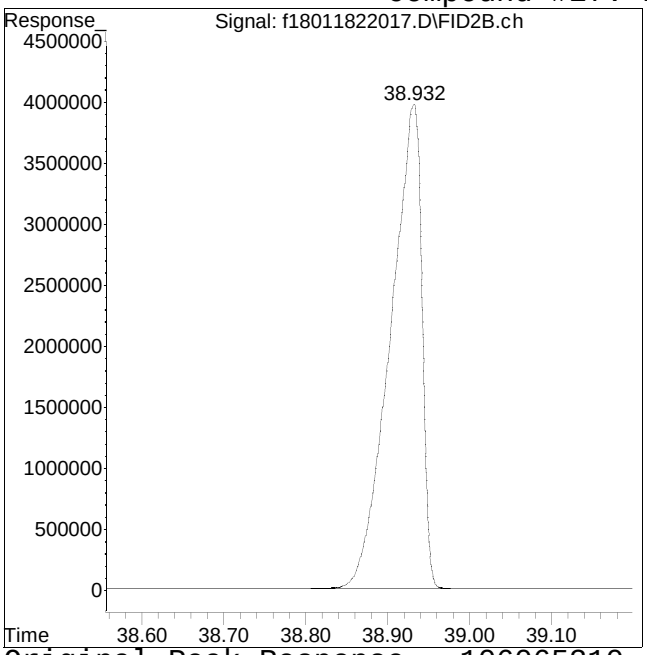
Original Peak Response = 103190782 Manual Peak Response = 103184050 M4
M4 = Poor automated baseline construction.

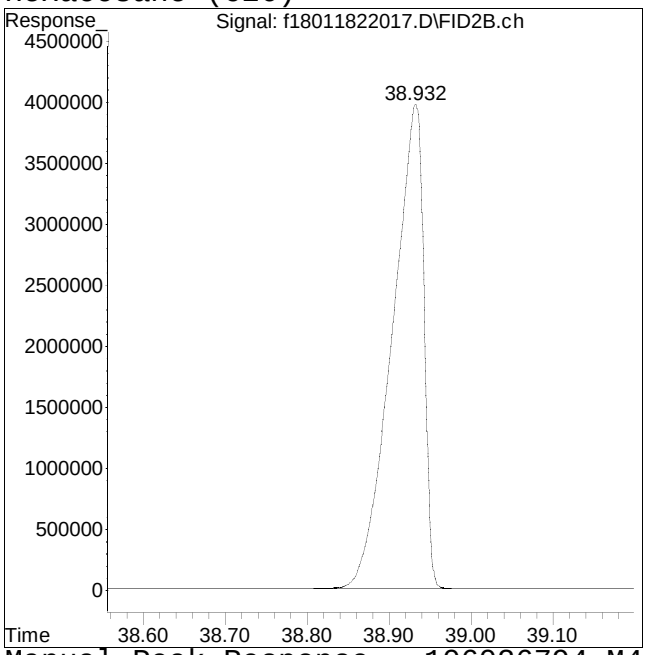
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #27: n-Hexacosane (C26)





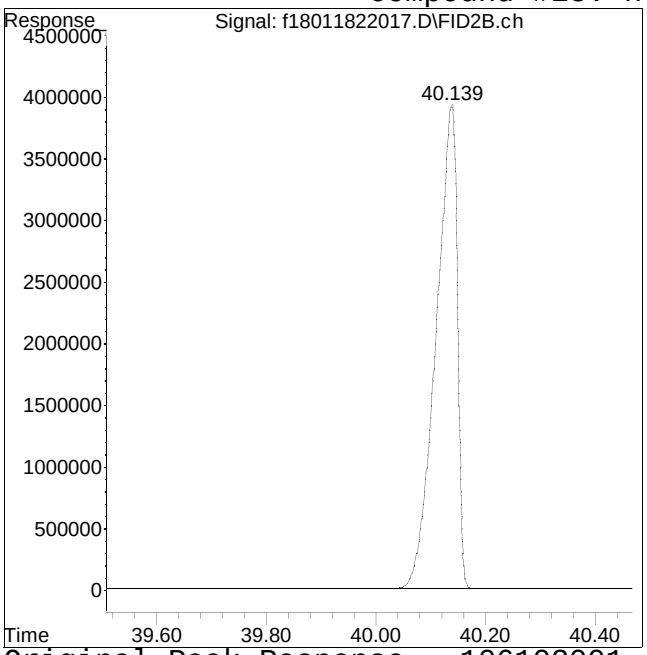
Original Peak Response = 106065310 Manual Peak Response = 106026794 M4
M4 = Poor automated baseline construction.

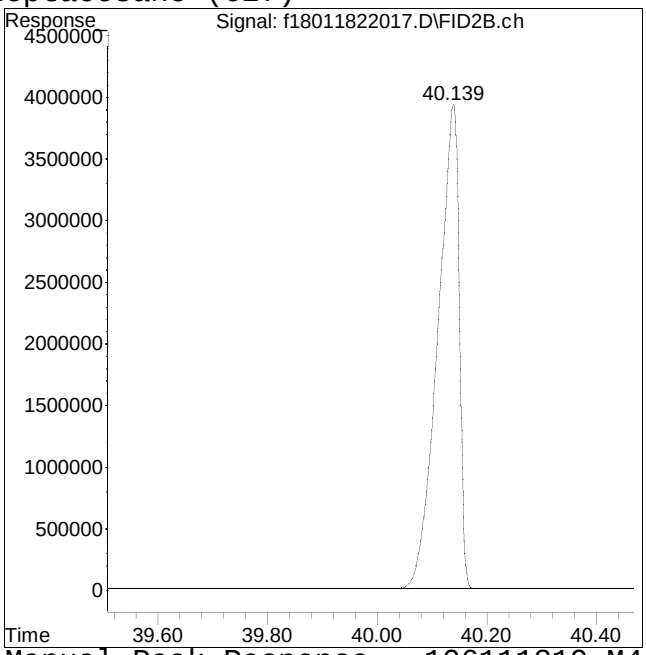
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #28: n-Heptacosane (C27)





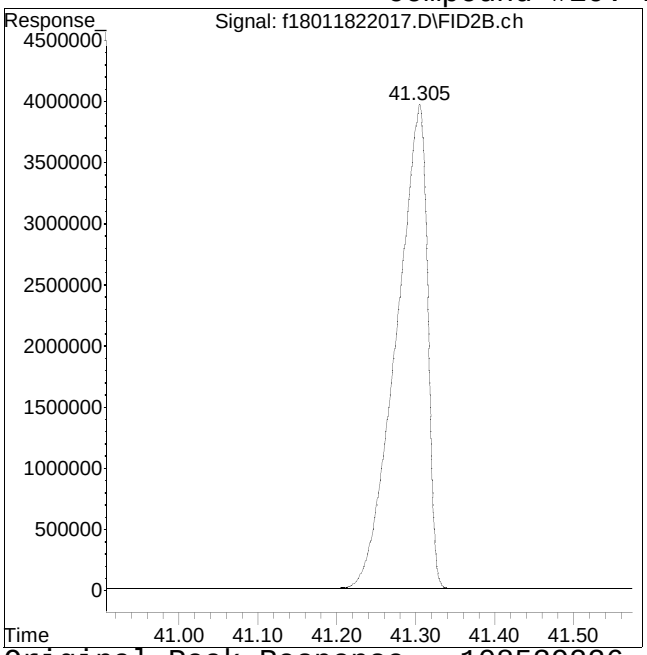
Original Peak Response = 106102001 Manual Peak Response = 106111319 M4
M4 = Poor automated baseline construction.

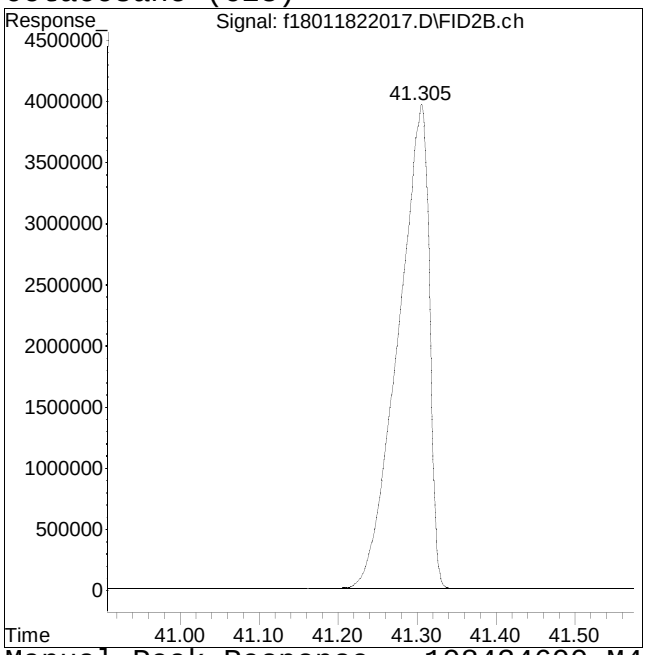
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #29: n-Octacosane (C28)





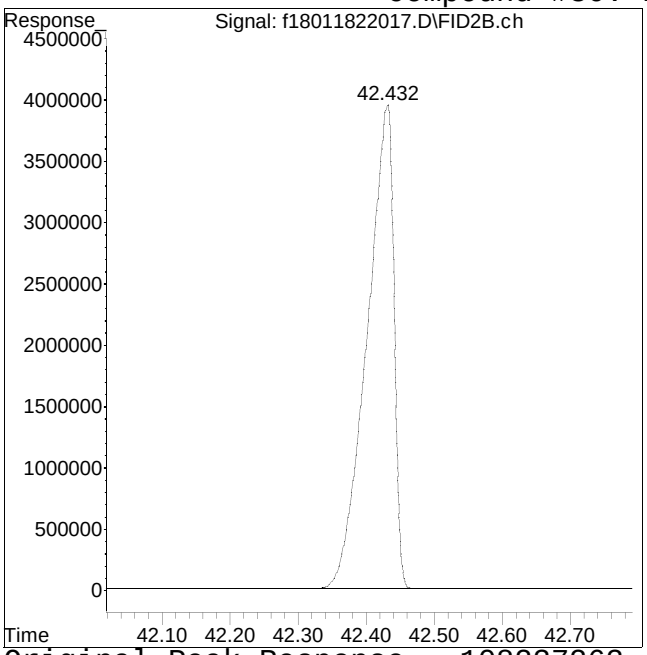
Original Peak Response = 108539226 Manual Peak Response = 108434600 M4
M4 = Poor automated baseline construction.

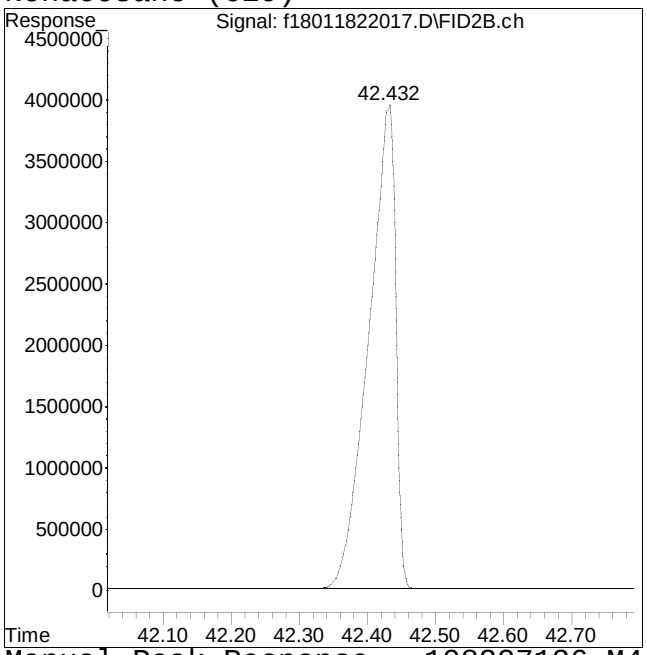
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #30: n-Nonacosane (C29)





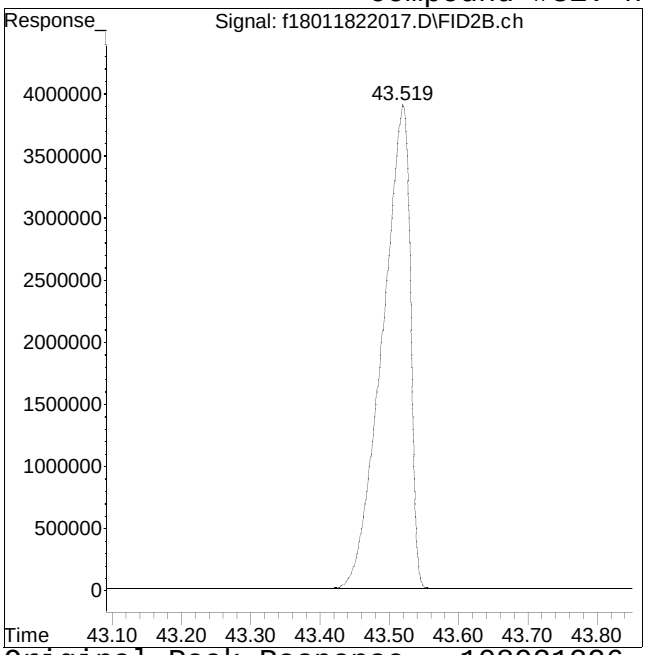
Original Peak Response = 108237263 Manual Peak Response = 108227126 M4
M4 = Poor automated baseline construction.

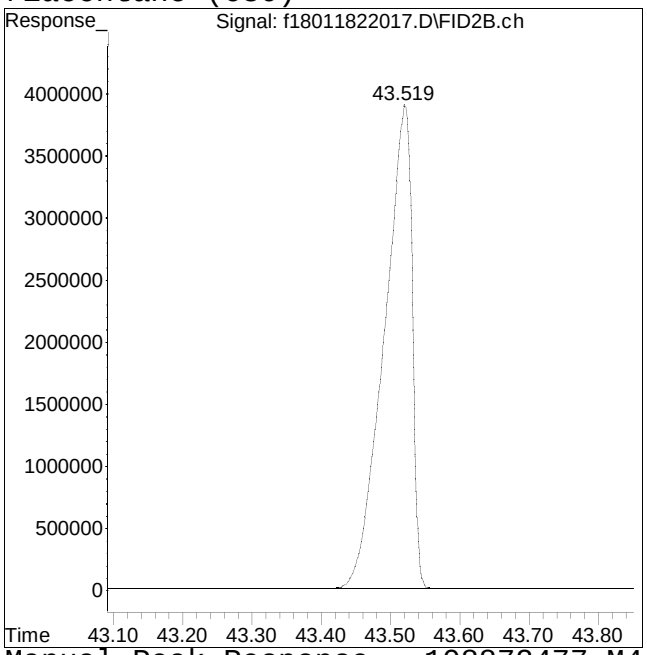
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #31: n-Triacontane (C30)





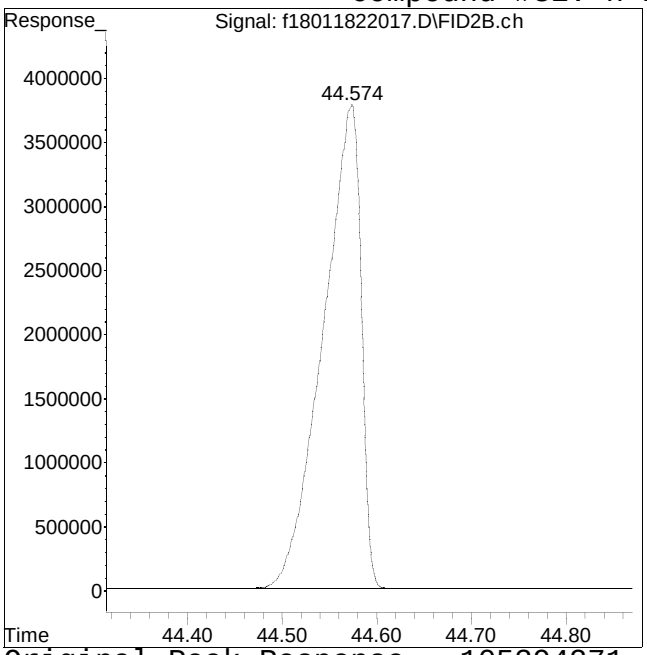
Original Peak Response = 108921226 Manual Peak Response = 108872477 M4
M4 = Poor automated baseline construction.

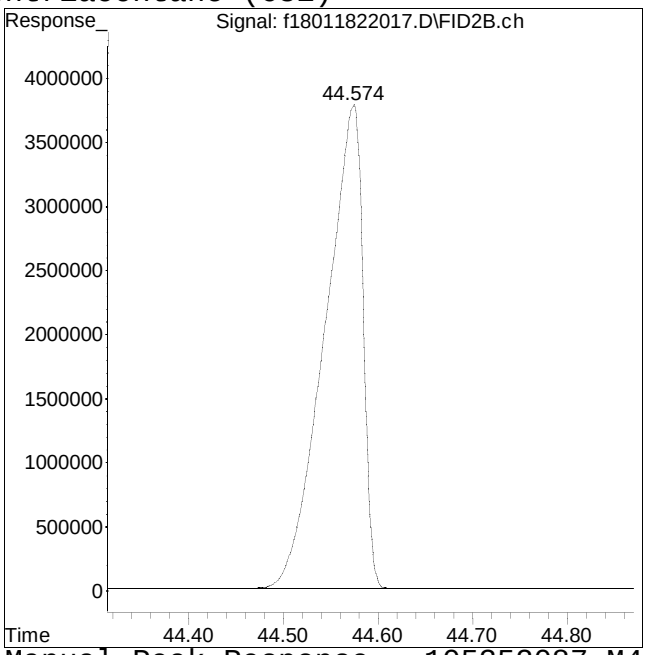
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #32: n-Hentriacontane (C31)





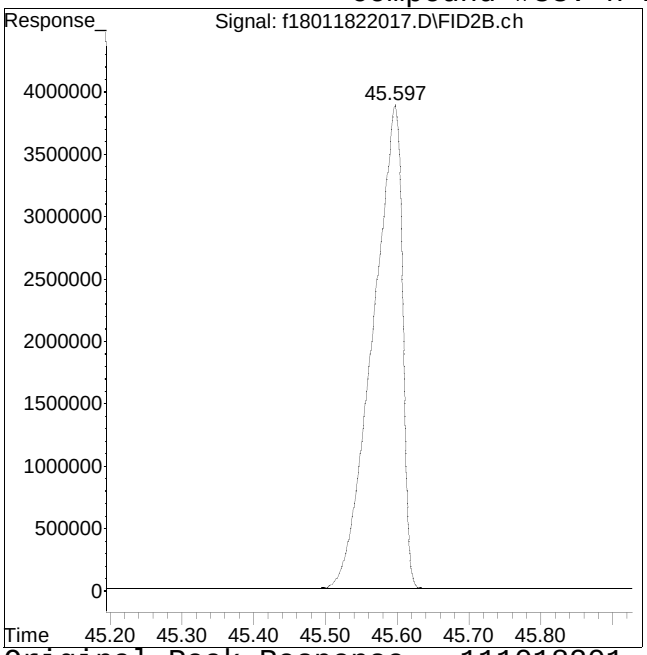
Original Peak Response = 105394271 Manual Peak Response = 105352087 M4
M4 = Poor automated baseline construction.

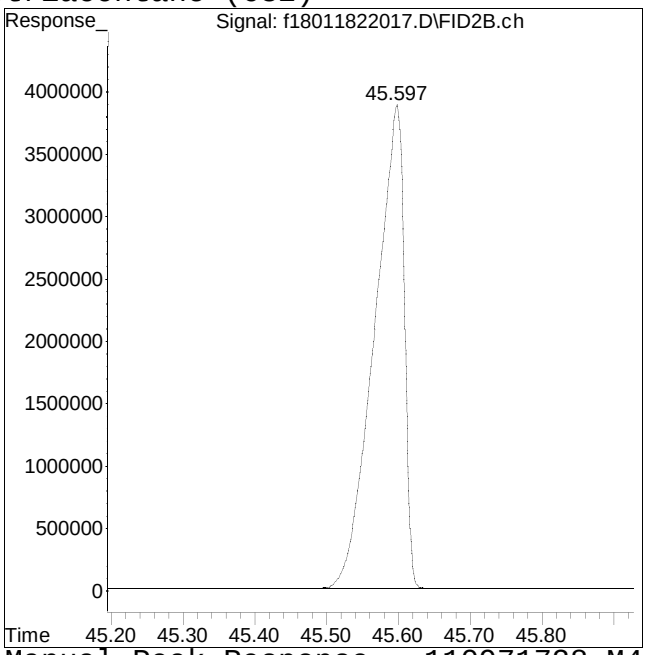
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #33: n-Dotriacontane (C32)





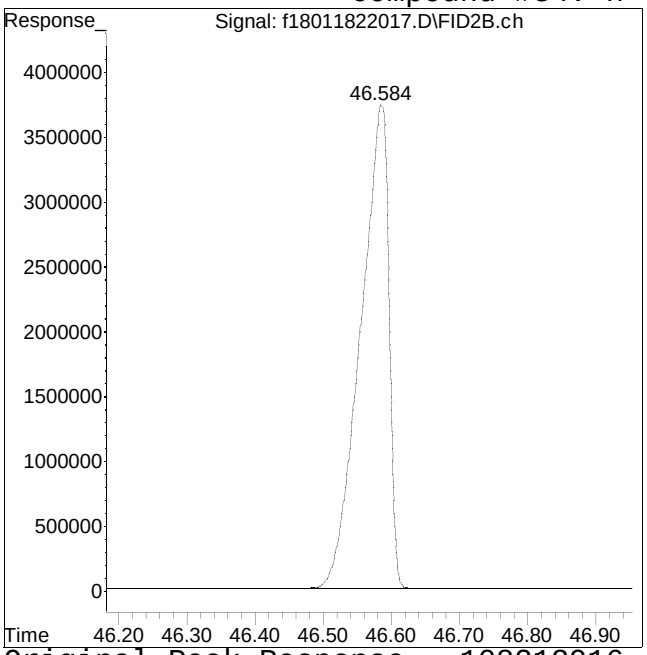
Original Peak Response = 111018201 Manual Peak Response = 110971728 M4
M4 = Poor automated baseline construction.

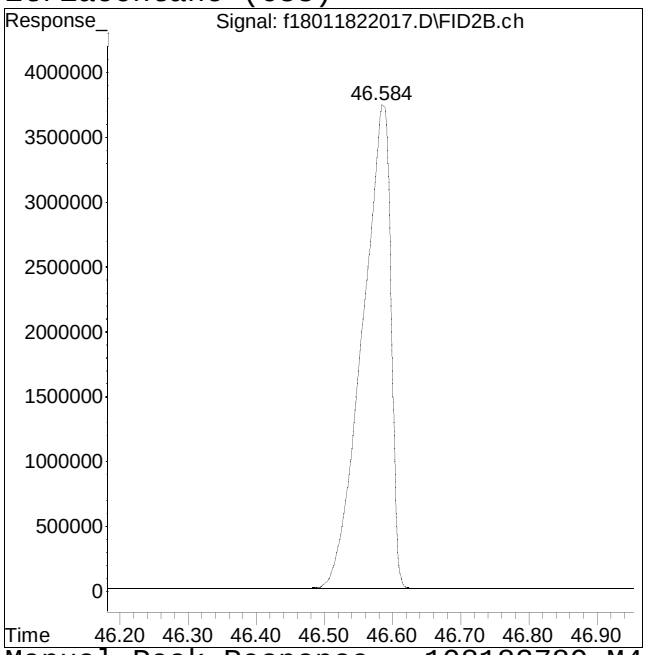
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #34: n-Tritriacontane (C33)





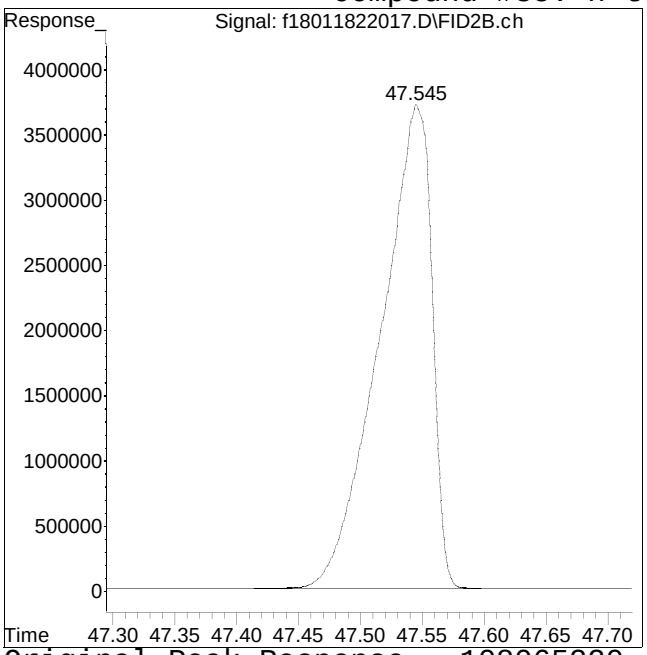
Original Peak Response = 108212916 Manual Peak Response = 108183789 M4
M4 = Poor automated baseline construction.

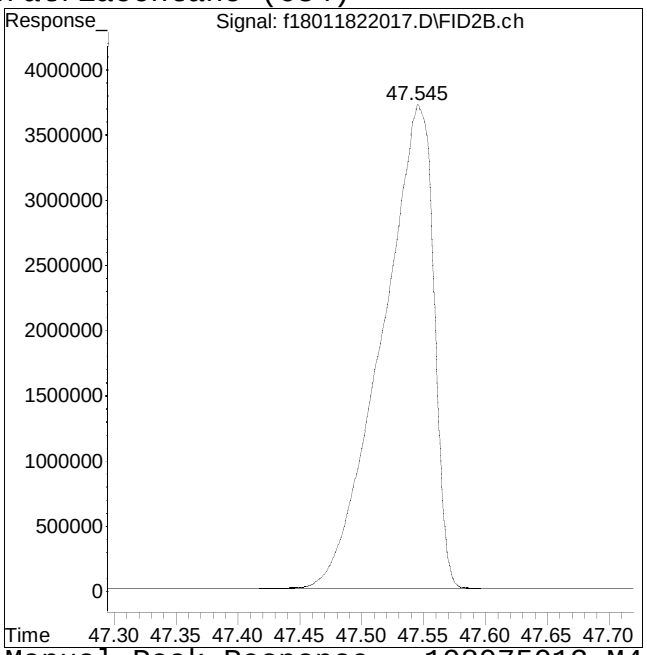
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #35: n-tetratriacontane (C34)





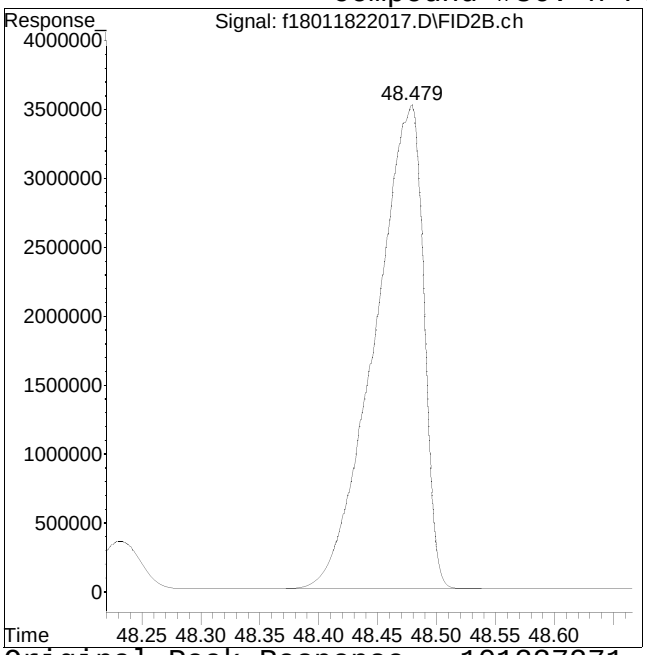
Original Peak Response = 108065220 Manual Peak Response = 108075013 M4
M4 = Poor automated baseline construction.

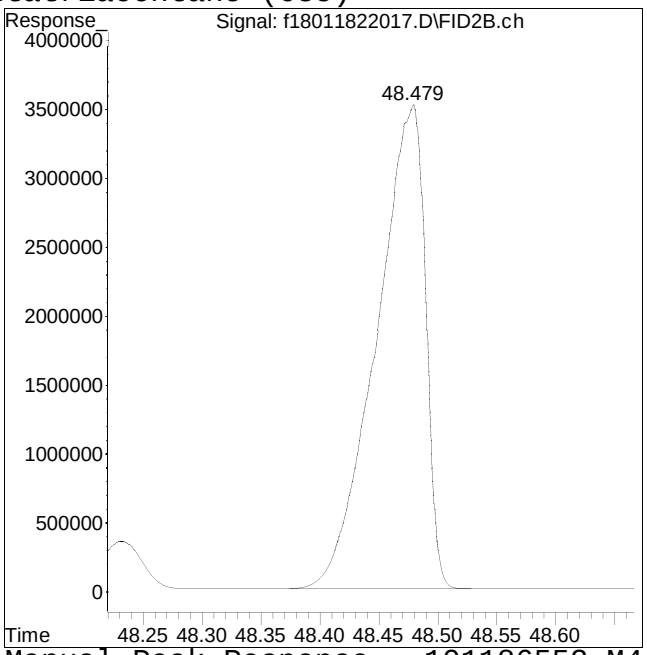
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #36: n-Pentatriacontane (C35)





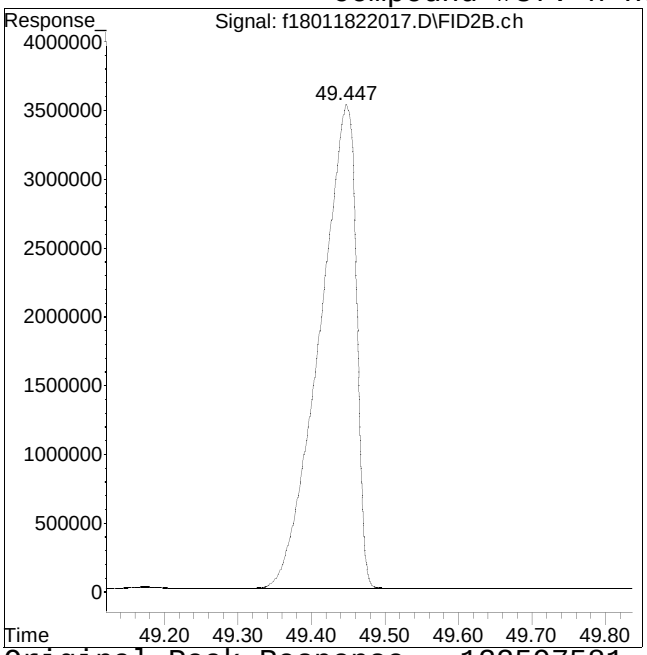
Original Peak Response = 101237271 Manual Peak Response = 101186552 M4
M4 = Poor automated baseline construction.

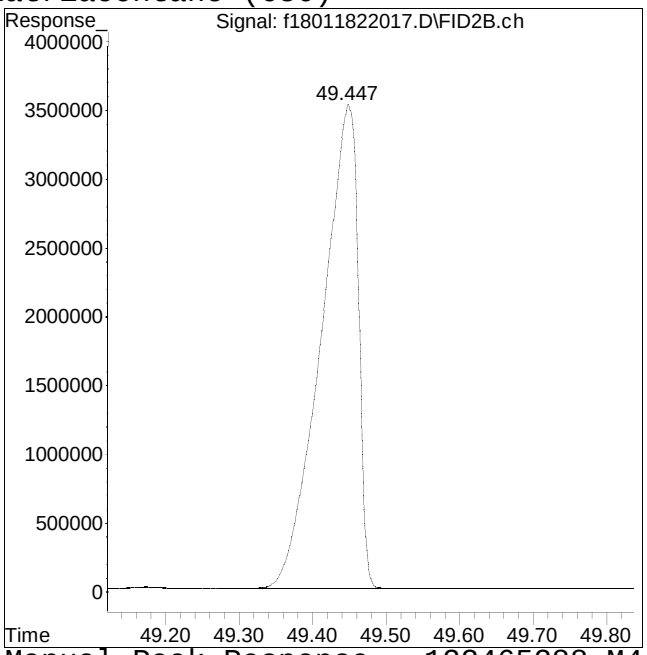
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #37: n-Hexatriacontane (C36)





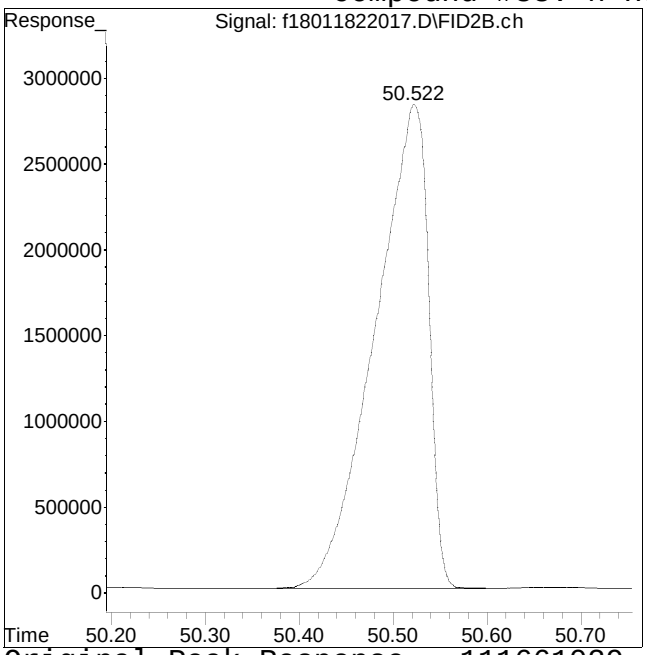
Original Peak Response = 122597581 Manual Peak Response = 122465288 M4
M4 = Poor automated baseline construction.

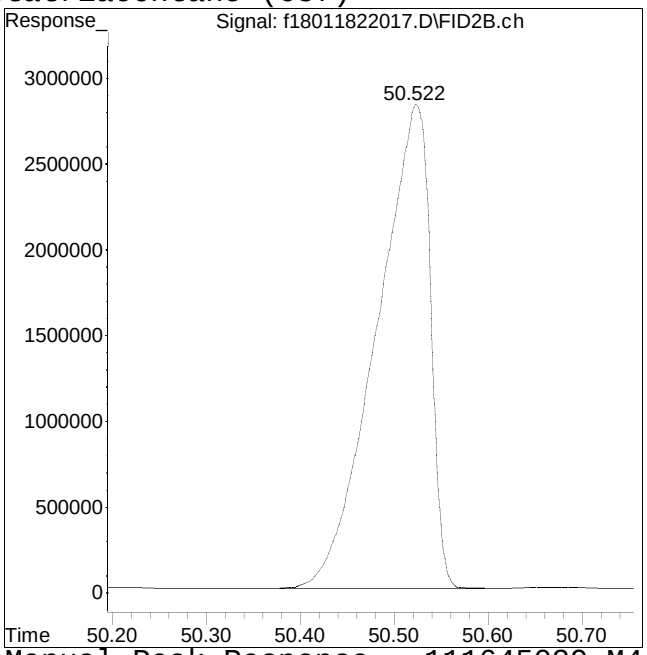
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #38: n-Heptatriacontane (C37)





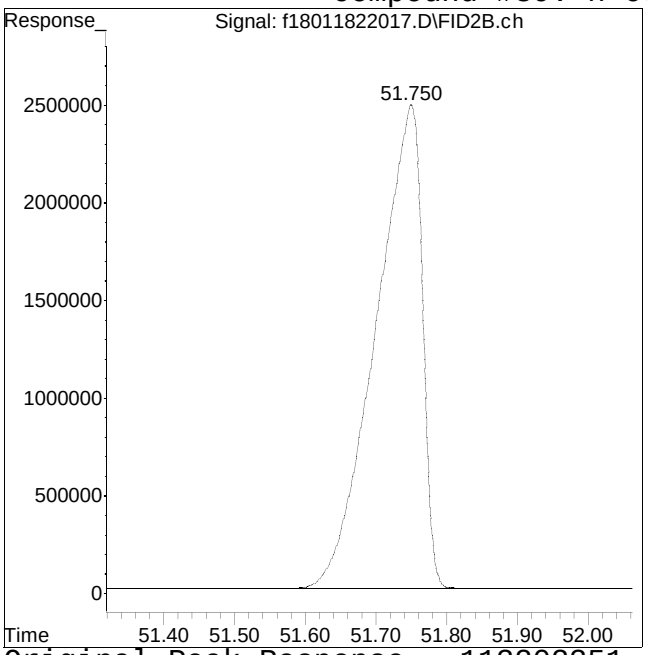
Original Peak Response = 111661029 Manual Peak Response = 111645029 M4
M4 = Poor automated baseline construction.

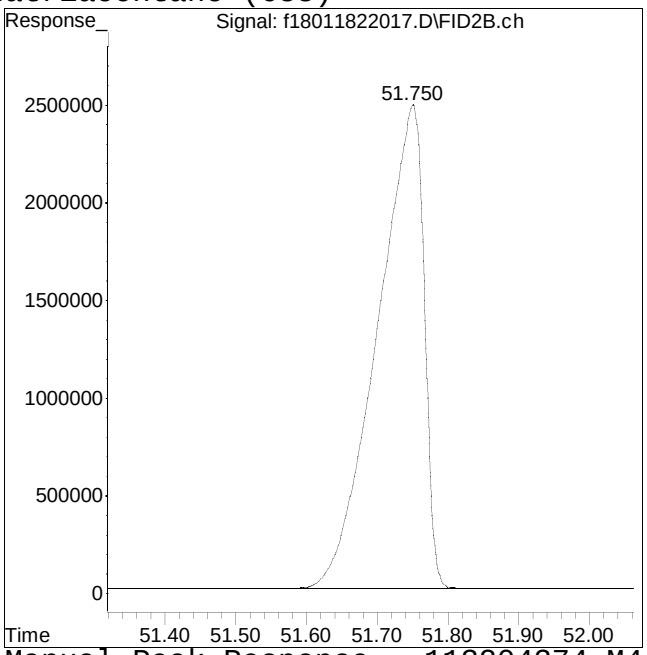
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #39: n-Octatriacontane (C38)





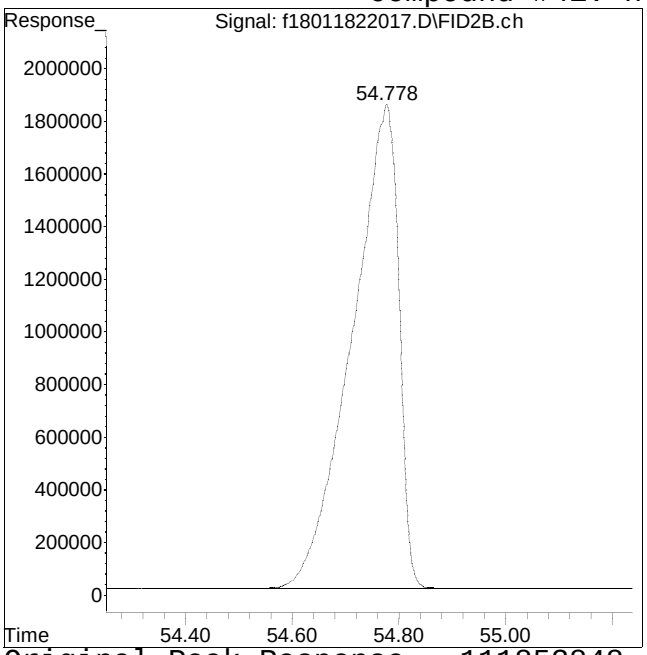
Original Peak Response = 113202351 Manual Peak Response = 113204374 M4
M4 = Poor automated baseline construction.

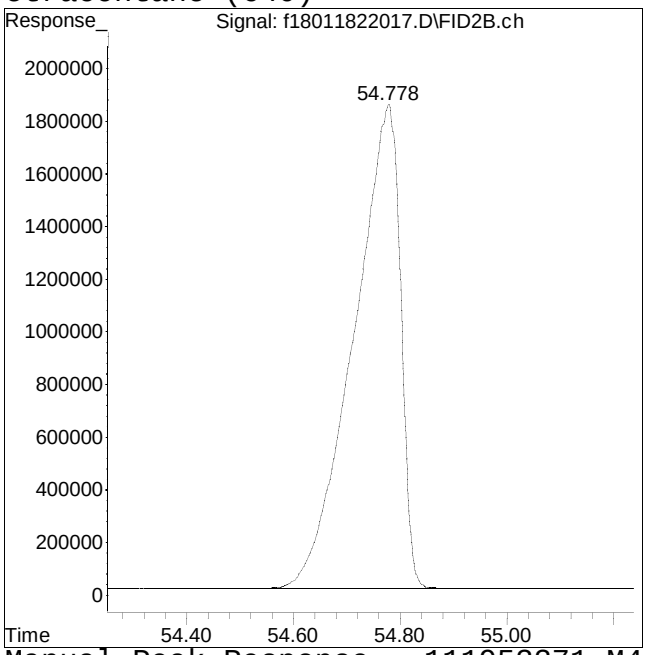
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822017.D
Date Inj'd : 1/19/2022 12:06 am
Sample : I1801182204R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:45 pm

Compound #41: n-Tetracontane (C40)





Original Peak Response = 111853848 Manual Peak Response = 111953371 M4
M4 = Poor automated baseline construction.

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822019.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 01:33 am
Operator : FID18:WR
Sample : I1801182205R
Misc : WG1596727,FRBE52,200ug/ml
ALS Vial : 60 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 17:59:31 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:53:12 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	31.204	59045137	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	29.236	232222136	188.129 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 376.26%#	
24) s d50-Tetracosane	35.856	189115760	188.848 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 377.70%#	
Target Compounds			
2) t n-Octane (C8)	5.671	183157154	190.329 ug/mL M4
3) t n-Nonane (C9)	7.851	189233153	189.772 ug/mL M4
4) t n-Decane (C10)	10.314	197105402	190.309 ug/mL M4
5) t n-Undecane (C11)	12.814	197342507	189.418 ug/mL M4
6) t n-Dodecane (C12)	15.236	199851913	189.405 ug/mL M4
7) t n-Tridecane (C13)	17.540	200742267	188.812 ug/mL M4
9) t n-Tetradecane (C14)	19.720	206335318	188.481 ug/mL M4
11) t n-Pentadecane (C15)	21.783	208167158	188.595 ug/mL M4
12) t n-Hexadecane (C16)	23.736	207154802	187.130 ug/mL M4
14) t n-Heptadecane (C17)	25.596	211459942	187.739 ug/mL M4
15) t Pristane	25.710	213225490	186.404 ug/mL M4
16) t n-Octadecane (C18)	27.361	214214001	188.181 ug/mL M4
17) t Phytane	27.526	197460643	187.352 ug/mL M4
18) t n-Nonadecane (C19)	29.043	215897373	188.966 ug/mL M4
20) t n-Eicosane (C20)	30.644	215981424	187.140 ug/mL M4
21) t n-Heneicosane (C21)	32.176	217732708	187.292 ug/mL M4
22) t n-Docosane (C22)	33.646	218063297	186.522 ug/mL M4
23) t n-Tricosane (C23)	35.056	218508257	187.509 ug/mL M4
25) t n-Tetracosane (C24)	36.410	218055777	189.377 ug/mL M4
26) t n-Pentacosane (C25)	37.707	214603392	187.235 ug/mL M4
27) t n-Hexacosane (C26)	38.962	220616563	187.235 ug/mL M4
28) t n-Heptacosane (C27)	40.170	220936904	188.156 ug/mL M4
29) t n-Octacosane (C28)	41.336	226021784	188.244 ug/mL M4
30) t n-Nonacosane (C29)	42.462	225374202	188.197 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822019.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 01:33 am
Operator : FID18:WR
Sample : I1801182205R
Misc : WG1596727,FRBE52,200ug/ml
ALS Vial : 60 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 17:59:31 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:53:12 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

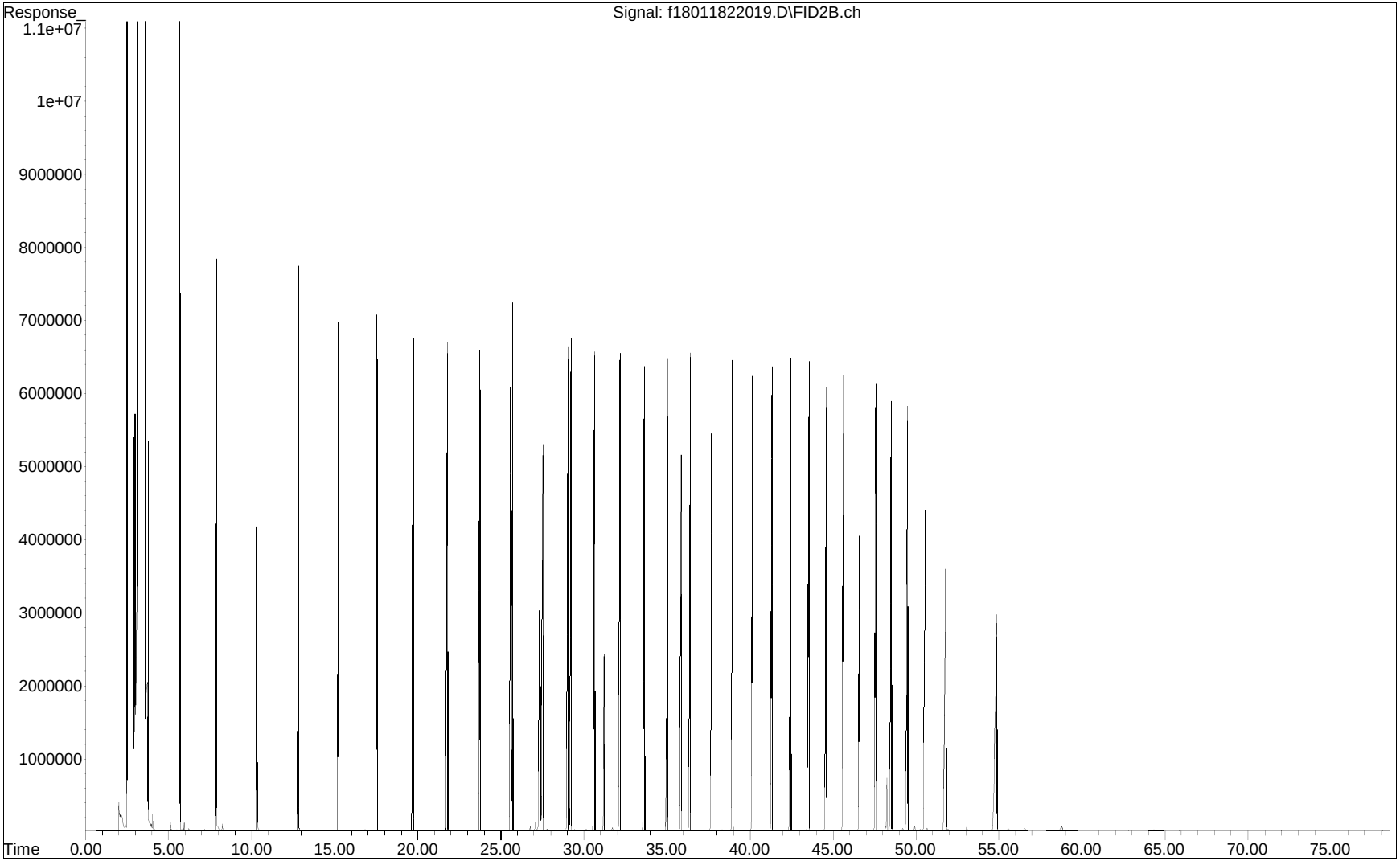
	Compound	R.T.	Response	Conc	Units	
31) t	n-Triacontane (C30)	43.553	226750621	188.459	ug/mL	M4
32) t	n-Hentriacontane (C31)	44.604	219370681	187.576	ug/mL	M4
33) t	n-Dotriacontane (C32)	45.631	231130445	188.910	ug/mL	M4
34) t	n-Tritriacontane (C33)	46.620	225257819	189.552	ug/mL	M4
35) t	n-tetratriacontane (C34)	47.580	225263411	190.196	ug/mL	M4
36) t	n-Pentatriacontane (C35)	48.513	211257814	186.097	ug/mL	M4
37) t	n-Hexatriacontane (C36)	49.491	256128437	192.515	ug/mL	M4
38) t	n-Heptatriacontane (C37)	50.573	233721984	192.168	ug/mL	M4
39) t	n-Octatriacontane (C38)	51.802	237329689	191.677	ug/mL	M4
41) t	n-Tetracontane (C40)	54.855	235168758	190.861	ug/mL	M4

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\f18011822019.D
Operator : FID18:WR
Acquired : 19 Jan 2022 01:33 am using AcqMethod FID18.M
Sample Name: I1801182205R
Instrument: FID 18
Misc Info : WG1596727,FRBE52,200ug/ml
Vial Number: 60
CurrentMeth: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M

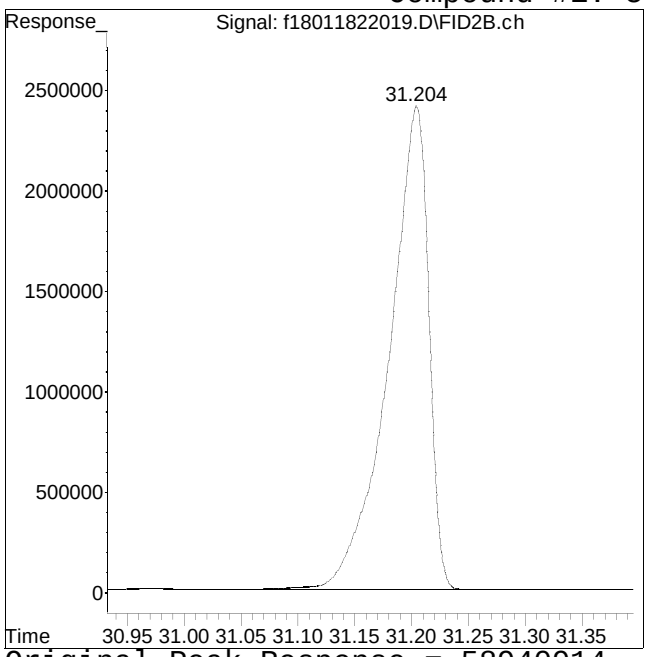


Manual Integration/Negative Proof Report

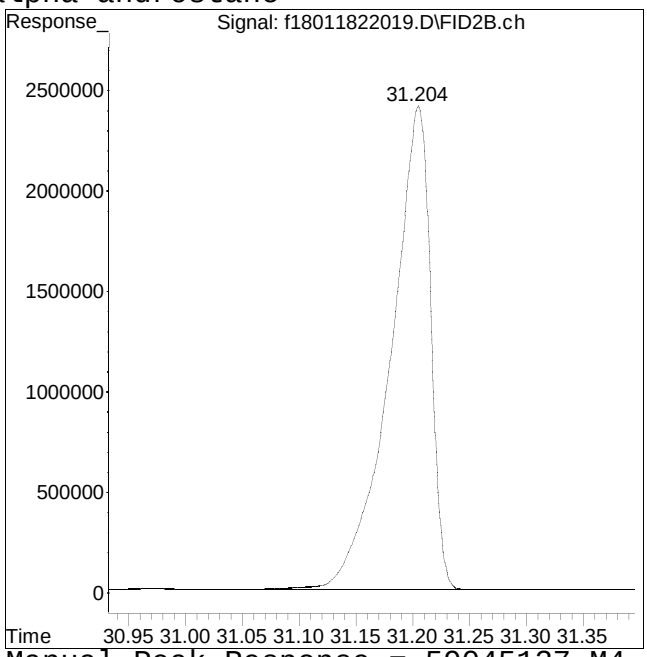
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #1: 5-alpha-androstane



Original Peak Response = 58940914



Manual Peak Response = 59045137 M4

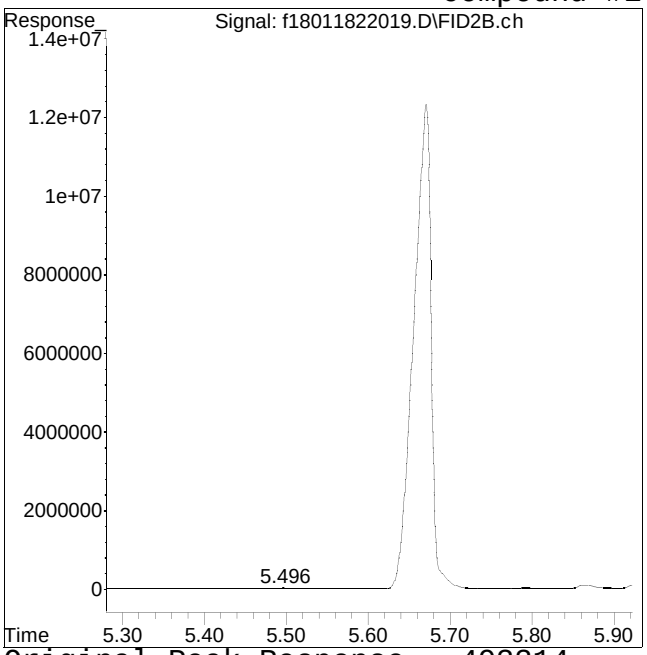
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

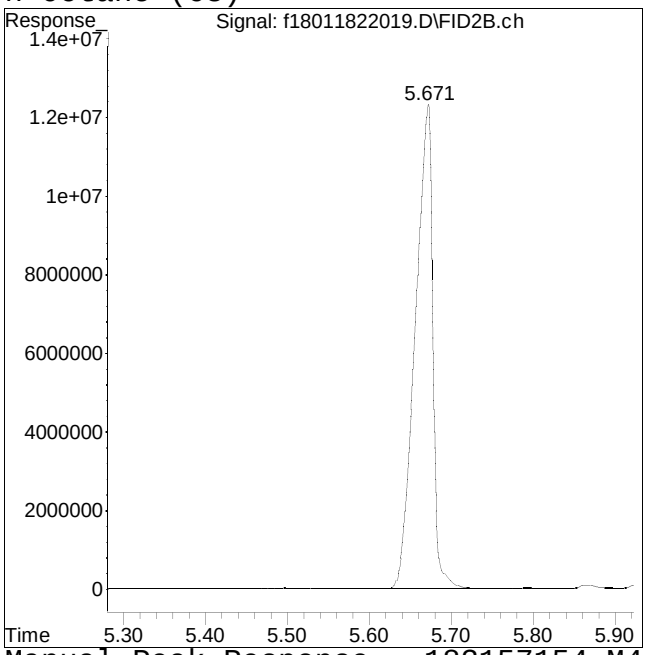
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #2: n-Octane (C8)



Original Peak Response = 493314



Manual Peak Response = 183157154 M4

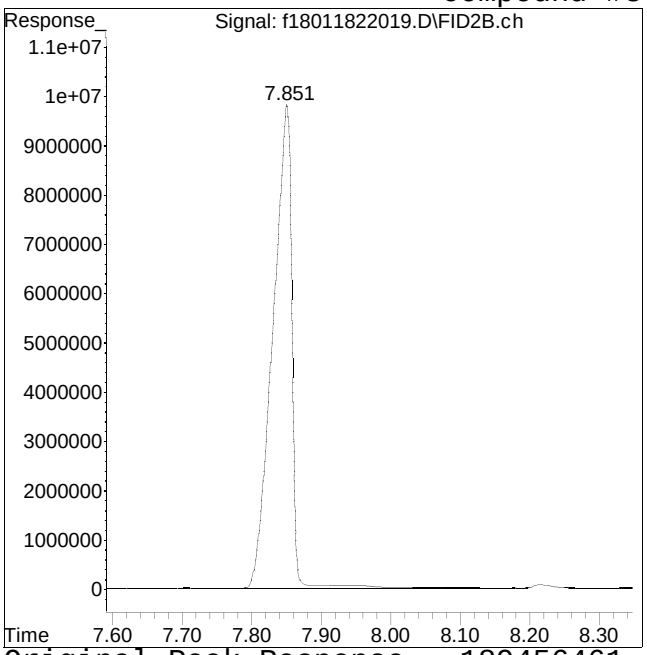
M4 = Poor automated baseline construction.

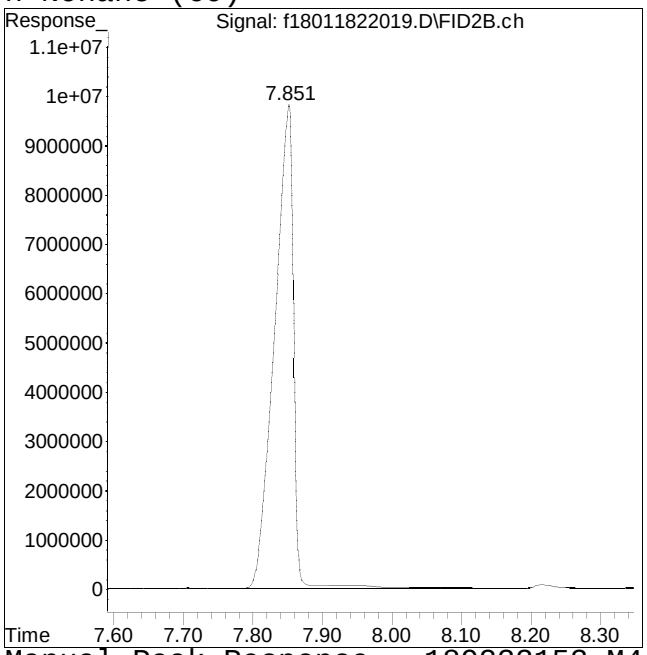
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #3: n-Nonane (C9)





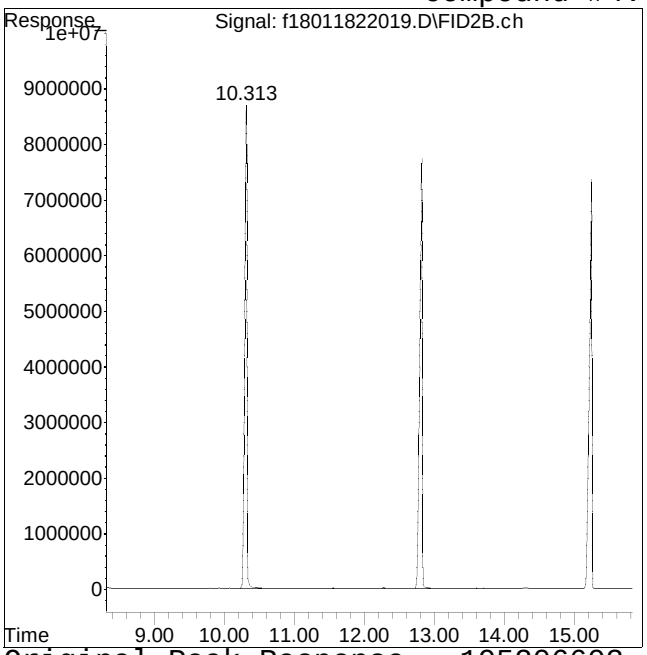
Original Peak Response = 189456461 Manual Peak Response = 189233153 M4
M4 = Poor automated baseline construction.

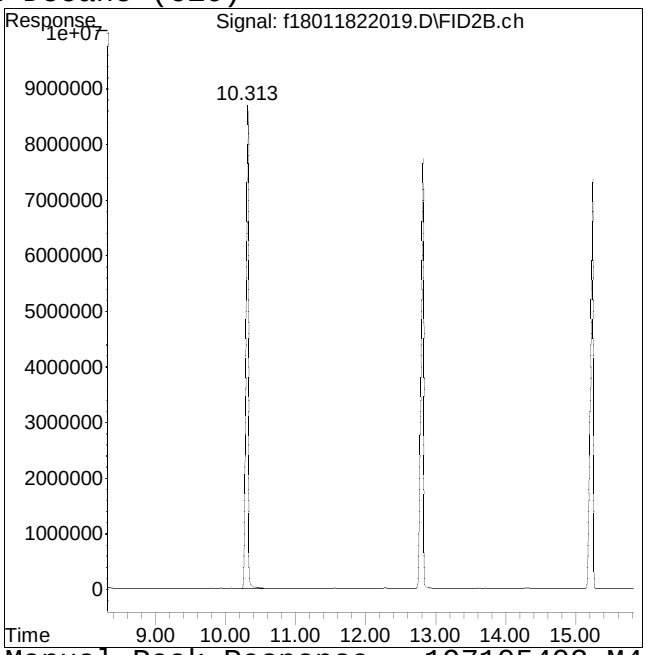
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #4: n-Decane (C10)





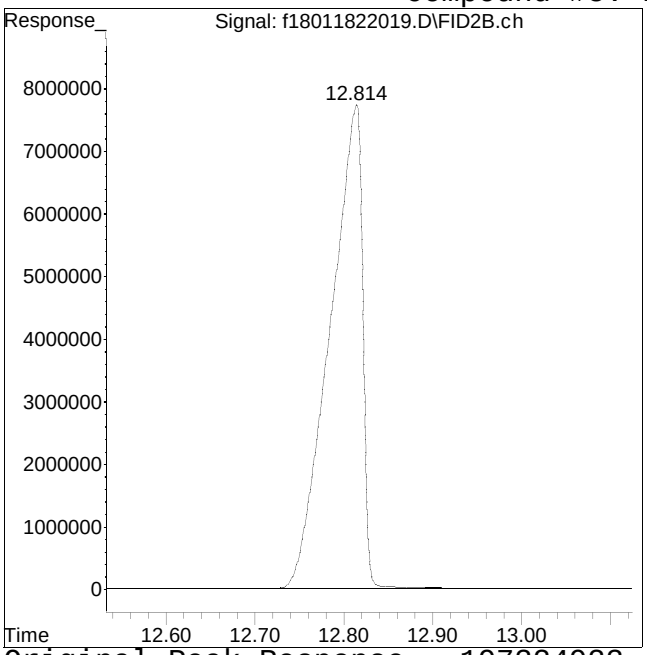
Original Peak Response = 195206603 Manual Peak Response = 197105402 M4
M4 = Poor automated baseline construction.

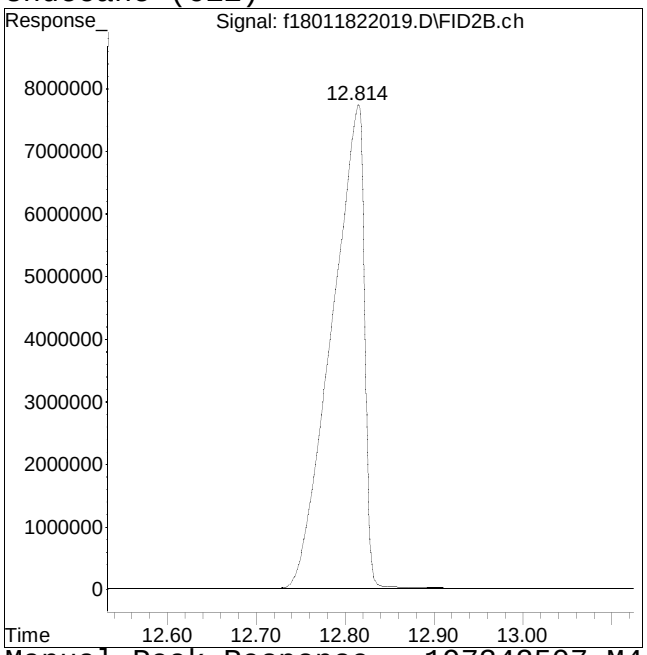
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #5: n-Undecane (C11)





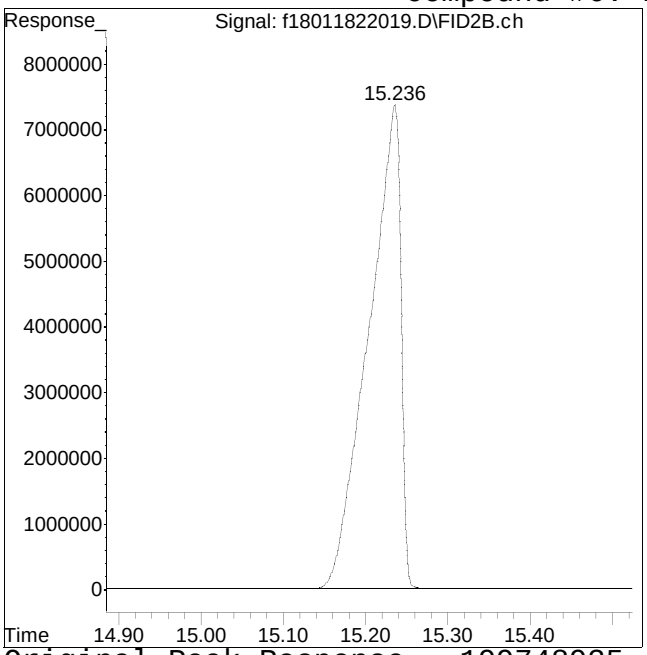
Original Peak Response = 197324923 Manual Peak Response = 197342507 M4
M4 = Poor automated baseline construction.

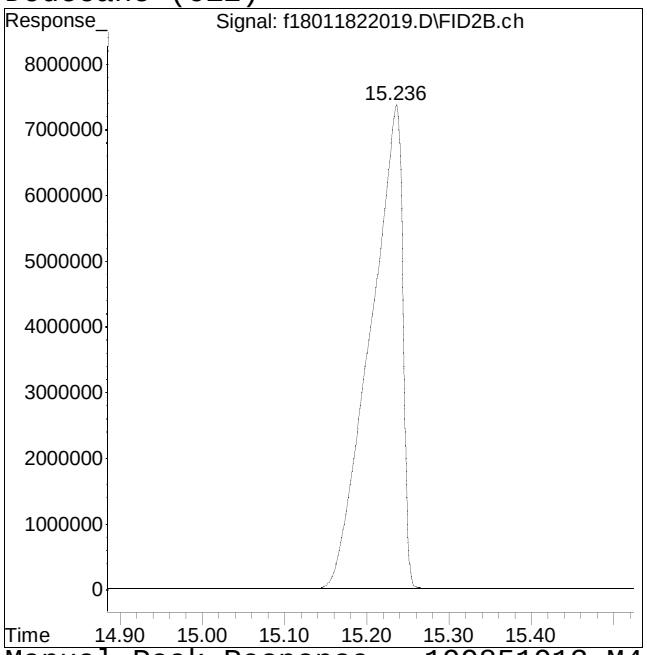
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #6: n-Dodecane (C12)





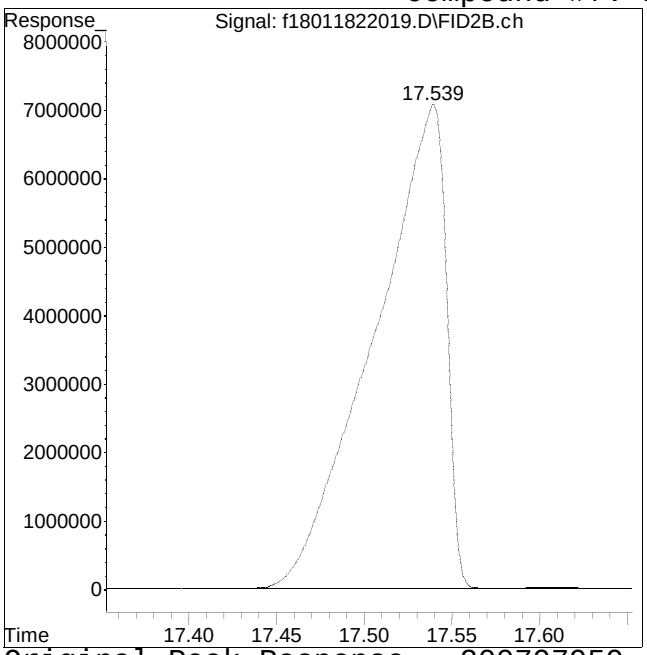
Original Peak Response = 199748935 Manual Peak Response = 199851913 M4
M4 = Poor automated baseline construction.

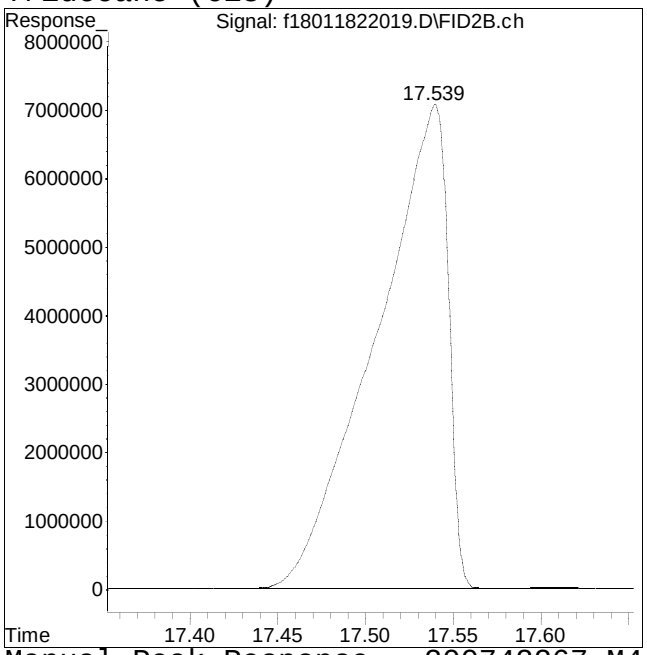
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #7: n-Tridecane (C13)





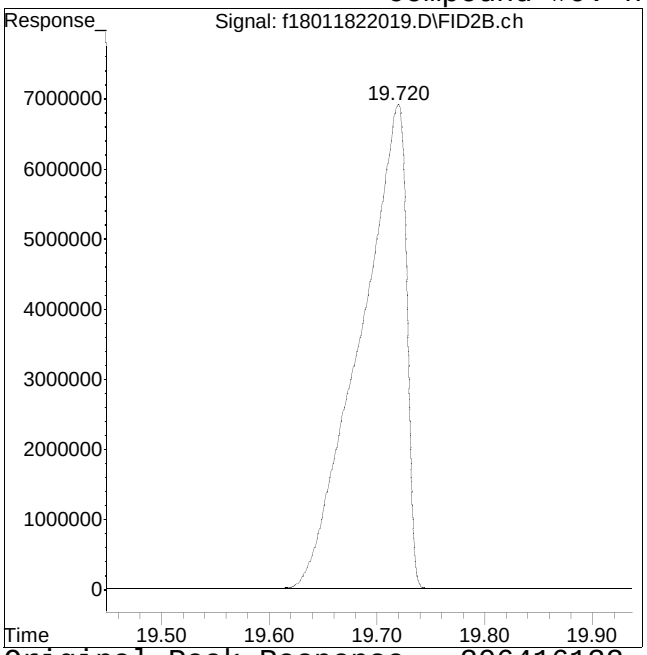
Original Peak Response = 200797959 Manual Peak Response = 200742267 M4
M4 = Poor automated baseline construction.

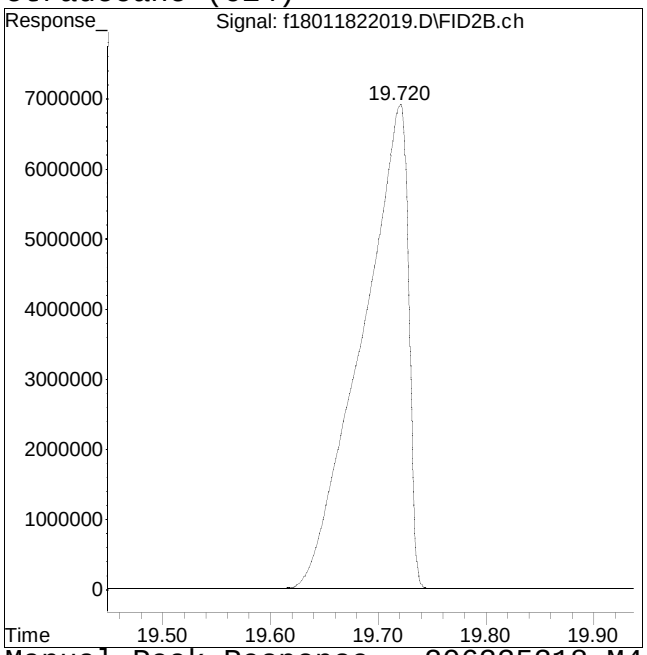
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #9: n-Tetradecane (C14)





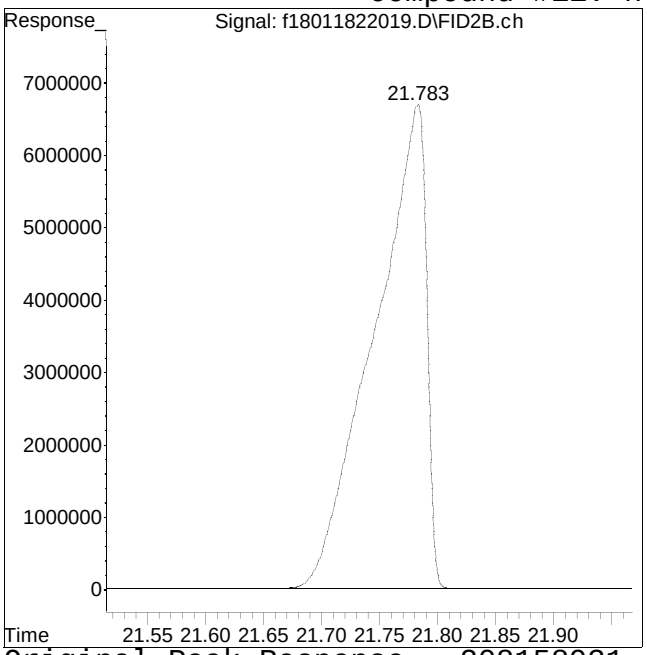
Original Peak Response = 206416132 Manual Peak Response = 206335318 M4
M4 = Poor automated baseline construction.

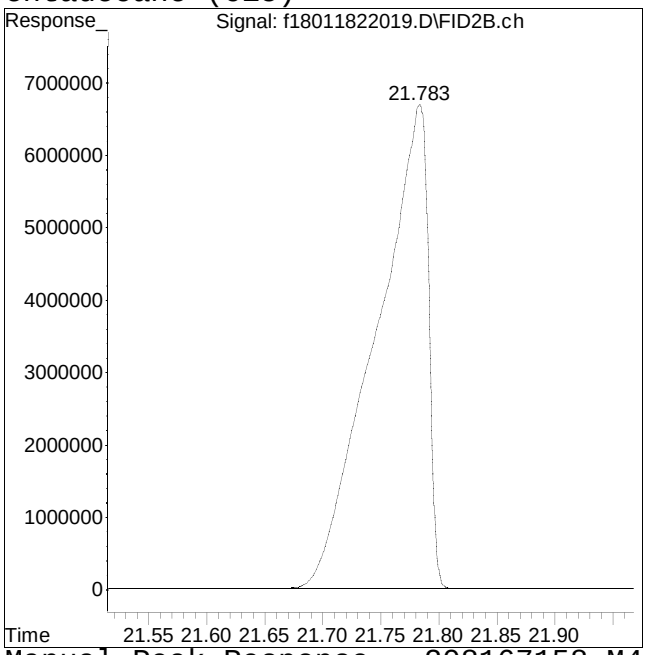
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #11: n-Pentadecane (C15)





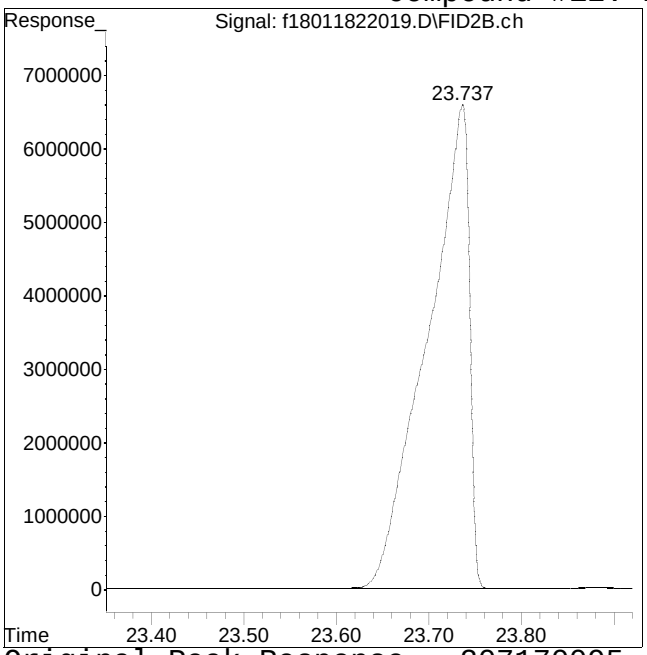
Original Peak Response = 208158931 Manual Peak Response = 208167158 M4
M4 = Poor automated baseline construction.

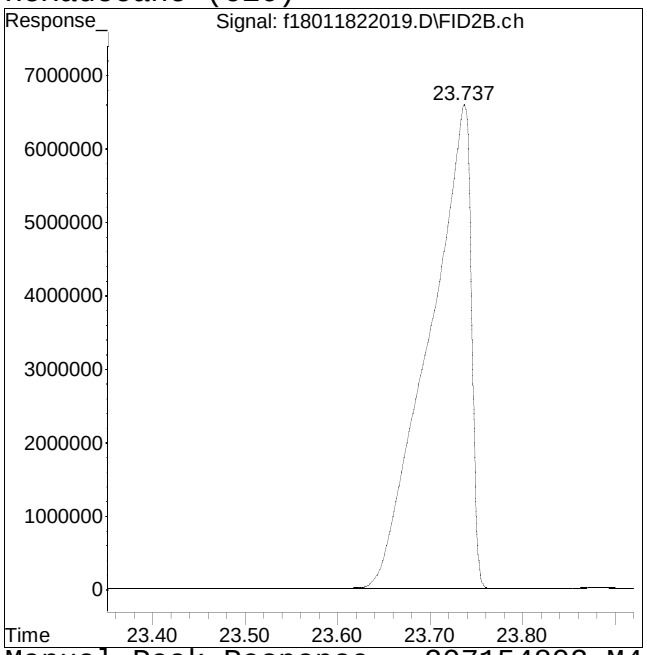
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #12: n-Hexadecane (C16)





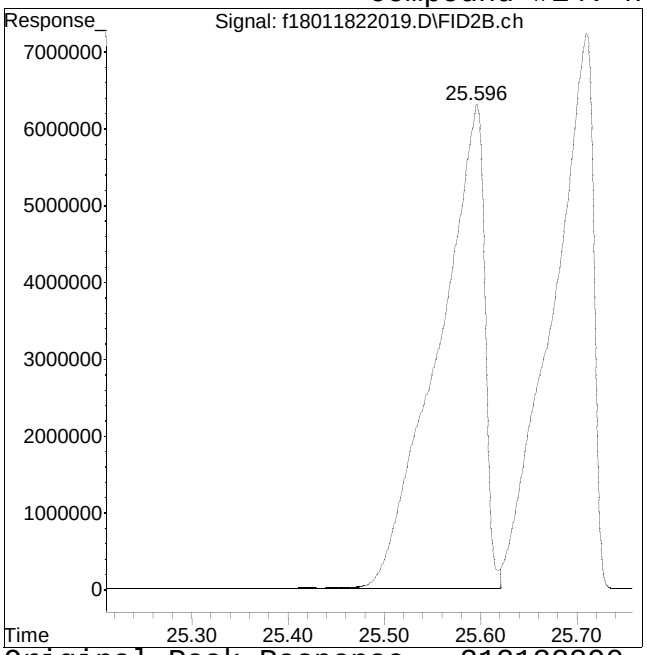
Original Peak Response = 207170095 Manual Peak Response = 207154802 M4
M4 = Poor automated baseline construction.

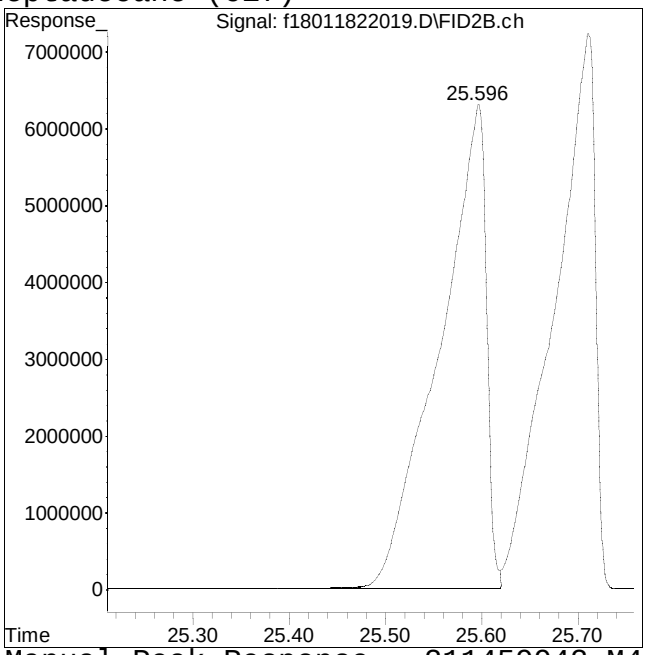
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #14: n-Heptadecane (C17)





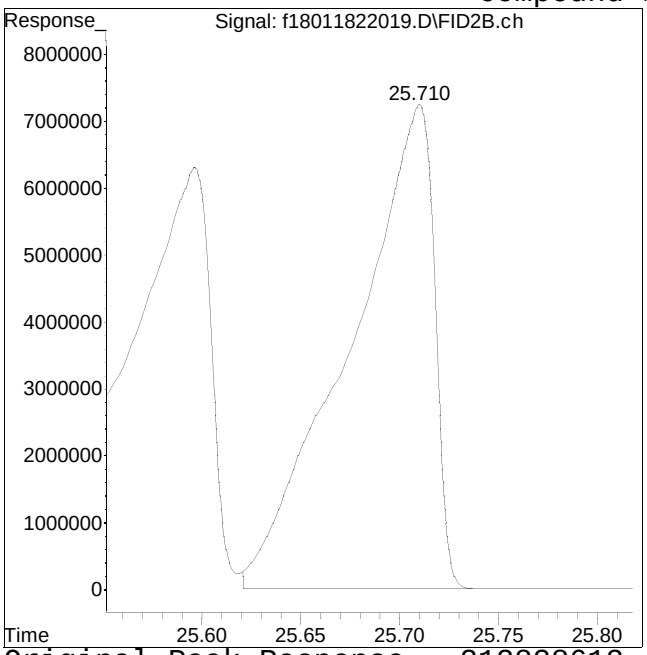
Original Peak Response = 212132390 Manual Peak Response = 211459942 M4
M4 = Poor automated baseline construction.

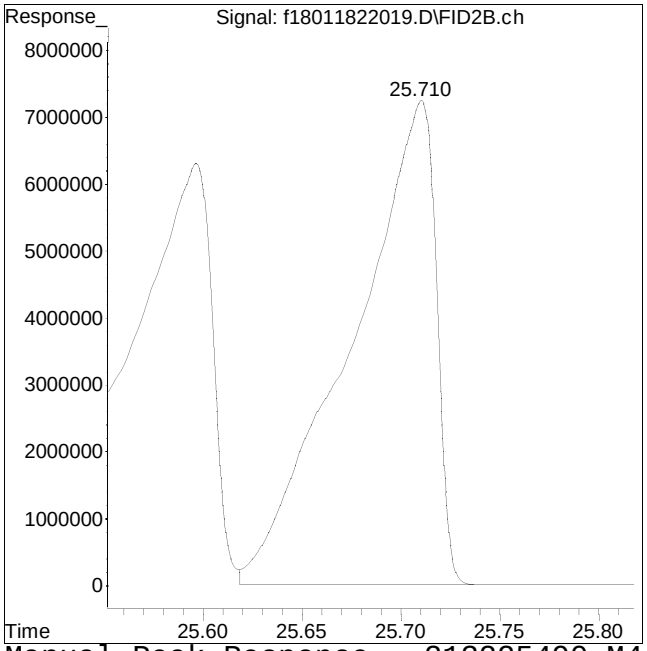
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #15: Pristane





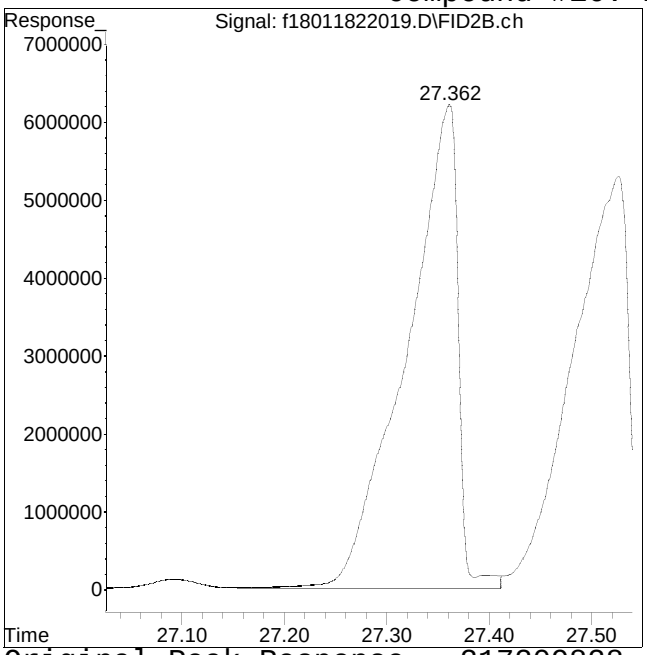
Original Peak Response = 212828612 Manual Peak Response = 213225490 M4
M4 = Poor automated baseline construction.

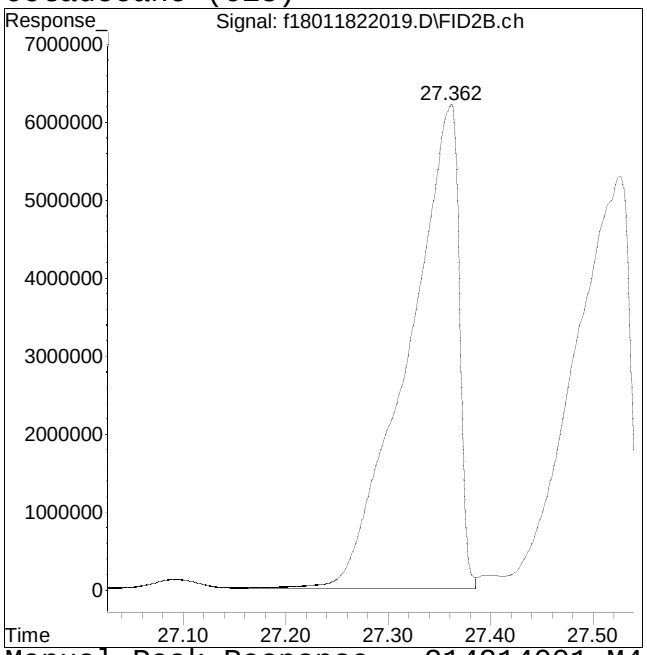
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #16: n-Octadecane (C18)





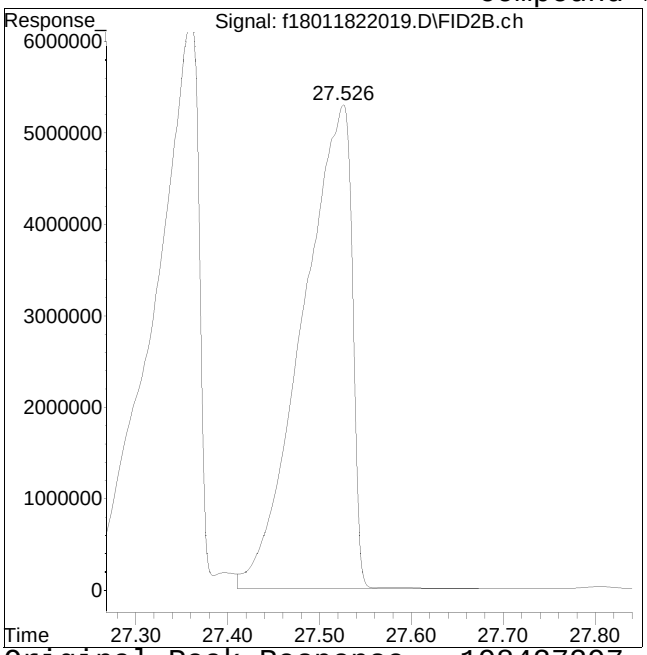
Original Peak Response = 217209828 Manual Peak Response = 214214001 M4
M4 = Poor automated baseline construction.

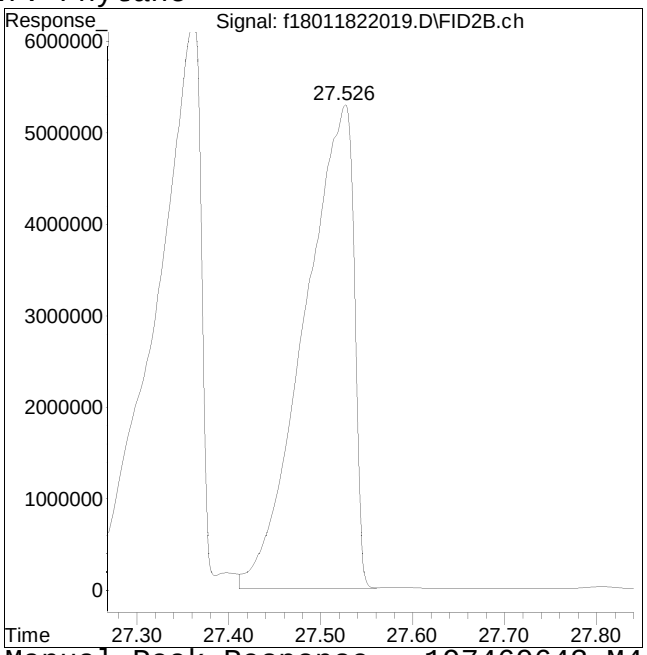
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #17: Phytane





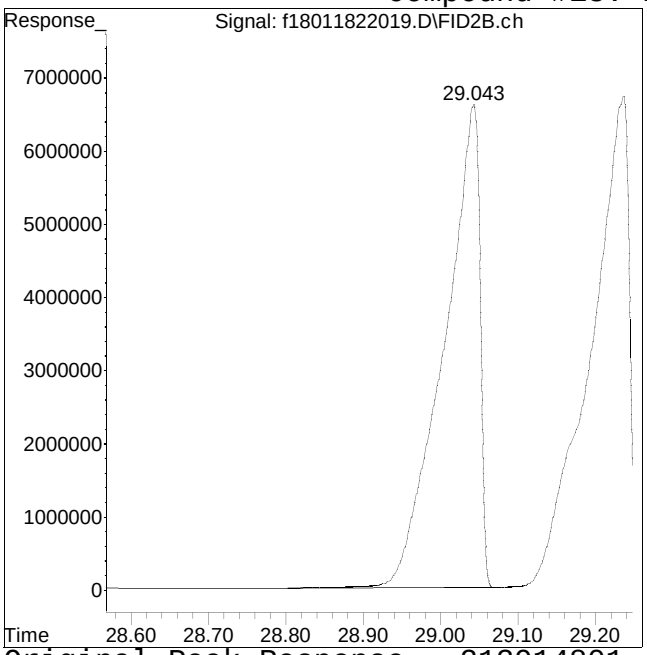
Original Peak Response = 198427297 Manual Peak Response = 197460643 M4
M4 = Poor automated baseline construction.

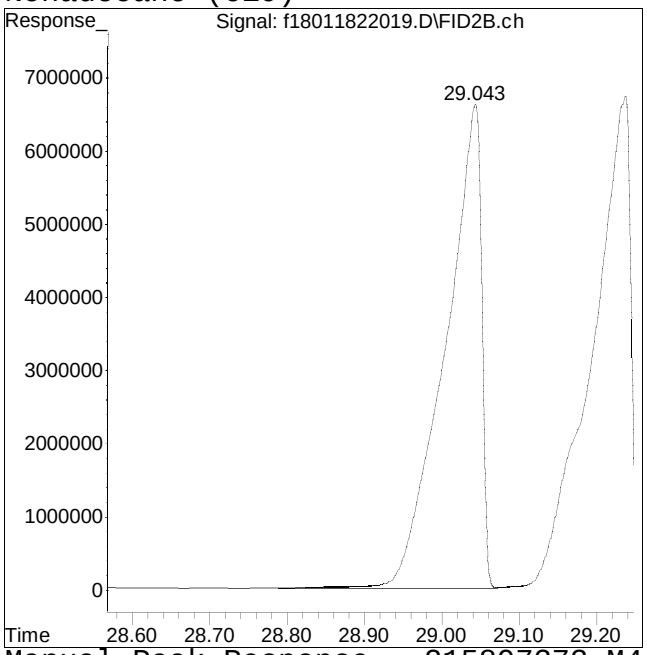
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #18: n-Nonadecane (C19)





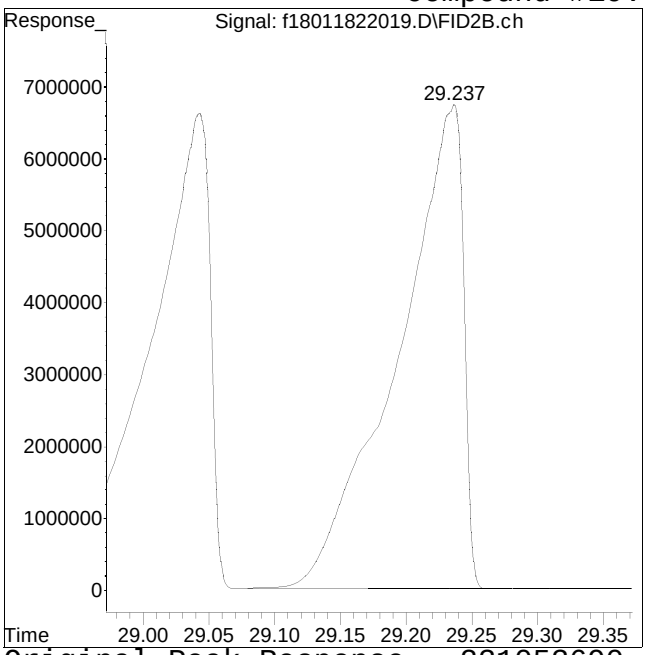
Original Peak Response = 213914801 Manual Peak Response = 215897373 M4
M4 = Poor automated baseline construction.

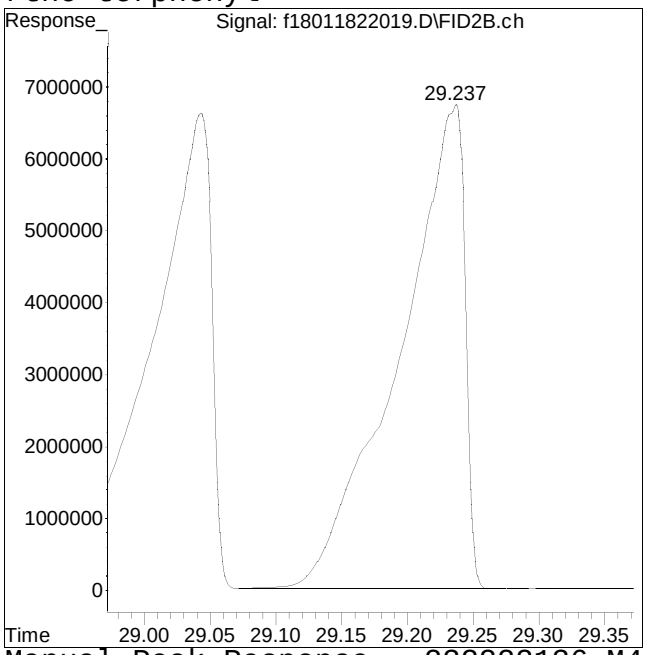
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #19: ortho-terphenyl





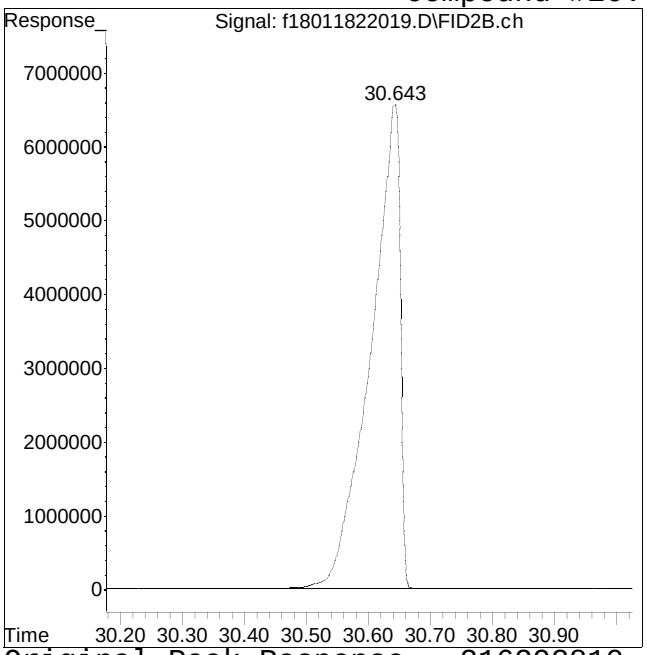
Original Peak Response = 231053690 Manual Peak Response = 232222136 M4
M4 = Poor automated baseline construction.

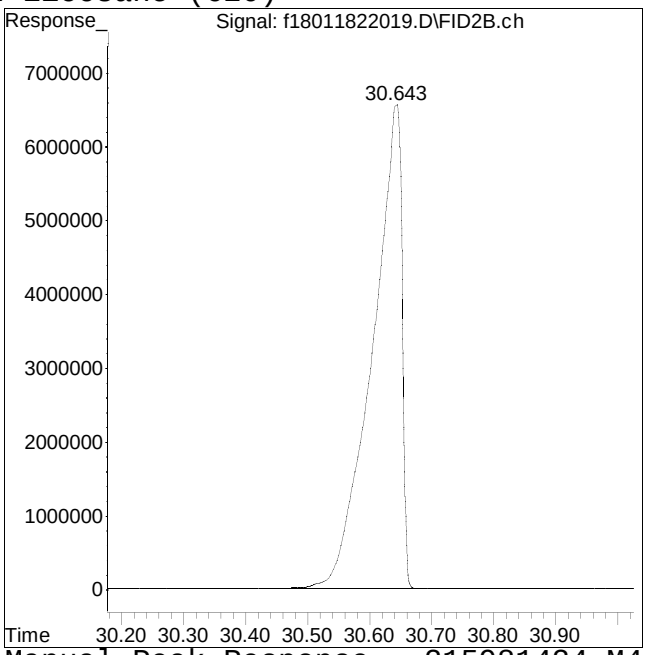
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #20: n-Eicosane (C20)





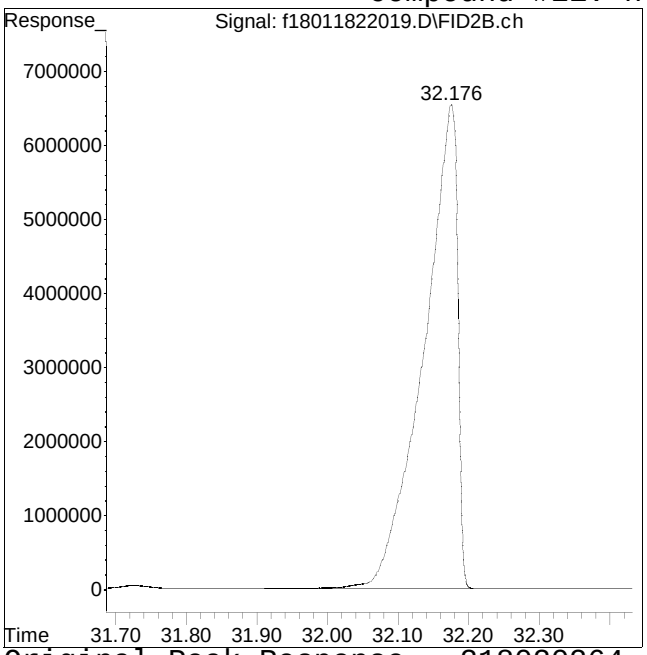
Original Peak Response = 216292810 Manual Peak Response = 215981424 M4
M4 = Poor automated baseline construction.

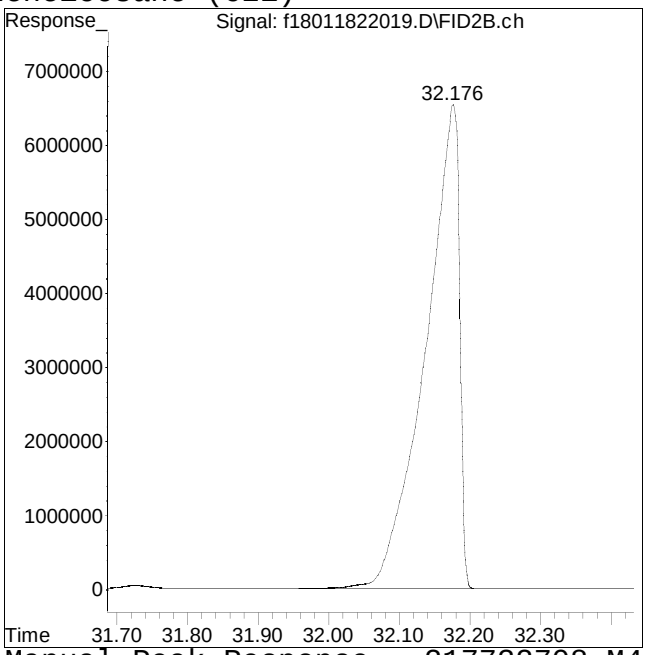
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #21: n-Heneicosane (C21)





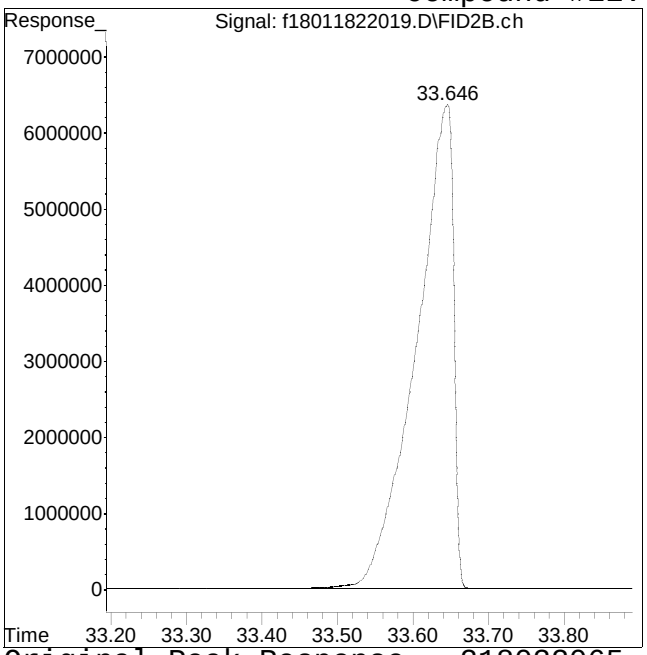
Original Peak Response = 218020264 Manual Peak Response = 217732708 M4
M4 = Poor automated baseline construction.

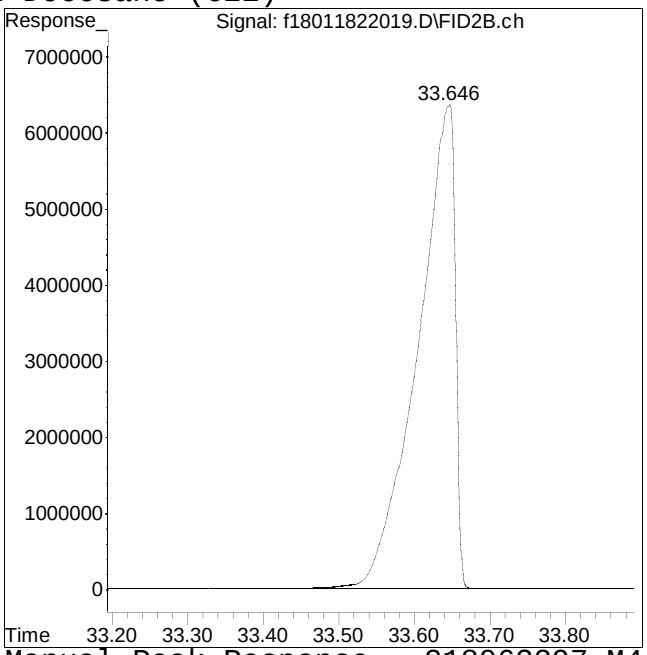
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #22: n-Docosane (C22)





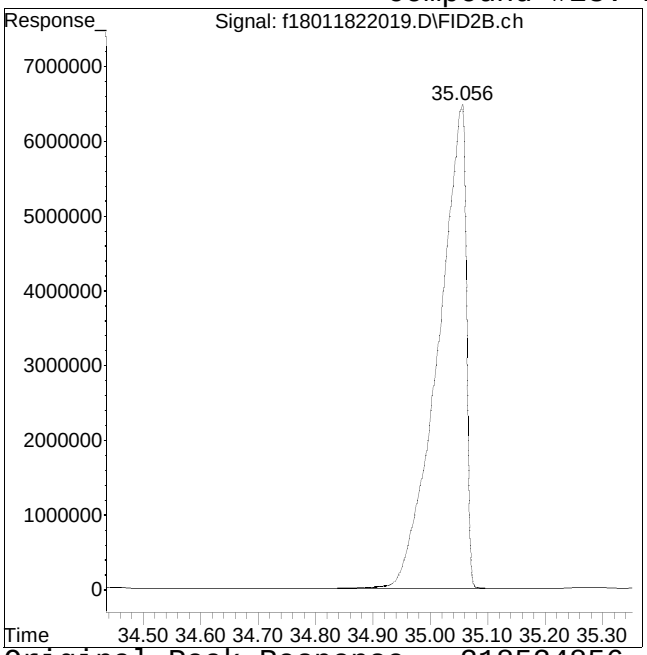
Original Peak Response = 218032065 Manual Peak Response = 218063297 M4
M4 = Poor automated baseline construction.

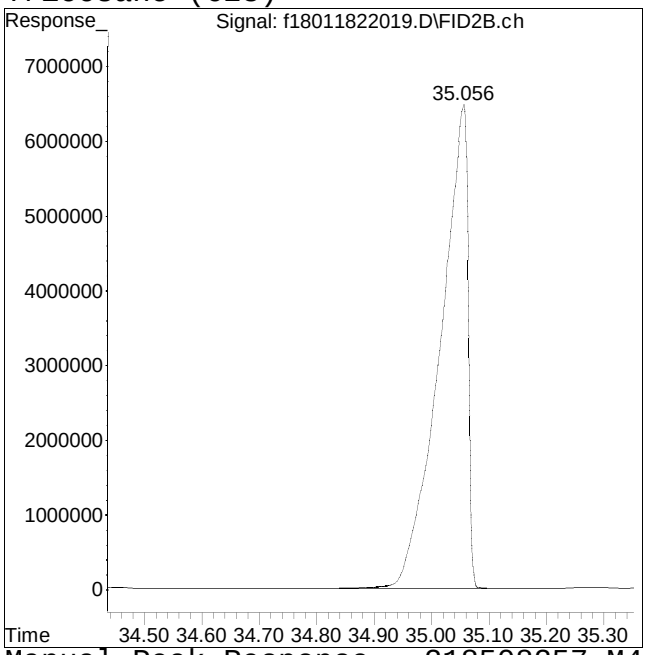
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #23: n-Tricosane (C23)





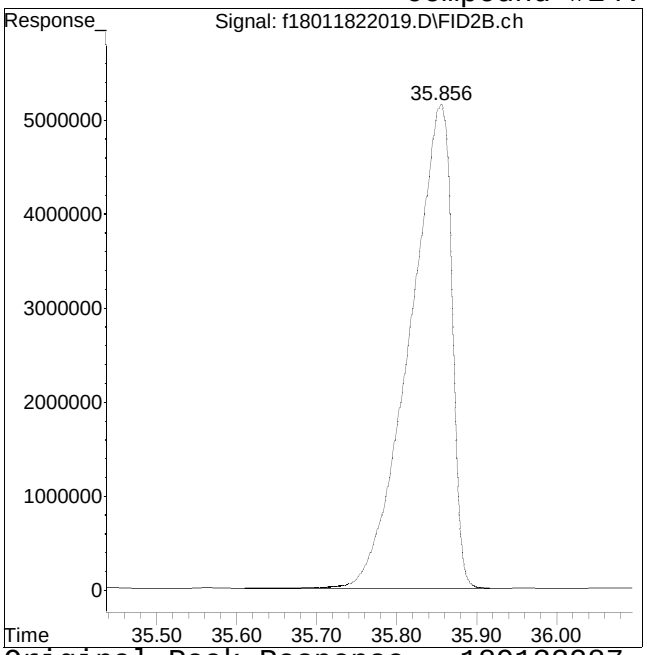
Original Peak Response = 218524856 Manual Peak Response = 218508257 M4
M4 = Poor automated baseline construction.

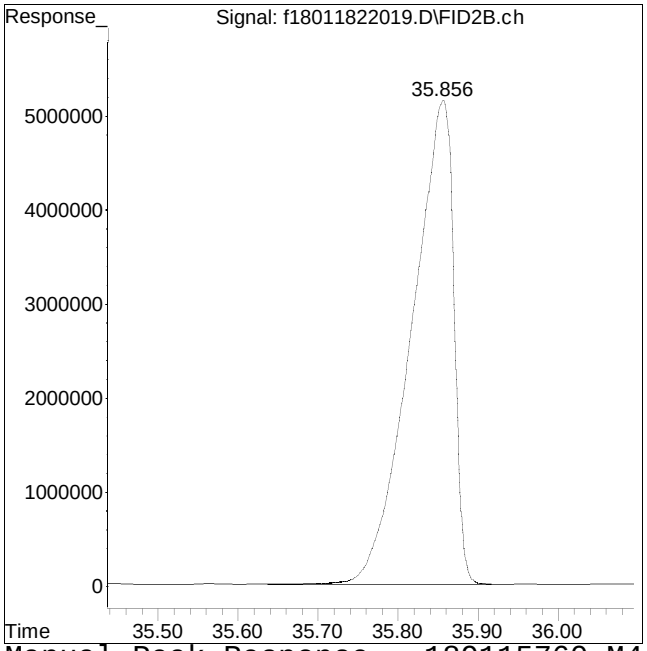
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #24: d50-Tetracosane





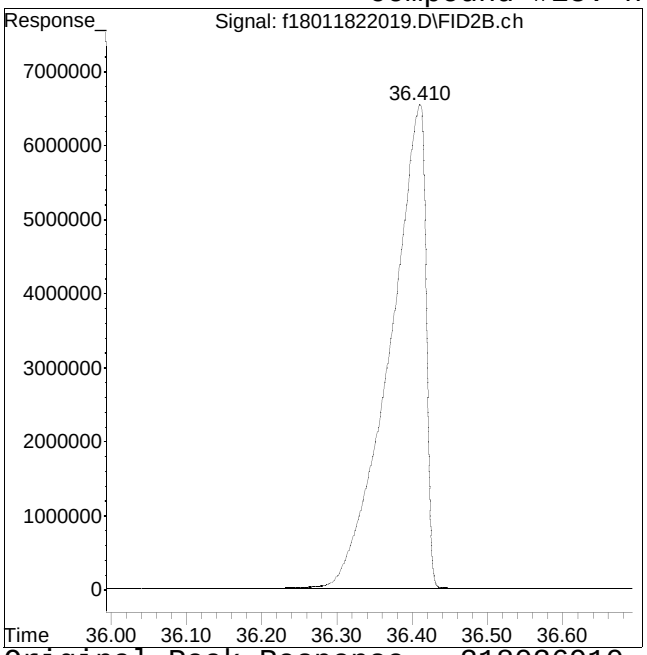
Original Peak Response = 189133287 Manual Peak Response = 189115760 M4
M4 = Poor automated baseline construction.

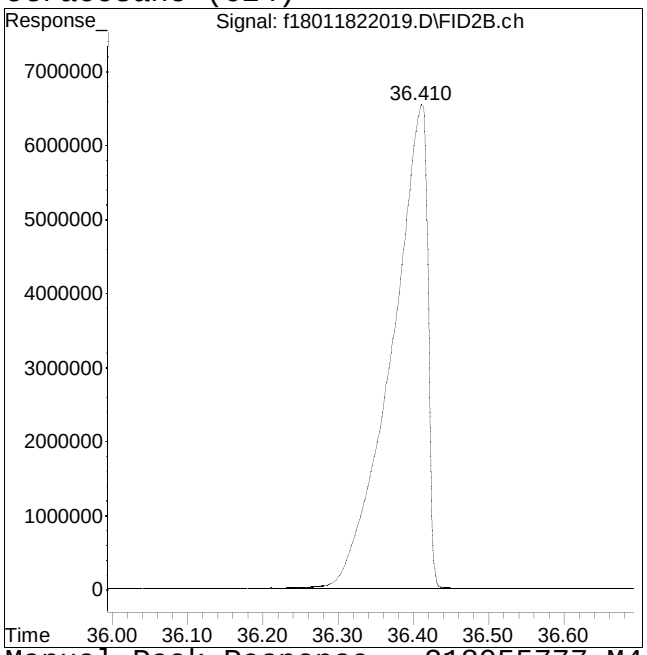
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #25: n-Tetracosane (C24)





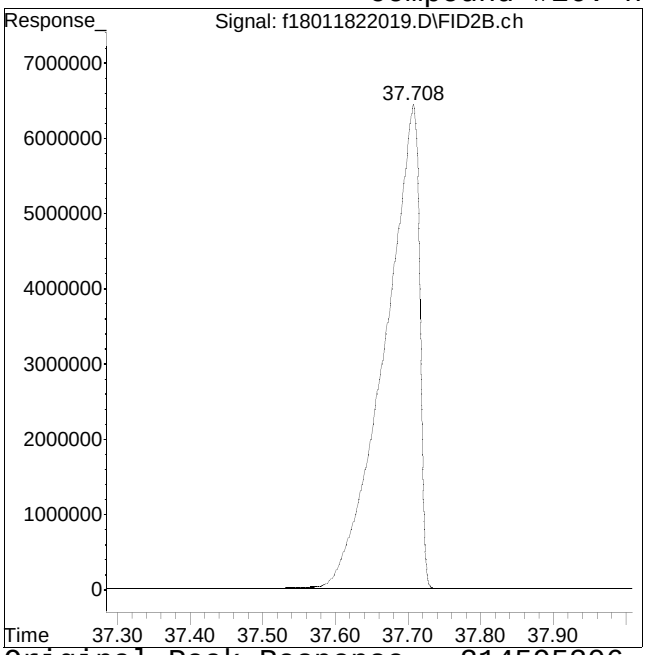
Original Peak Response = 218036910 Manual Peak Response = 218055777 M4
M4 = Poor automated baseline construction.

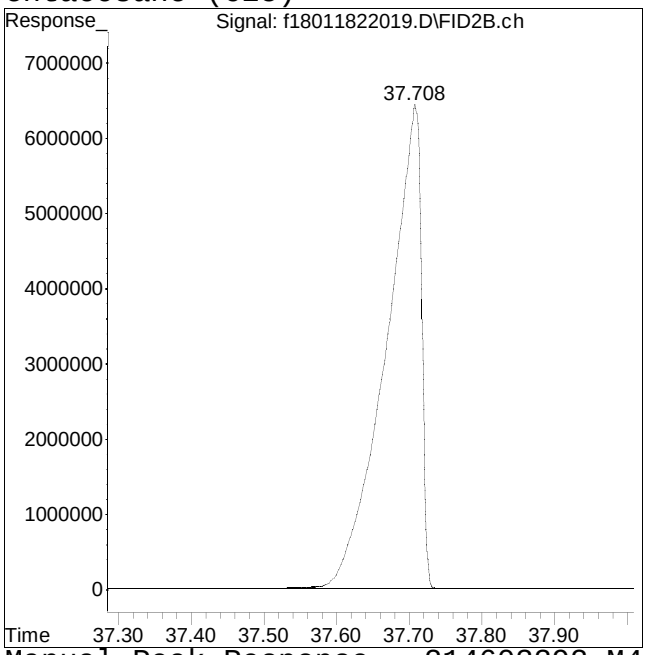
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #26: n-Pentacosane (C25)





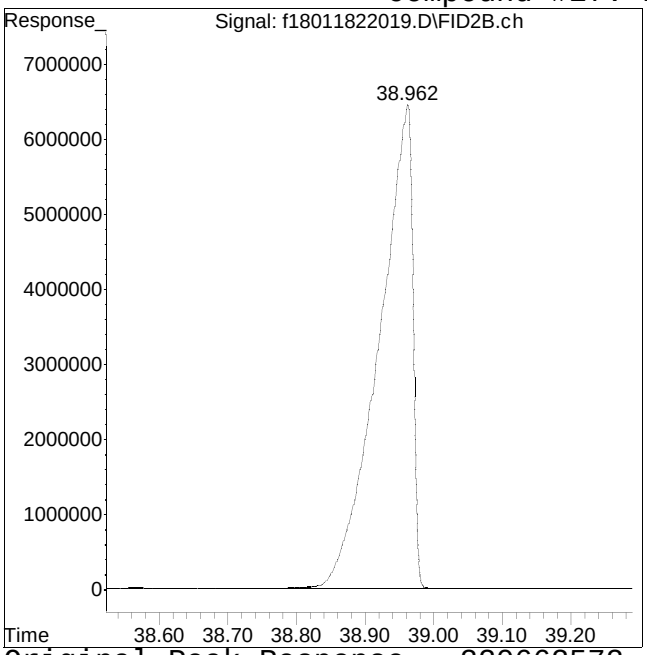
Original Peak Response = 214595306 Manual Peak Response = 214603392 M4
M4 = Poor automated baseline construction.

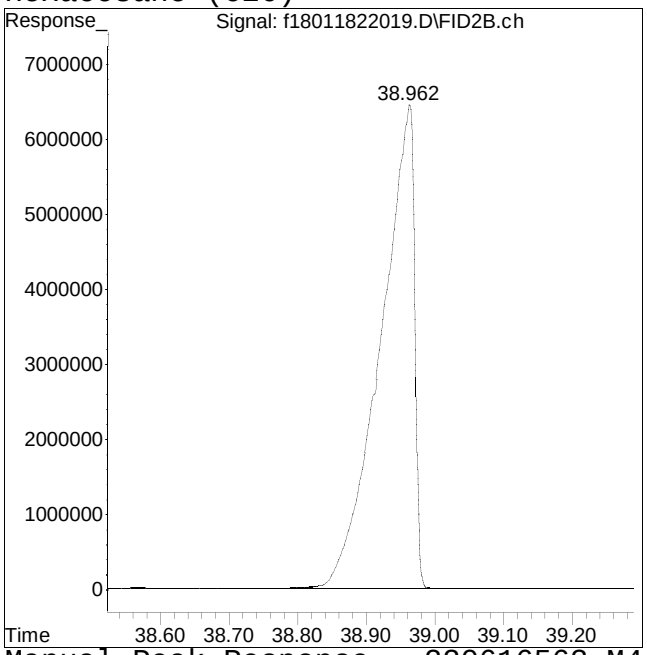
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #27: n-Hexacosane (C26)





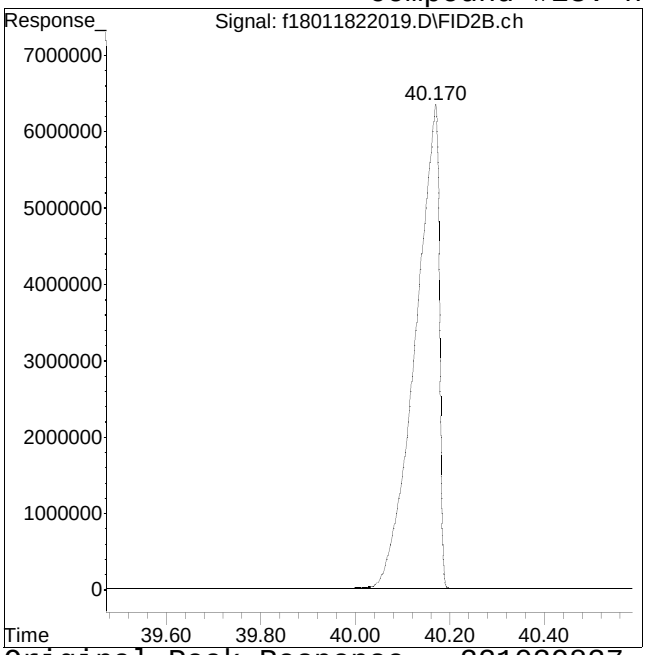
Original Peak Response = 220662572 Manual Peak Response = 220616563 M4
M4 = Poor automated baseline construction.

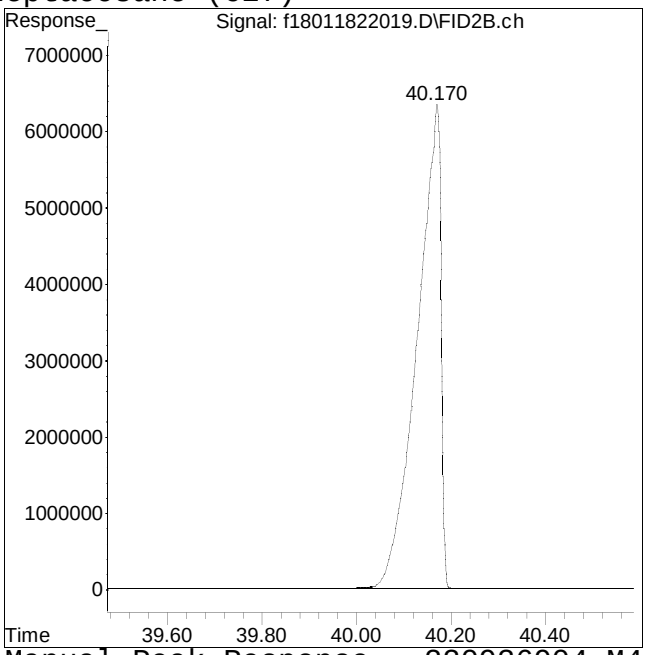
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #28: n-Heptacosane (C27)





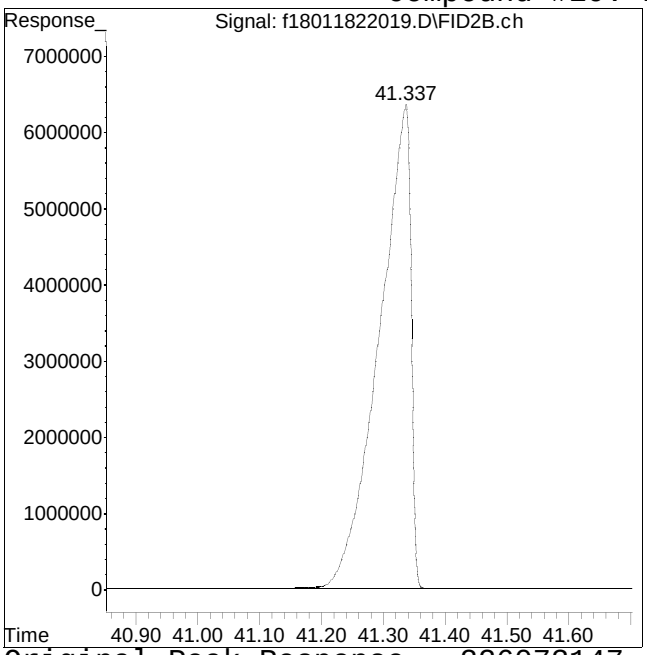
Original Peak Response = 221039837 Manual Peak Response = 220936904 M4
M4 = Poor automated baseline construction.

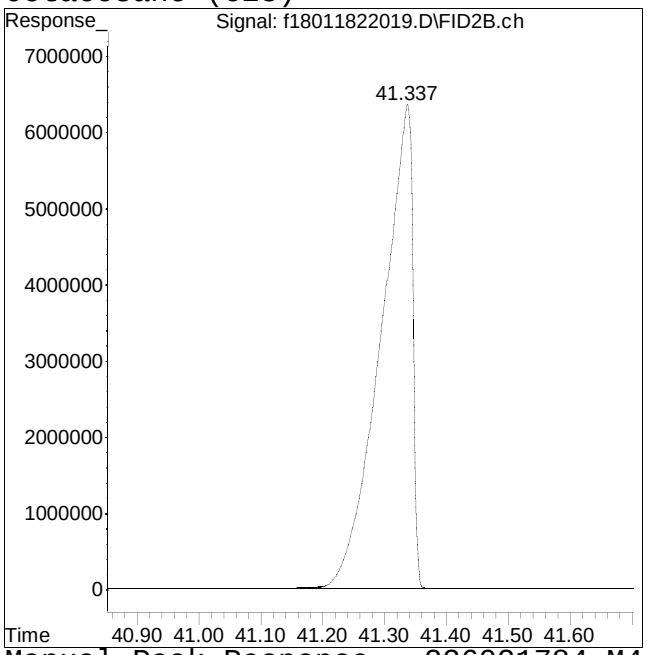
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #29: n-Octacosane (C28)





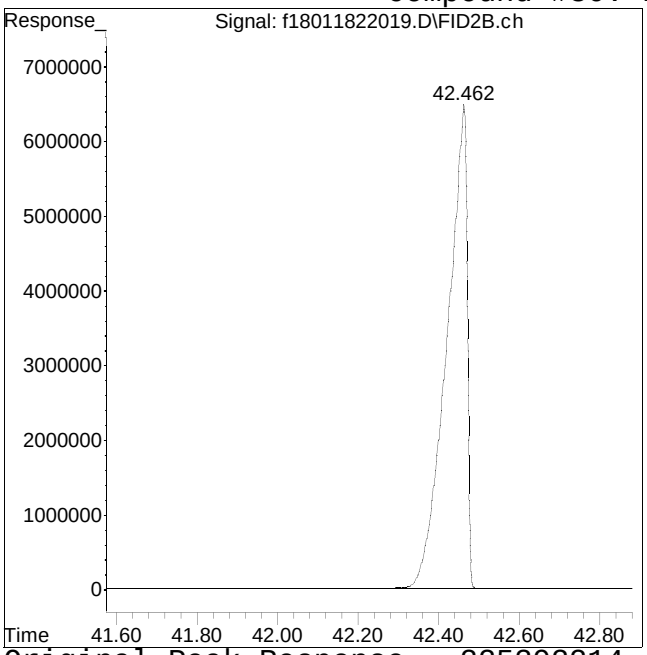
Original Peak Response = 226073147 Manual Peak Response = 226021784 M4
M4 = Poor automated baseline construction.

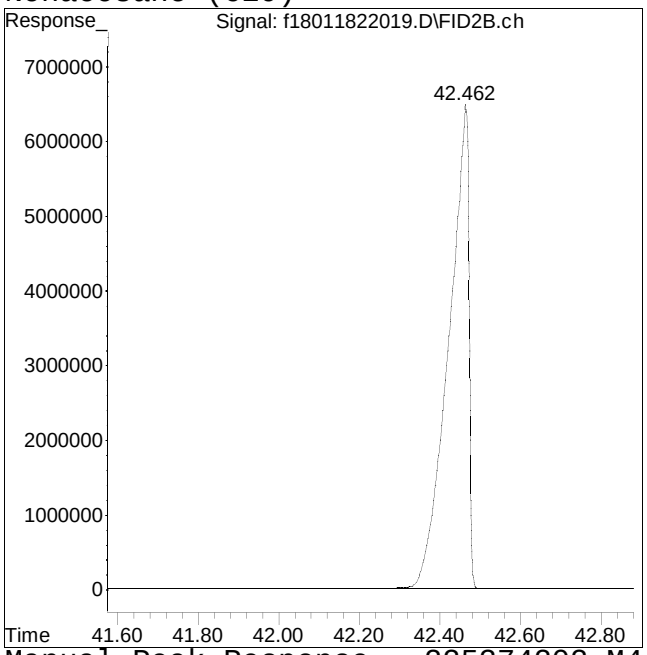
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #30: n-Nonacosane (C29)





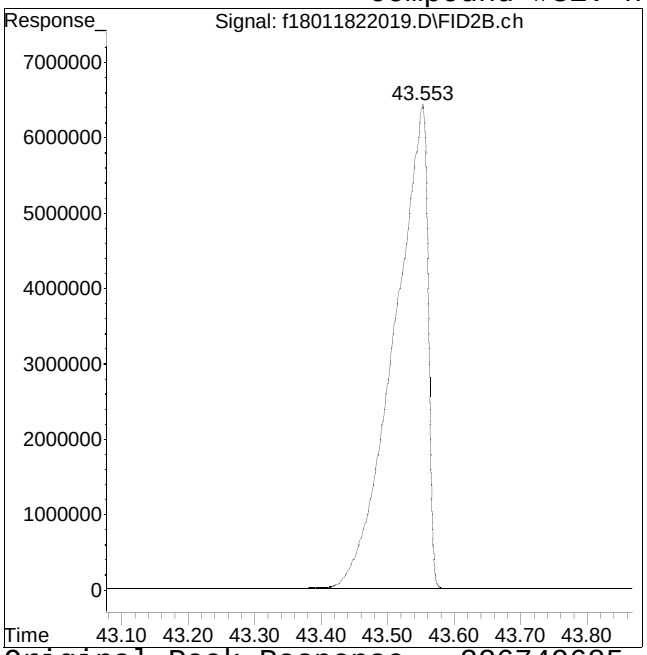
Original Peak Response = 225392214 Manual Peak Response = 225374202 M4
M4 = Poor automated baseline construction.

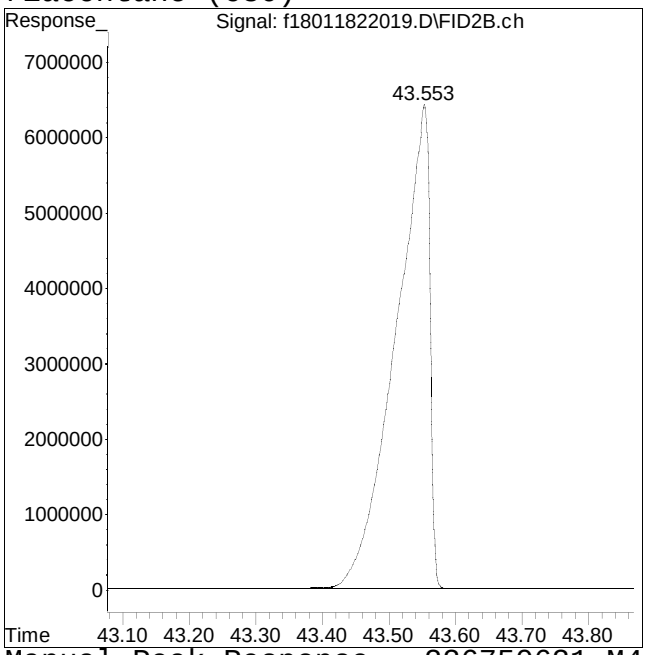
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #31: n-Triacontane (C30)





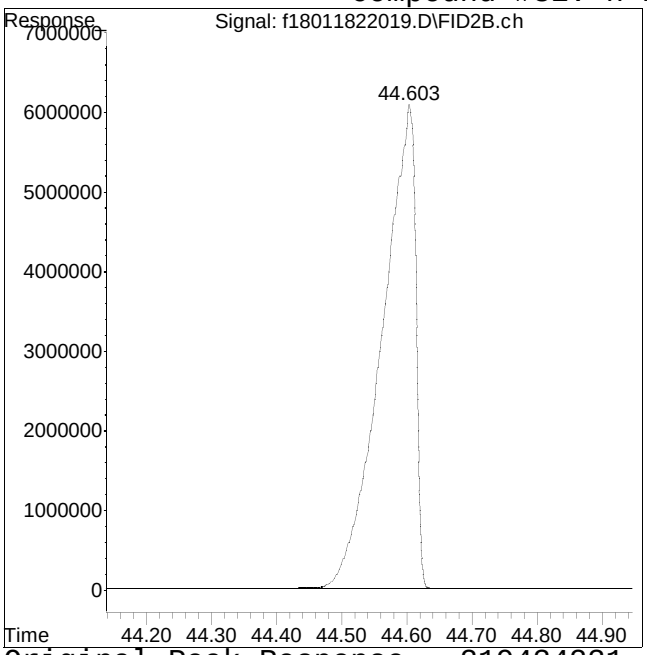
Original Peak Response = 226749685 Manual Peak Response = 226750621 M4
M4 = Poor automated baseline construction.

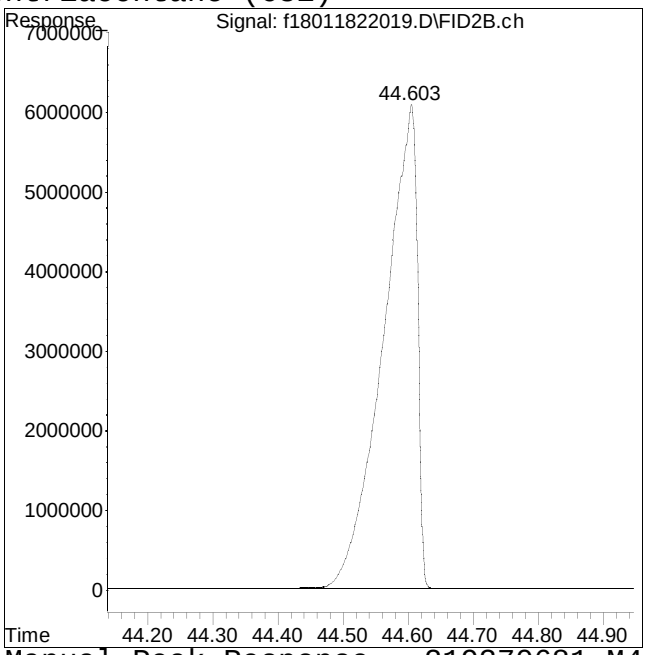
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #32: n-Hentriacontane (C31)





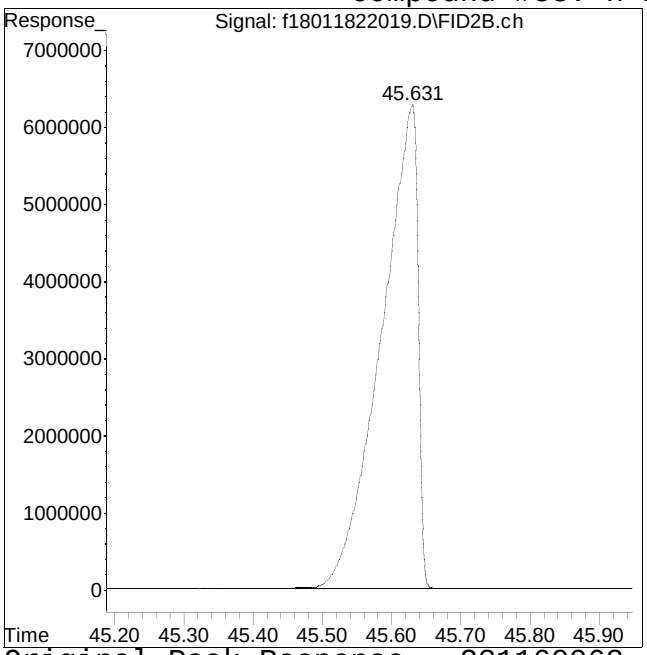
Original Peak Response = 219434231 Manual Peak Response = 219370681 M4
M4 = Poor automated baseline construction.

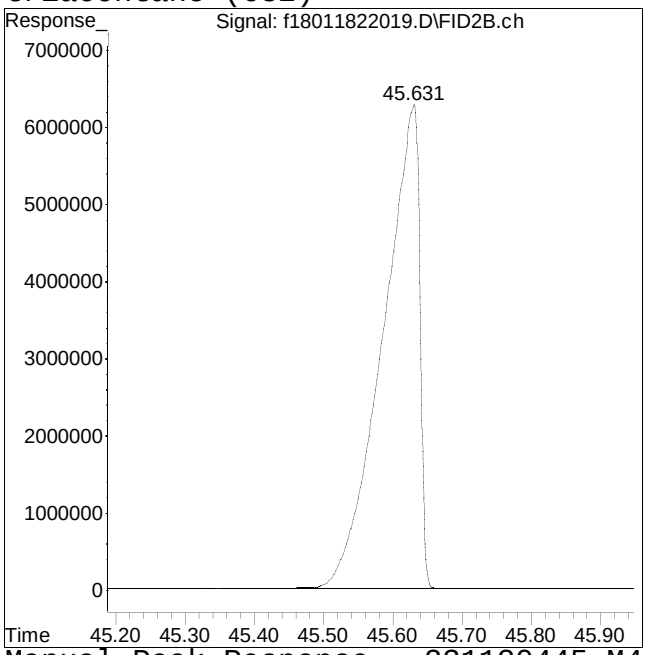
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #33: n-Dotriacontane (C32)





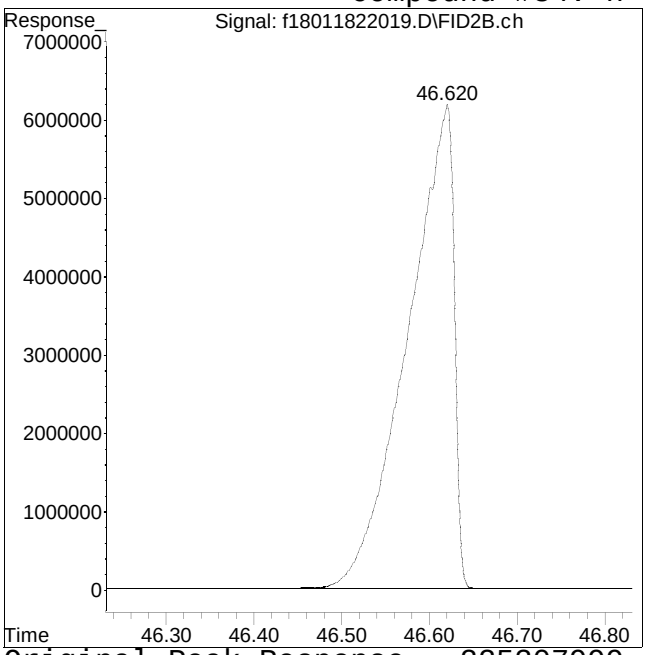
Original Peak Response = 231160063 Manual Peak Response = 231130445 M4
M4 = Poor automated baseline construction.

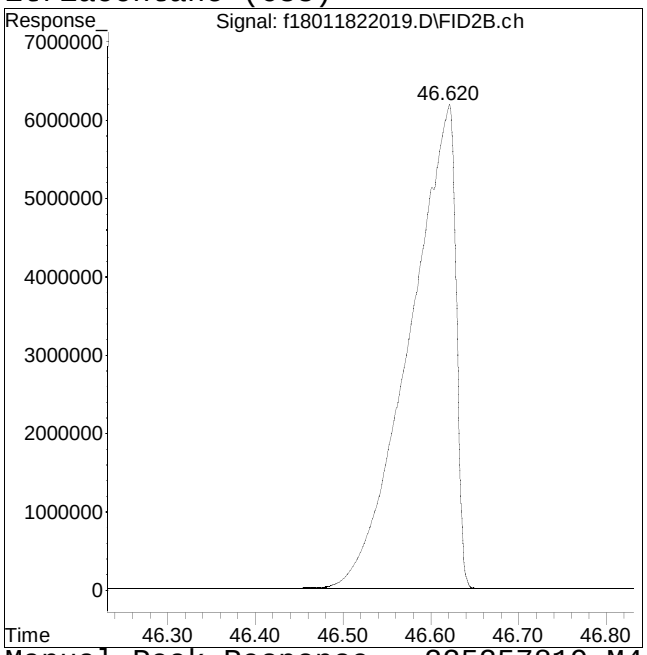
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #34: n-Tritriacontane (C33)





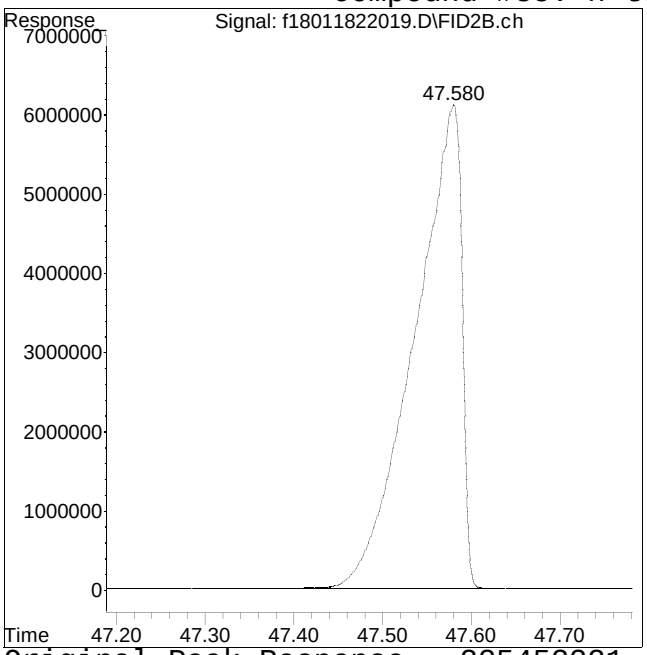
Original Peak Response = 225307999 Manual Peak Response = 225257819 M4
M4 = Poor automated baseline construction.

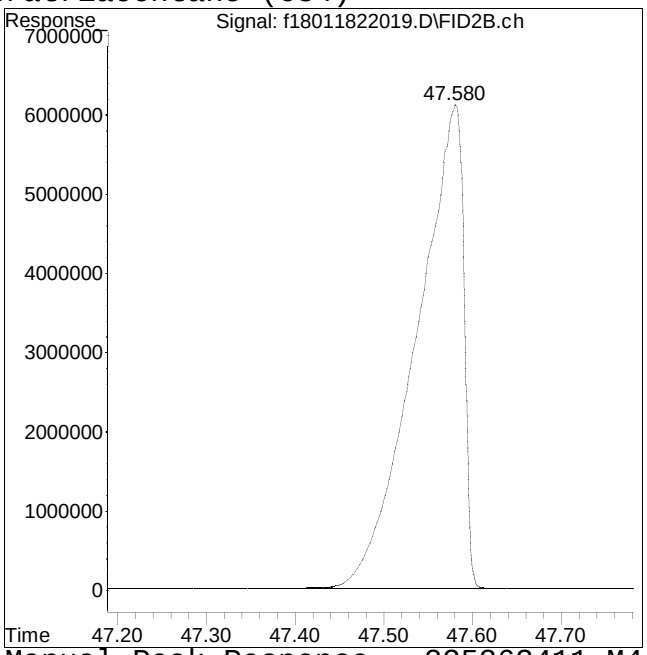
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #35: n-tetratriacontane (C34)





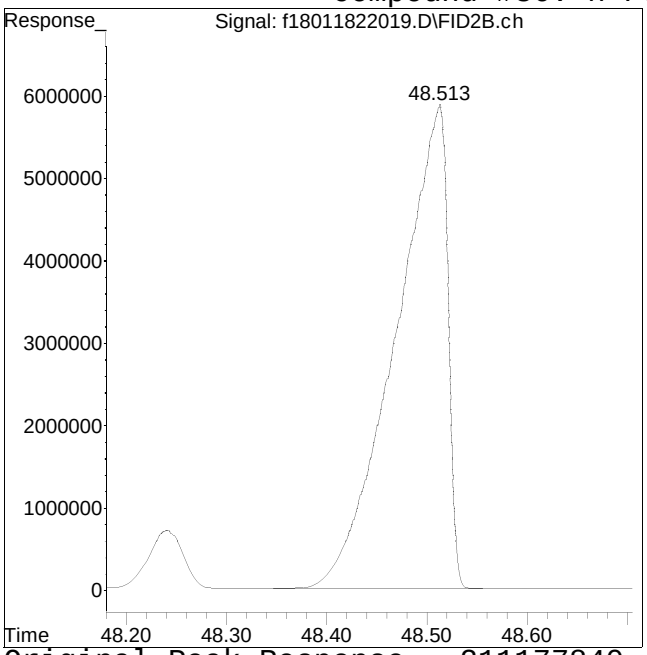
Original Peak Response = 225452221 Manual Peak Response = 225263411 M4
M4 = Poor automated baseline construction.

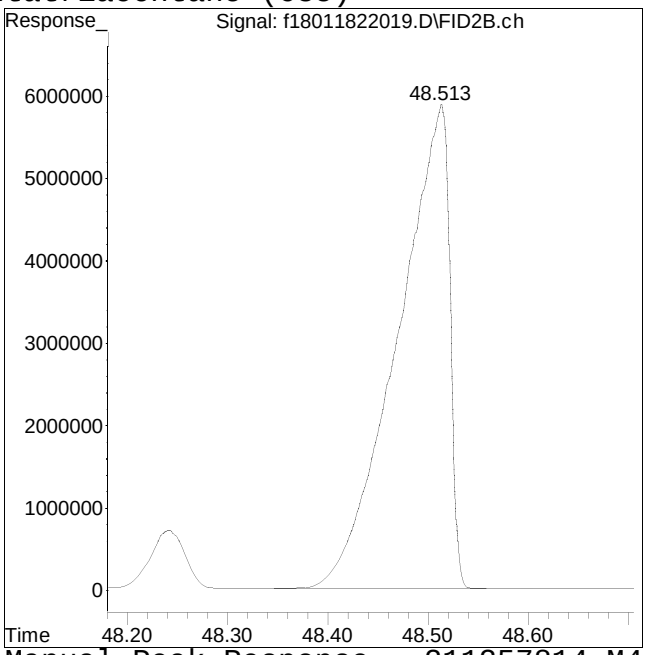
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #36: n-Pentatriacontane (C35)





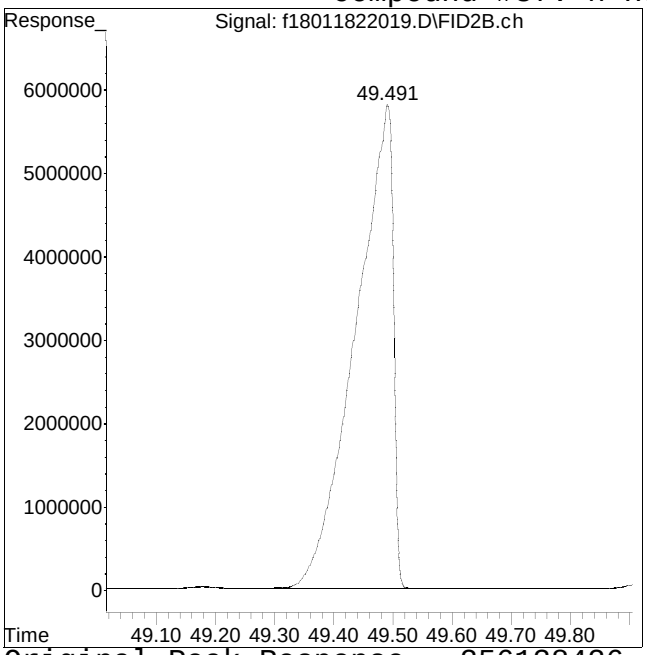
Original Peak Response = 211177840 Manual Peak Response = 211257814 M4
M4 = Poor automated baseline construction.

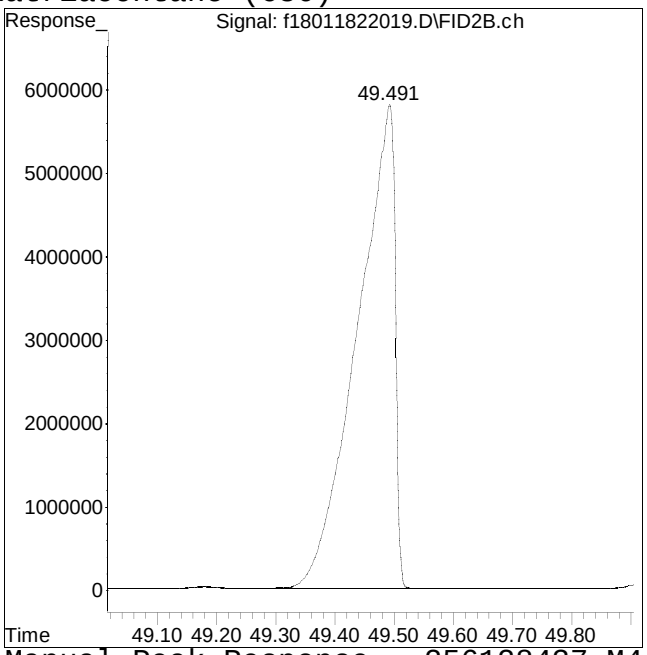
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #37: n-Hexatriacontane (C36)





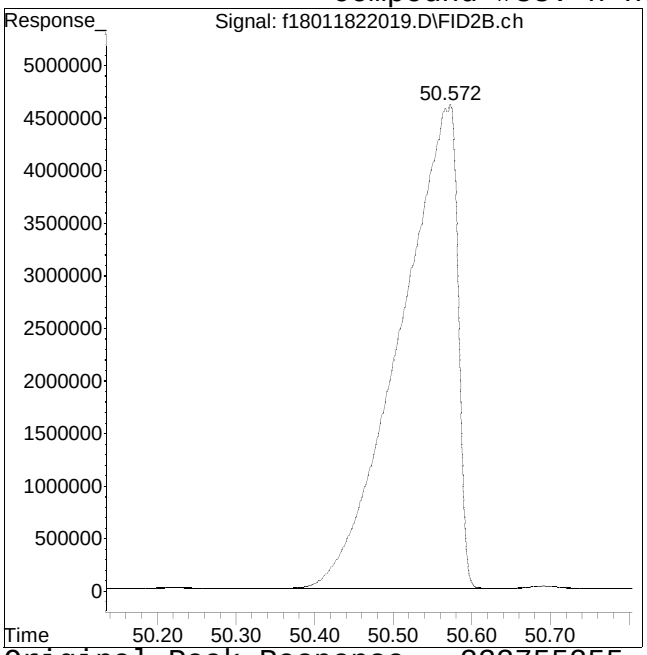
Original Peak Response = 256138426 Manual Peak Response = 256128437 M4
M4 = Poor automated baseline construction.

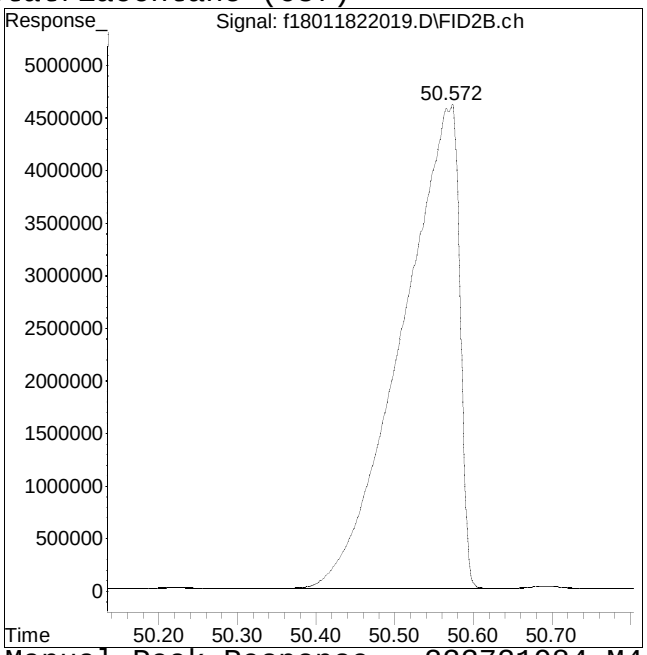
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #38: n-Heptatriacontane (C37)





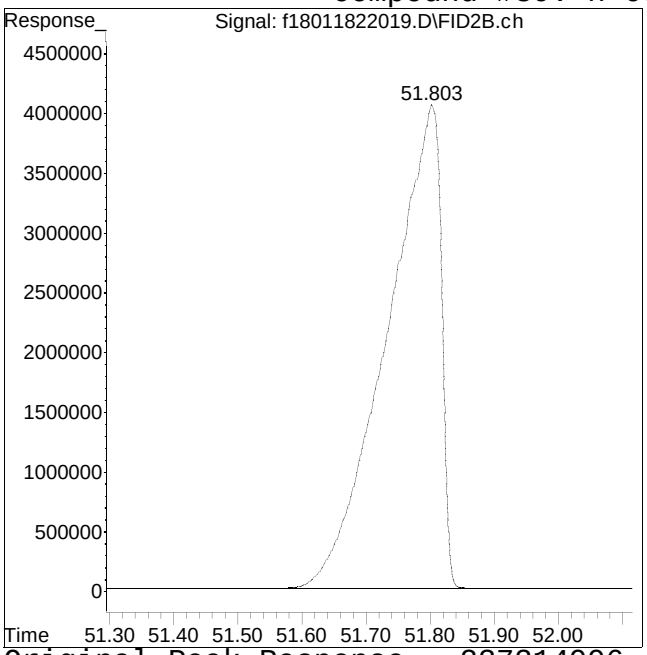
Original Peak Response = 233755255 Manual Peak Response = 233721984 M4
M4 = Poor automated baseline construction.

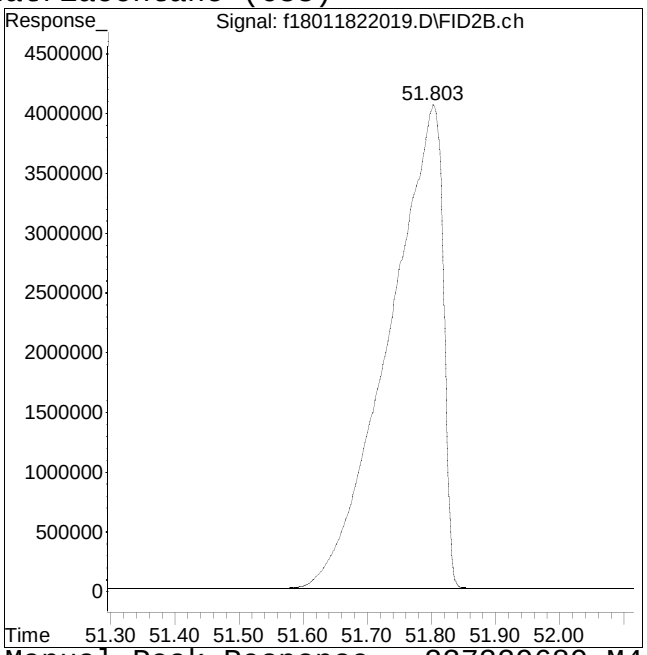
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #39: n-Octatriacontane (C38)





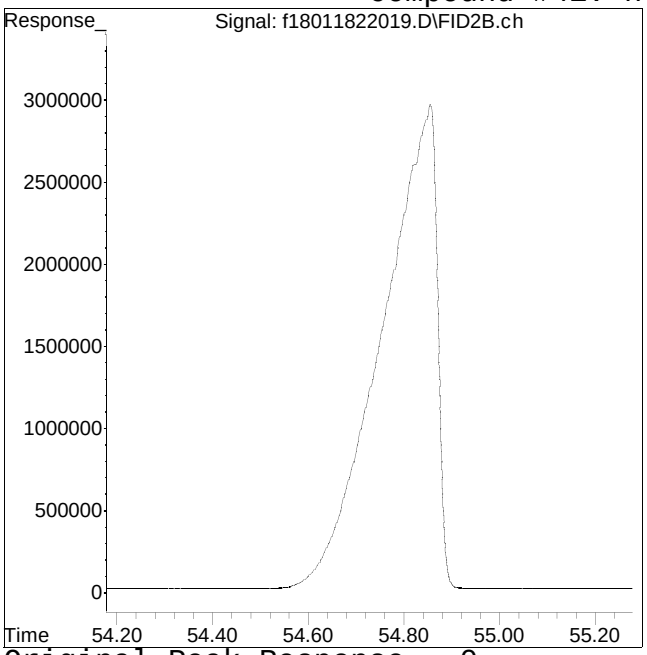
Original Peak Response = 237314996 Manual Peak Response = 237329689 M4
M4 = Poor automated baseline construction.

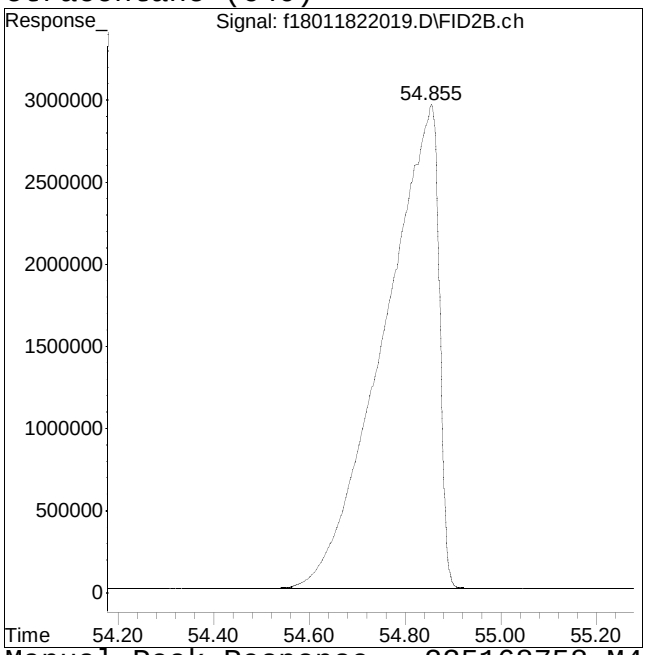
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822019.D
Date Inj'd : 1/19/2022 1:33 am
Sample : I1801182205R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 5:53 pm

Compound #41: n-Tetracontane (C40)





Original Peak Response = 0 Manual Peak Response = 235168758 M4
M4 = Poor automated baseline construction.

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822021.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 02:59 am
Operator : FID18:WR
Sample : I1801182206R
Misc : WG1596727,FRBE53,500ug/ml
ALS Vial : 61 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 18:01:51 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:59:56 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

Compound	R.T.	Response	Conc	Units	
Internal Standards					
1) I 5-alpha-androstane	31.198	54363457	50.000	ug/mL	M4
System Monitoring Compounds					
19) s ortho-terphenyl	29.285	577142843	513.924	ug/mL	M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 1027.85%#			
24) s d50-Tetracosane	35.904	472702349	518.465	ug/mL	M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 1036.93%#			
Target Compounds					
2) t n-Octane (C8)	0.000	0	N.D.	ug/mL	
3) t n-Nonane (C9)	0.000	0	N.D.	ug/mL	
4) t n-Decane (C10)	0.000	0	N.D.	ug/mL	
5) t n-Undecane (C11)	0.000	0	N.D.	ug/mL	
6) t n-Dodecane (C12)	0.000	0	N.D.	ug/mL	
7) t n-Tridecane (C13)	0.000	0	N.D.	ug/mL	
9) t n-Tetradecane (C14)	0.000	0	N.D.	ug/mL	
11) t n-Pentadecane (C15)	0.000	0	N.D.	ug/mL	
12) t n-Hexadecane (C16)	0.000	0	N.D.	ug/mL	d
14) t n-Heptadecane (C17)	0.000	0	N.D.	ug/mL	
15) t Pristane	0.000	0	N.D.	ug/mL	
16) t n-Octadecane (C18)	0.000	0	N.D.	ug/mL	
17) t Phytane	0.000	0	N.D.	ug/mL	
18) t n-Nonadecane (C19)	0.000	0	N.D.	ug/mL	
20) t n-Eicosane (C20)	0.000	0	N.D.	ug/mL	
21) t n-Heneicosane (C21)	0.000	0	N.D.	ug/mL	
22) t n-Docosane (C22)	0.000	0	N.D.	ug/mL	
23) t n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d
25) t n-Tetracosane (C24)	0.000	0	N.D.	ug/mL	d
26) t n-Pentacosane (C25)	0.000	0	N.D.	ug/mL	d
27) t n-Hexacosane (C26)	0.000	0	N.D.	ug/mL	d
28) t n-Heptacosane (C27)	0.000	0	N.D.	ug/mL	d
29) t n-Octacosane (C28)	0.000	0	N.D.	ug/mL	d
30) t n-Nonacosane (C29)	0.000	0	N.D.	ug/mL	d

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822021.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 02:59 am
Operator : FID18:WR
Sample : I1801182206R
Misc : WG1596727,FRBE53,500ug/ml
ALS Vial : 61 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 20 18:01:51 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Thu Jan 20 17:59:56 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

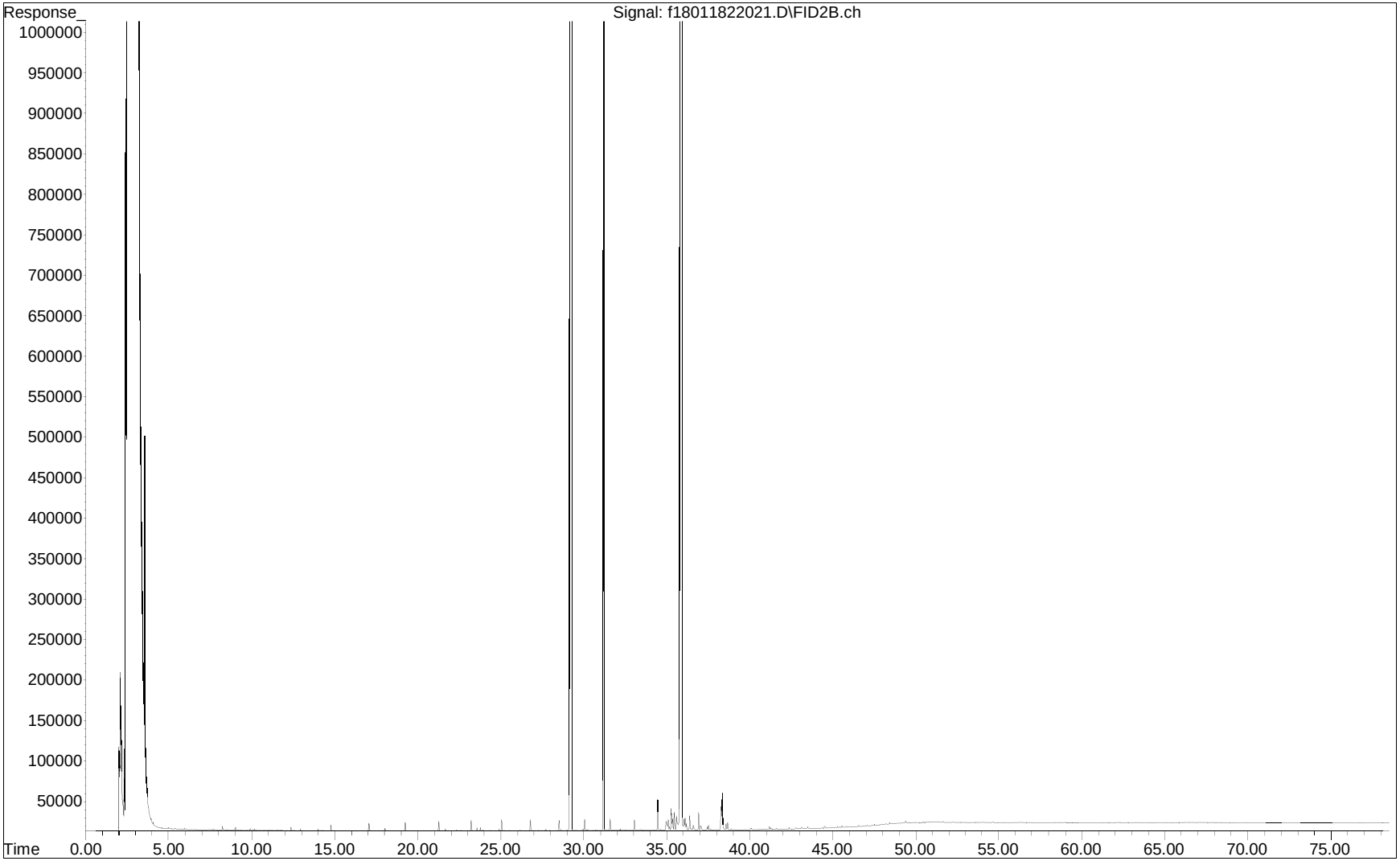
	Compound	R.T.	Response	Conc	Units	
31) t	n-Triacontane (C30)	0.000	0	N.D.	ug/mL	d
32) t	n-Hentriacontane (C31)	0.000	0	N.D.	ug/mL	d
33) t	n-Dotriacontane (C32)	0.000	0	N.D.	ug/mL	d
34) t	n-Tritriacontane (C33)	0.000	0	N.D.	ug/mL	d
35) t	n-tetratriacontane (C34)	0.000	0	N.D.	ug/mL	d
36) t	n-Pentatriacontane (C35)	0.000	0	N.D.	ug/mL	d
37) t	n-Hexatriacontane (C36)	0.000	0	N.D.	ug/mL	d
38) t	n-Heptatriacontane (C37)	0.000	0	N.D.	ug/mL	d
39) t	n-Octatriacontane (C38)	0.000	0	N.D.	ug/mL	
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL	

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\f18011822021.D
Operator : FID18:WR
Acquired : 19 Jan 2022 02:59 am using AcqMethod FID18.M
Sample Name: I1801182206R
Instrument: FID 18
Misc Info : WG1596727,FRBE53,500ug/ml
Vial Number: 61
CurrentMeth: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M

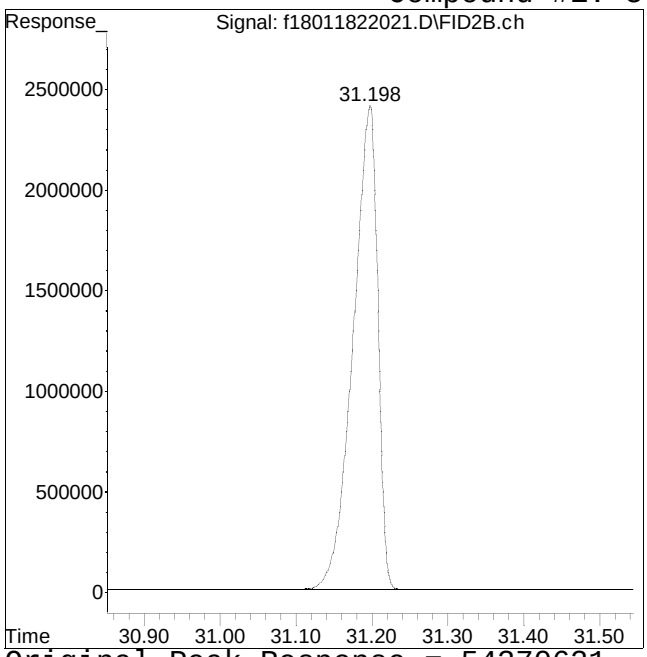


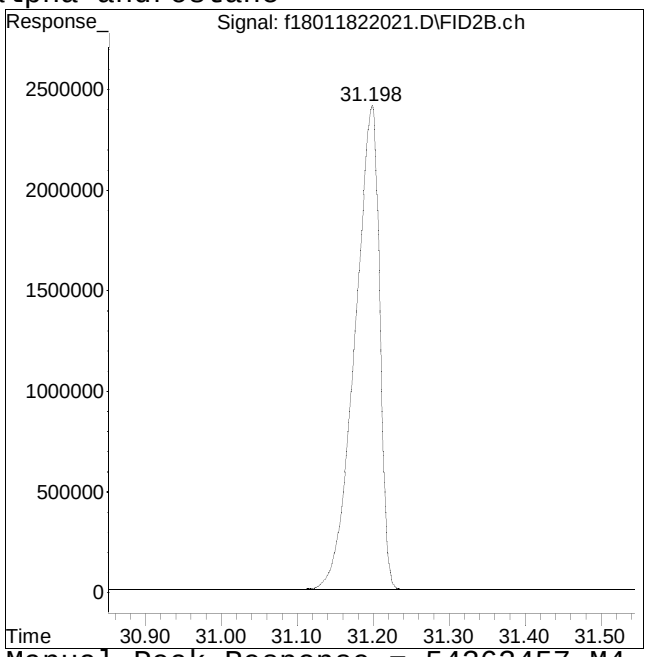
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822021.D
Date Inj'd : 1/19/2022 2:59 am
Sample : I1801182206R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:00 pm

Compound #1: 5-alpha-androstane





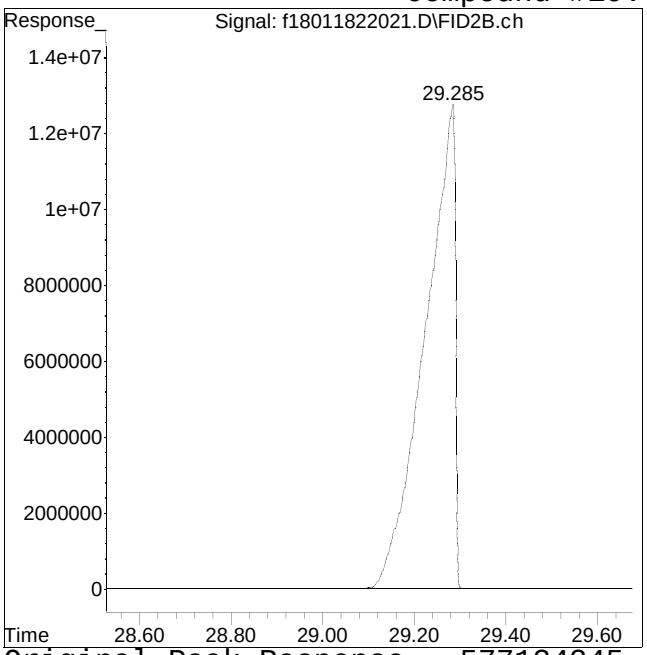
Original Peak Response = 54370621 Manual Peak Response = 54363457 M4
M4 = Poor automated baseline construction.

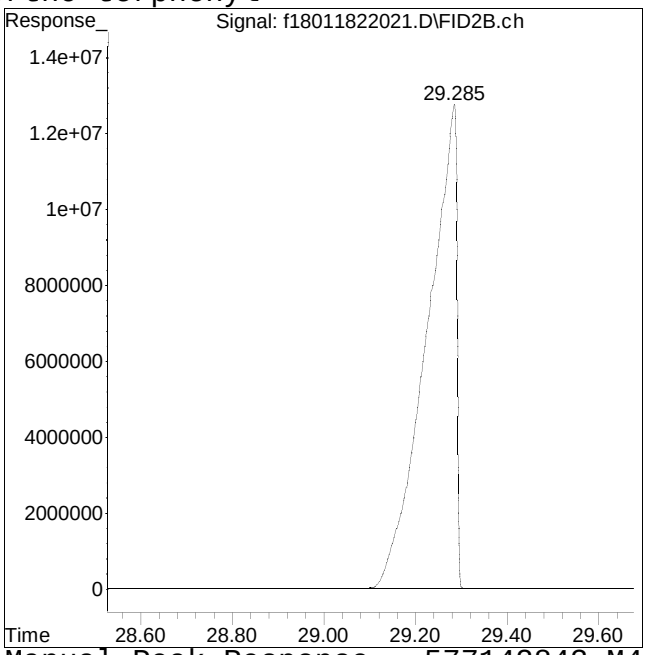
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822021.D
Date Inj'd : 1/19/2022 2:59 am
Sample : I1801182206R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:00 pm

Compound #19: ortho-terphenyl





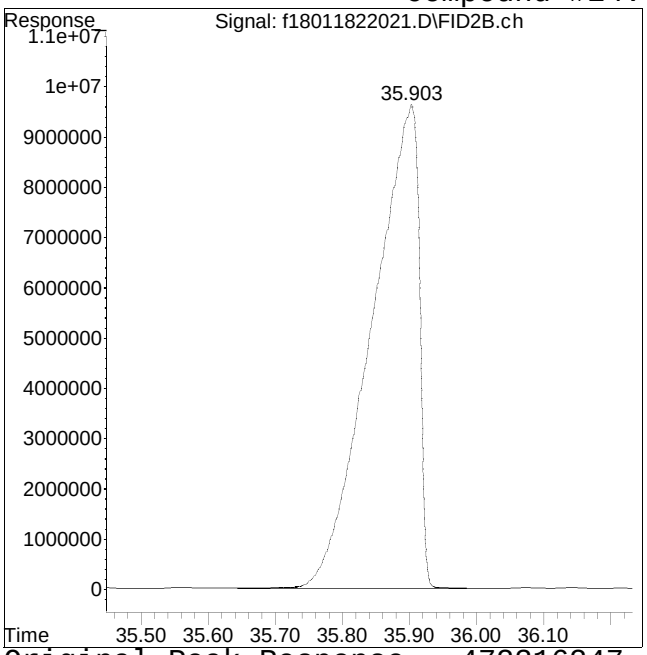
Original Peak Response = 577134245 Manual Peak Response = 577142843 M4
M4 = Poor automated baseline construction.

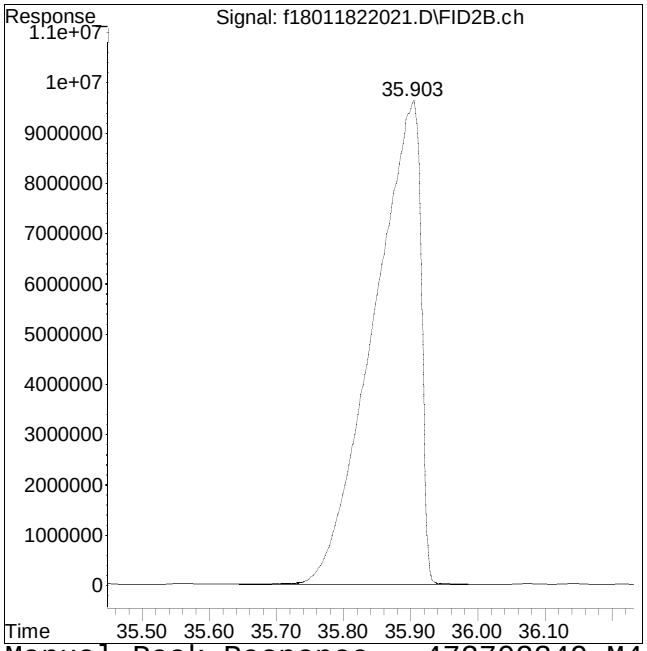
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822021.D
Date Inj'd : 1/19/2022 2:59 am
Sample : I1801182206R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/20/2022 6:00 pm

Compound #24: d50-Tetracosane





Original Peak Response = 472316247 Manual Peak Response = 472702349 M4
M4 = Poor automated baseline construction.

Evaluate Continuing Calibration Report

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822025.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 05:51 am
Operator : FID18:WR
Sample : CQ1801182201R
Misc : WG1596727,FRBE54,50ug/ml
ALS Vial : 63 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 21 10:30:17 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Fri Jan 21 10:22:37 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Min. RRF : 0.050 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 200%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1	I	5-alpha-androstane	1.000	1.000	0.0	97	0.00
2	t	n-Octane (C8)	0.807	0.814	-0.9	93	0.00
3	t	n-Nonane (C9)	0.836	0.851	-1.8	93	0.00
4	t	n-Decane (C10)	0.869	0.886	-2.0	94	0.00
5	t	n-Undecane (C11)	0.873	0.892	-2.2	93	0.00
6	t	n-Dodecane (C12)	0.884	0.915	-3.5	95	0.00
7	t	n-Tridecane (C13)	0.890	0.906	-1.8	93	0.00
9	t	n-Tetradecane (C14)	0.916	0.930	-1.5	94	0.00
11	t	n-Pentadecane (C15)	0.924	0.940	-1.7	96	0.00
12	t	n-Hexadecane (C16)	0.925	0.959	-3.7	96	0.00
14	t	n-Heptadecane (C17)	0.942	0.936	0.6	92	0.00
15	t	Pristane	0.955	0.958	-0.3	94	0.00
16	t	n-Octadecane (C18)	0.953	0.952	0.1	93	0.00
17	t	Phytane	0.881	0.863	2.0	91	0.00
18	t	n-Nonadecane (C19)	0.957	0.973	-1.7	96	0.00
19	s	ortho-terphenyl	1.038	1.057	-1.8	96	0.00
20	t	n-Eicosane (C20)	0.965	0.981	-1.7	95	0.00
21	t	n-Heneicosane (C21)	0.972	0.985	-1.3	96	0.00
22	t	n-Docosane (C22)	0.977	1.017	-4.1	97	0.00
23	t	n-Tricosane (C23)	0.974	0.970	0.4	92	0.00
24	s	d50-Tetracosane	0.844	0.861	-2.0	96	0.00
25	t	n-Tetracosane (C24)	0.965	0.994	-3.0	100	0.00
26	t	n-Pentacosane (C25)	0.958	0.988	-3.1	95	0.00
27	t	n-Hexacosane (C26)	0.985	1.016	-3.1	95	0.00
28	t	n-Heptacosane (C27)	0.983	0.981	0.2	95	0.00
29	t	n-Octacosane (C28)	1.005	1.014	-0.9	94	0.00
30	t	n-Nonacosane (C29)	1.002	1.008	-0.6	93	0.00
31	t	n-Triacontane (C30)	1.007	1.015	-0.8	93	0.00
32	t	n-Hentriacontane (C31)	0.978	0.999	-2.1	94	0.00
33	t	n-Dotriacontane (C32)	1.025	1.002	2.2	90	0.00
34	t	n-Tritriacontane (C33)	0.996	1.002	-0.6	93	0.00
35	t	n-tetratriacontane (C34)	0.993	1.021	-2.8	94	0.00

Evaluate Continuing Calibration Report

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822025.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 05:51 am
Operator : FID18:WR
Sample : CQ1801182201R
Misc : WG1596727,FRBE54,50ug/ml
ALS Vial : 63 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 21 10:30:17 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Fri Jan 21 10:22:37 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Min. RRF : 0.050 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 200%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
36 t	n-Pentatriacontane (C35)	0.948	0.992	-4.6	91	0.00
37 t	n-Hexatriacontane (C36)	1.118	1.059	5.3	90	0.00
38 t	n-Heptatriacontane (C37)	1.022	1.010	1.2	93	0.00
39 t	n-Octatriacontane (C38)	1.040	1.050	-1.0	93	0.00
41 t	n-Tetracontane (C40)	1.034	0.963	6.9	84	-0.02

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Mass Discrimination (Response)	Ratio	Range Limits
n-Hexatriacontane (C36) to n-Eicosane (C20)	1.08	0.70 - 1.30

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822025.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 05:51 am
Operator : FID18:WR
Sample : CQ1801182201R
Misc : WG1596727,FRBE54,50ug/ml
ALS Vial : 63 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 21 10:30:17 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Fri Jan 21 10:22:37 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	31.196	55780962	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	29.189	58971906	50.941 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 101.88%	
24) s d50-Tetracosane	35.811	48029419	51.026 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 102.05%	
Target Compounds			
2) t n-Octane (C8)	5.578	45409900	50.437 ug/mL M4
3) t n-Nonane (C9)	7.785	47472375	50.914 ug/mL M4
4) t n-Decane (C10)	10.268	49427873	51.011 ug/mL M4
5) t n-Undecane (C11)	12.776	49739924	51.077 ug/mL M4
6) t n-Dodecane (C12)	15.201	51021020	51.732 ug/mL M4
7) t n-Tridecane (C13)	17.505	50532551	50.880 ug/mL M4
9) t n-Tetradecane (C14)	19.684	51875378	50.744 ug/mL M4
11) t n-Pentadecane (C15)	21.746	52430297	50.860 ug/mL M4
12) t n-Hexadecane (C16)	23.700	53505063	51.828 ug/mL M4
14) t n-Heptadecane (C17)	25.553	52223045	49.687 ug/mL M4
15) t Pristane	25.665	53459595	50.152 ug/mL M4
16) t n-Octadecane (C18)	27.317	53099767	49.967 ug/mL M4
17) t Phytane	27.480	48140169	48.968 ug/mL M4
18) t n-Nonadecane (C19)	28.999	54255384	50.827 ug/mL M4
20) t n-Eicosane (C20)	30.600	54720008	50.841 ug/mL M4
21) t n-Heneicosane (C21)	32.131	54934184	50.663 ug/mL M4
22) t n-Docosane (C22)	33.600	56704480	52.042 ug/mL M4
23) t n-Tricosane (C23)	35.005	54083086	49.748 ug/mL M4
25) t n-Tetracosane (C24)	36.358	55461877	51.534 ug/mL M4
26) t n-Pentacosane (C25)	37.659	55099956	51.544 ug/mL M4
27) t n-Hexacosane (C26)	38.911	56674865	51.572 ug/mL M4
28) t n-Heptacosane (C27)	40.117	54714675	49.914 ug/mL M4
29) t n-Octacosane (C28)	41.283	56576557	50.471 ug/mL M4
30) t n-Nonacosane (C29)	42.408	56211179	50.279 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822025.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 05:51 am
Operator : FID18:WR
Sample : CQ1801182201R
Misc : WG1596727,FRBE54,50ug/ml
ALS Vial : 63 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 21 10:30:17 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Fri Jan 21 10:22:37 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

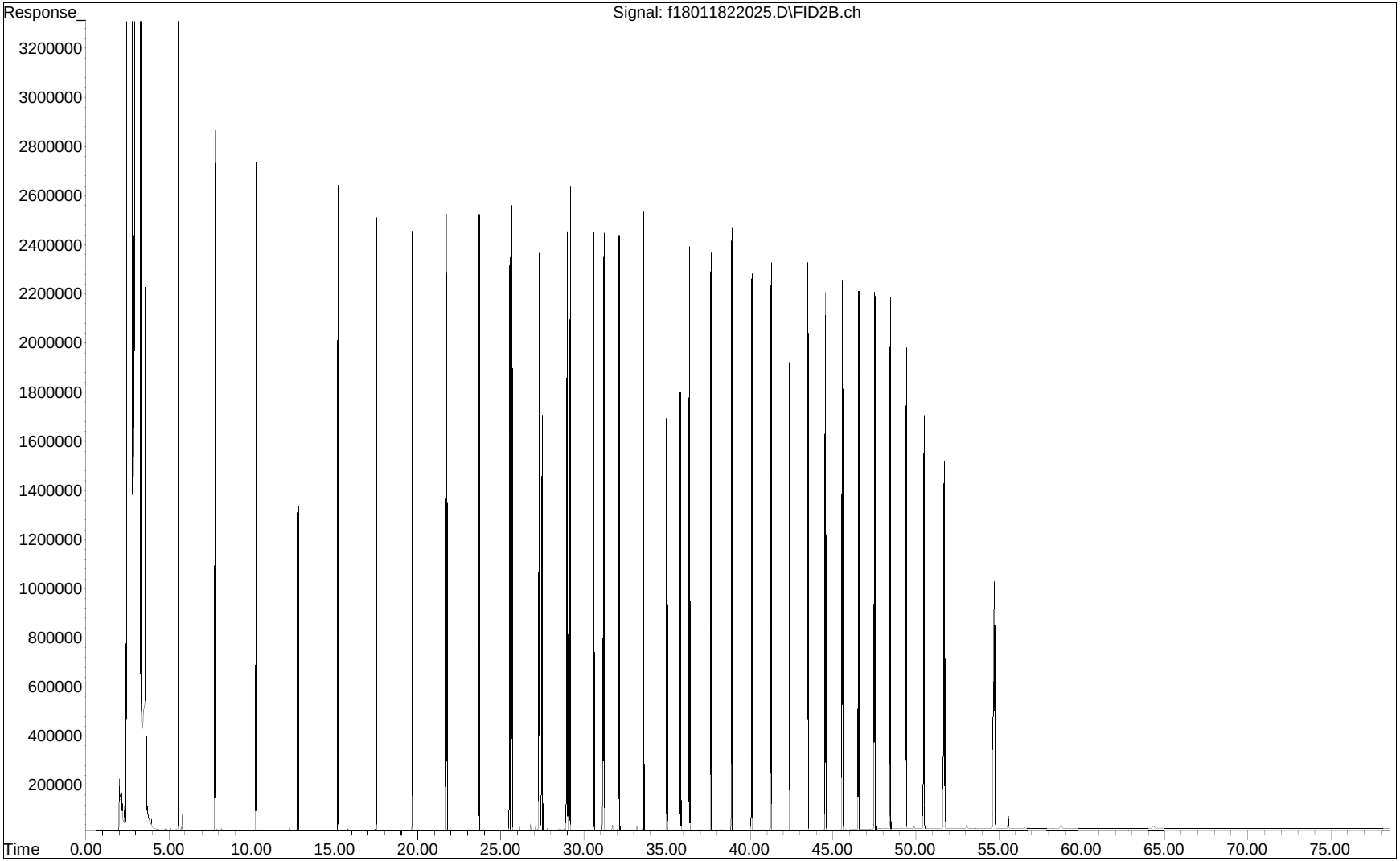
	Compound	R.T.	Response	Conc Units
31) t	n-Triacontane (C30)	43.495	56611854	50.387 ug/mL M4
32) t	n-Hentriacontane (C31)	44.551	55745241	51.090 ug/mL M4
33) t	n-Dotriacontane (C32)	45.571	55895074	48.900 ug/mL M4
34) t	n-Tritriacontane (C33)	46.559	55910783	50.327 ug/mL M4
35) t	n-tetratriacontane (C34)	47.522	56927652	51.382 ug/mL M4
36) t	n-Pentatriacontane (C35)	48.454	55350838	52.339 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.416	59075541	47.356 ug/mL M4
38) t	n-Heptatriacontane (C37)	50.491	56336024	49.418 ug/mL M4
39) t	n-Octatriacontane (C38)	51.709	58591234	50.510 ug/mL M4
41) t	n-Tetracontane (C40)	54.721	53701099	46.559 ug/mL M4

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\f18011822025.D
Operator : FID18:WR
Acquired : 19 Jan 2022 05:51 am using AcqMethod FID18.M
Sample Name: CQ1801182201R
Instrument: FID 18
Misc Info : WG1596727,FRBE54,50ug/ml
Vial Number: 63
CurrentMeth: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M

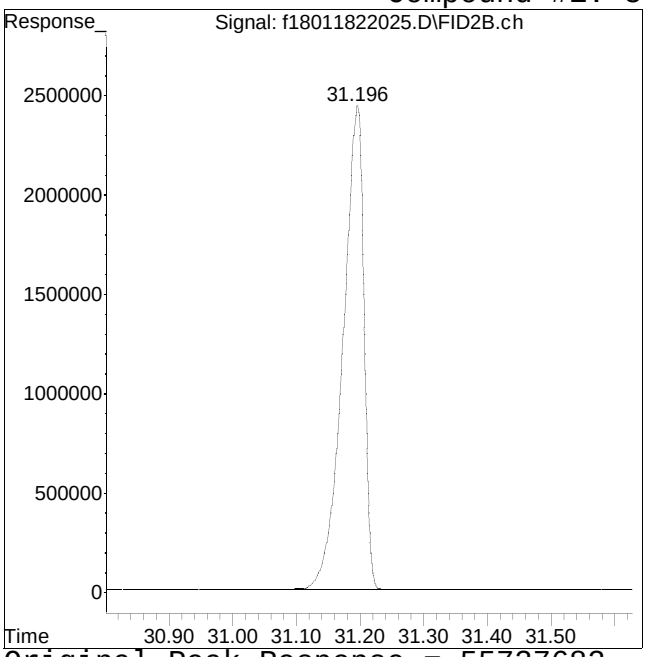


Manual Integration/Negative Proof Report

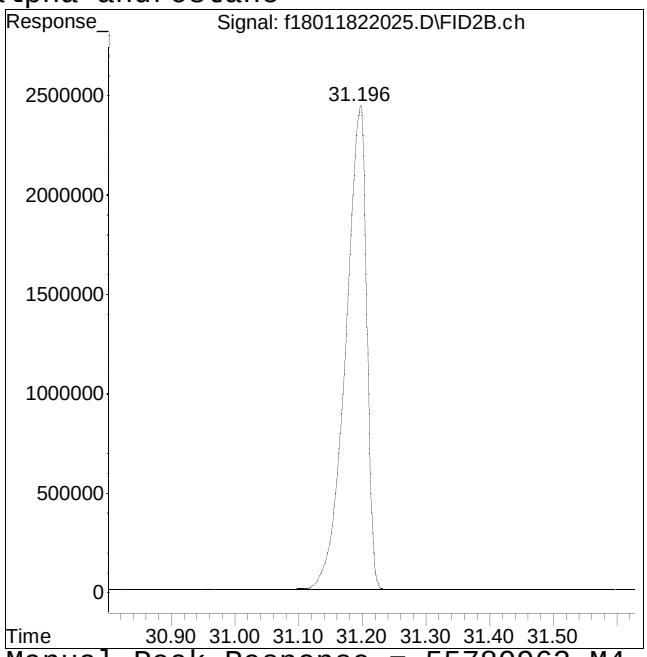
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #1: 5-alpha-androstane



Original Peak Response = 55737682



Manual Peak Response = 55780962 M4

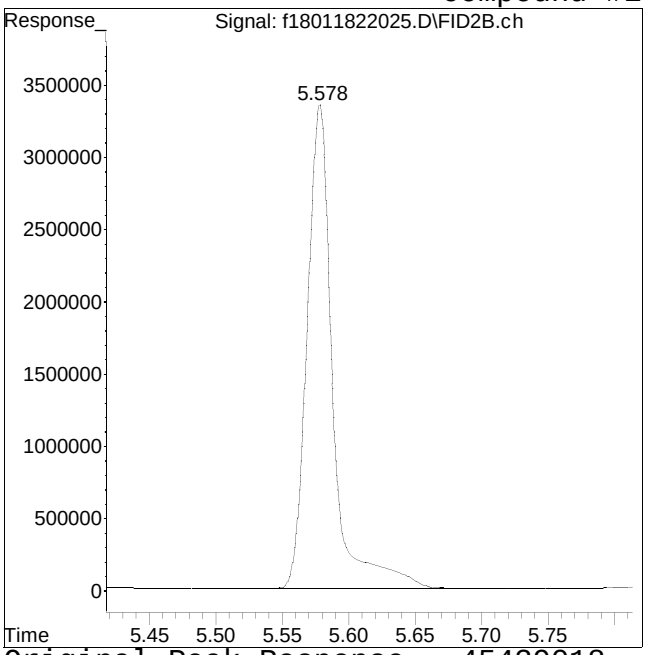
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

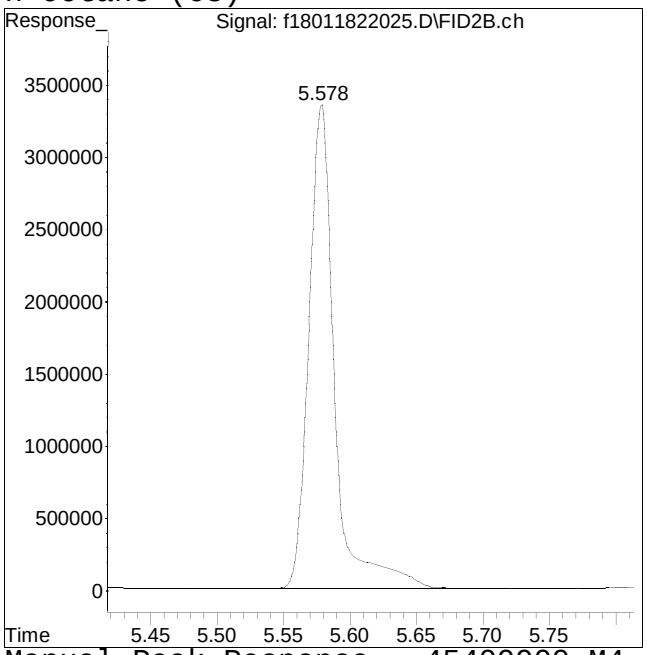
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #2: n-Octane (C8)



Original Peak Response = 45439018



Manual Peak Response = 45409900 M4

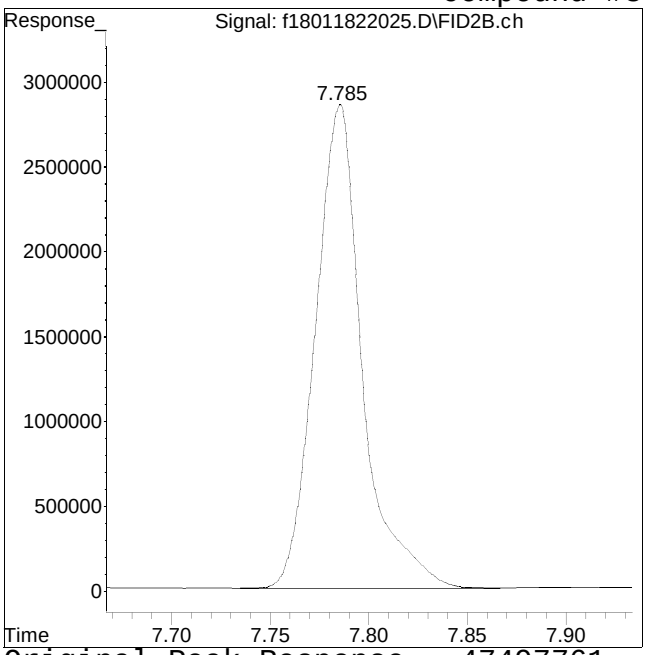
M4 = Poor automated baseline construction.

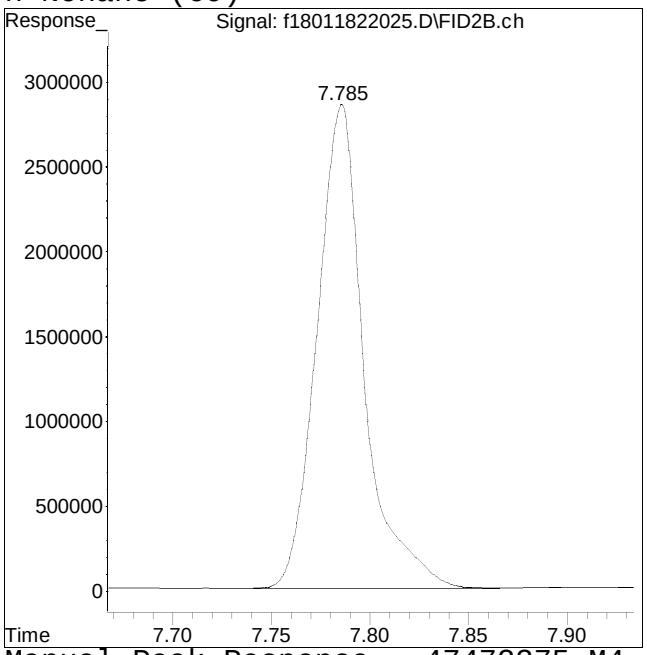
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #3: n-Nonane (C9)





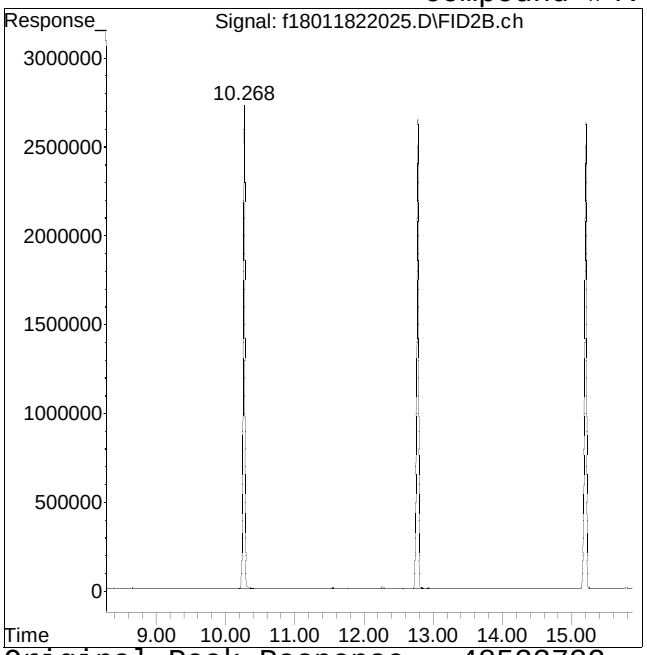
Original Peak Response = 47497761 Manual Peak Response = 47472375 M4
M4 = Poor automated baseline construction.

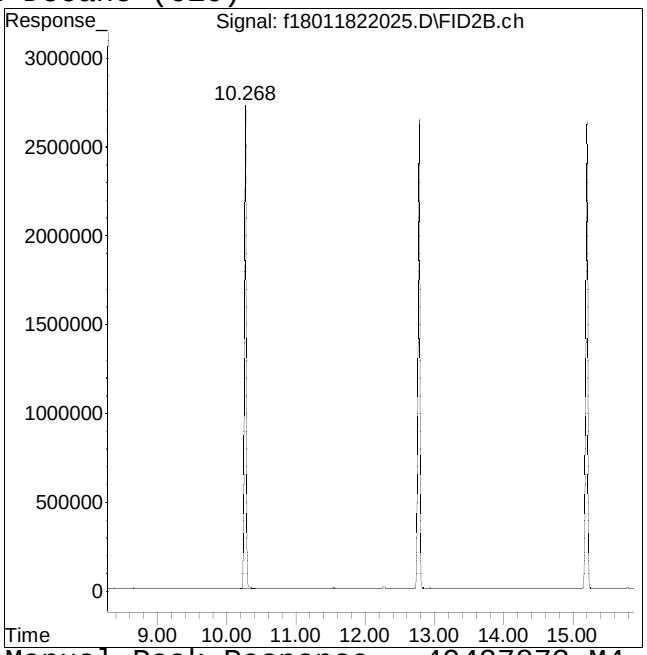
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #4: n-Decane (C10)





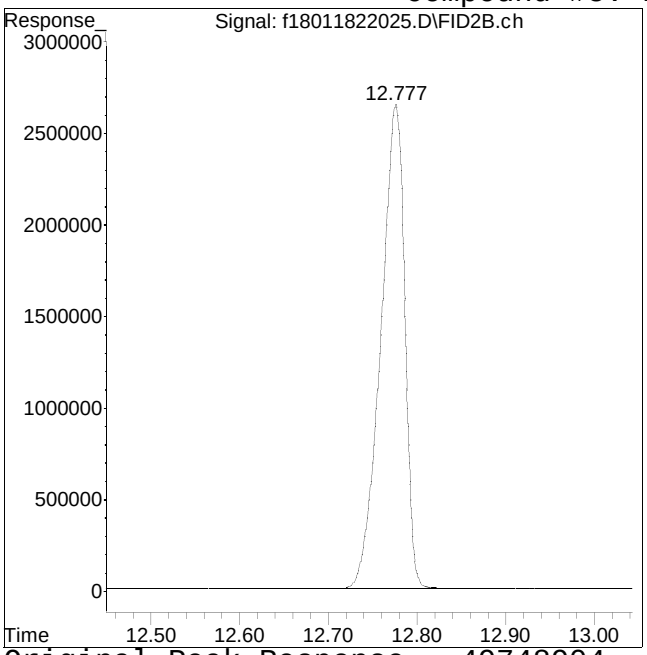
Original Peak Response = 48533732 Manual Peak Response = 49427873 M4
M4 = Poor automated baseline construction.

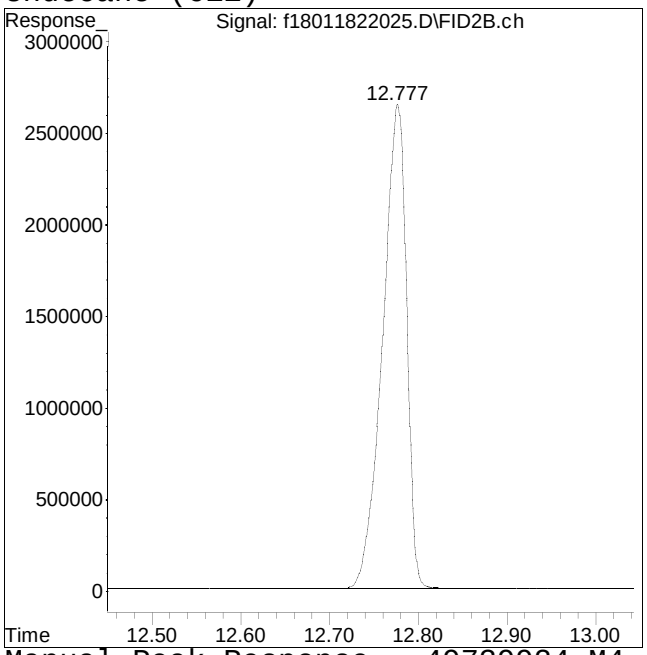
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #5: n-Undecane (C11)





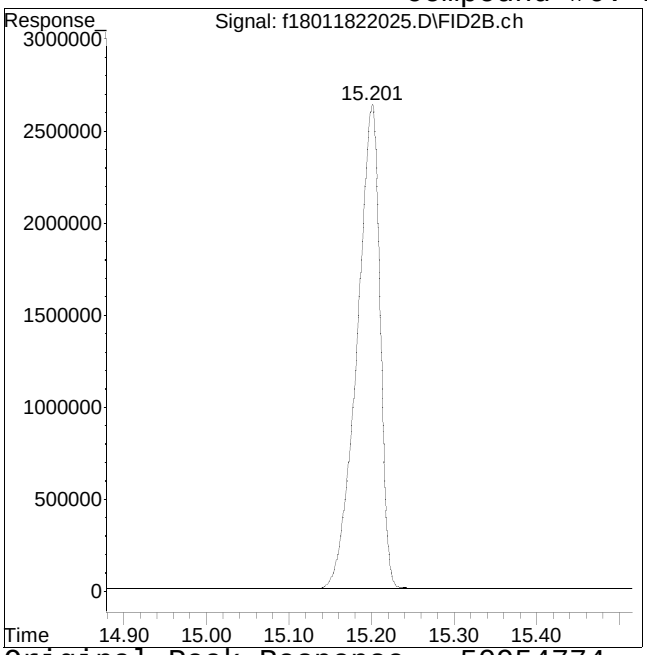
Original Peak Response = 49748904 Manual Peak Response = 49739924 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

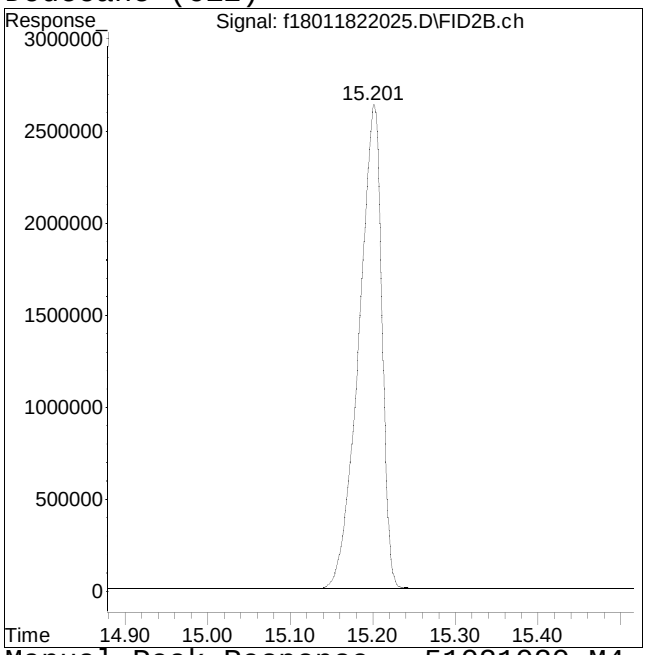
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #6: n-Dodecane (C12)



Original Peak Response = 50954774



Manual Peak Response = 51021020 M4

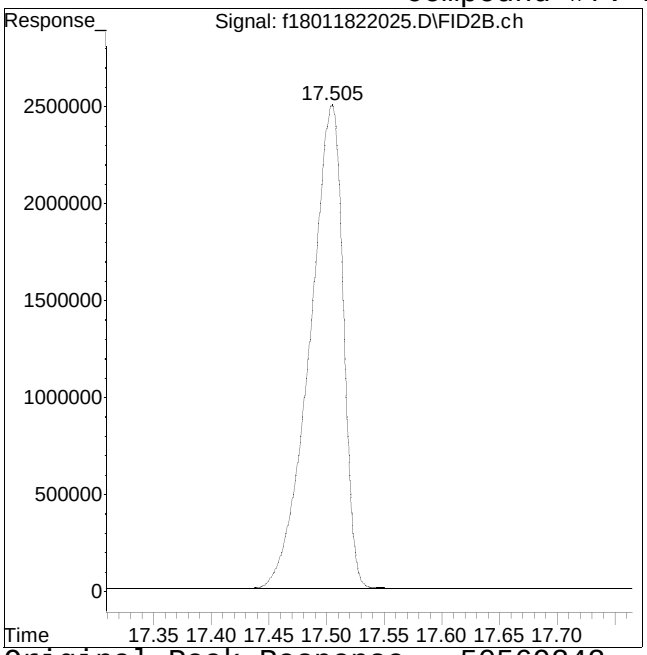
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

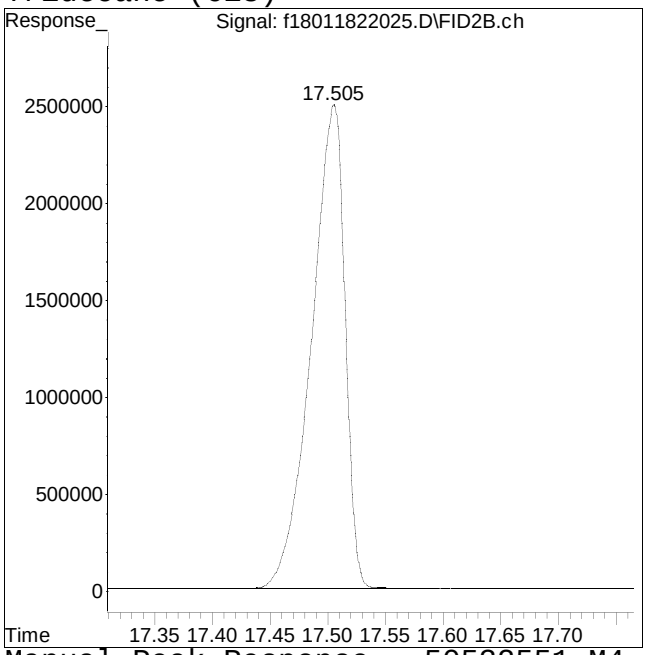
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #7: n-Tridecane (C13)



Original Peak Response = 50569242



Manual Peak Response = 50532551 M4

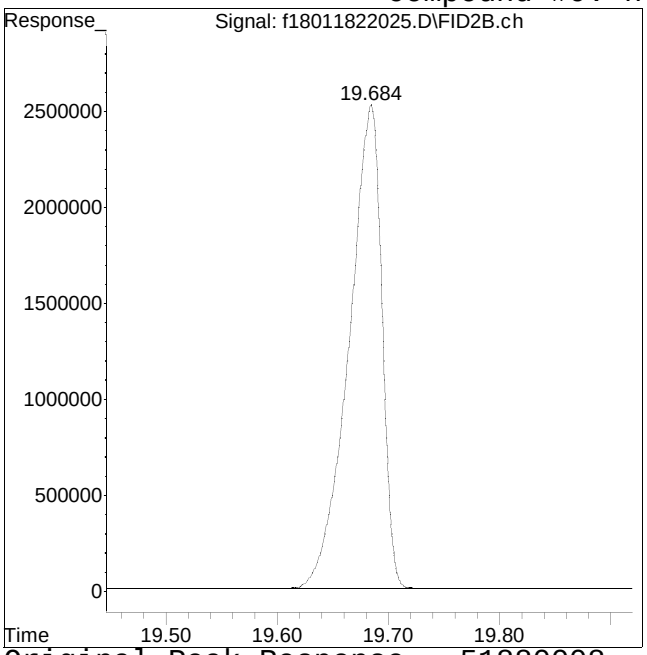
M4 = Poor automated baseline construction.

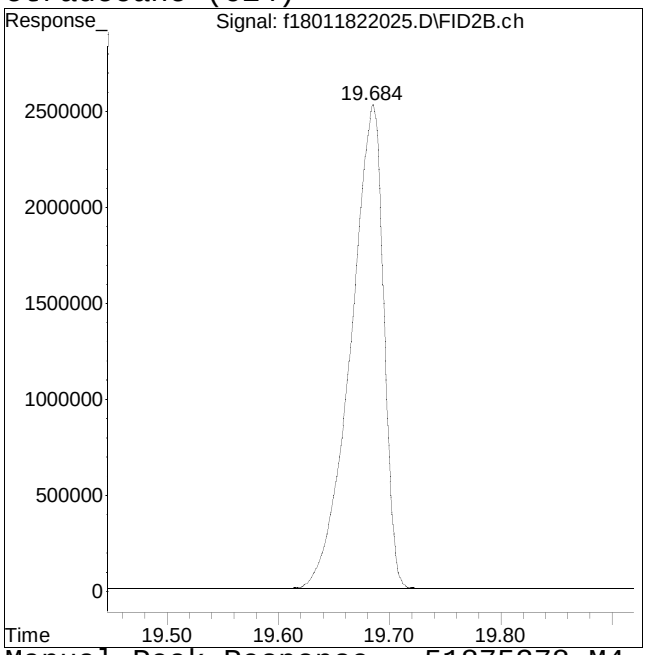
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #9: n-Tetradecane (C14)





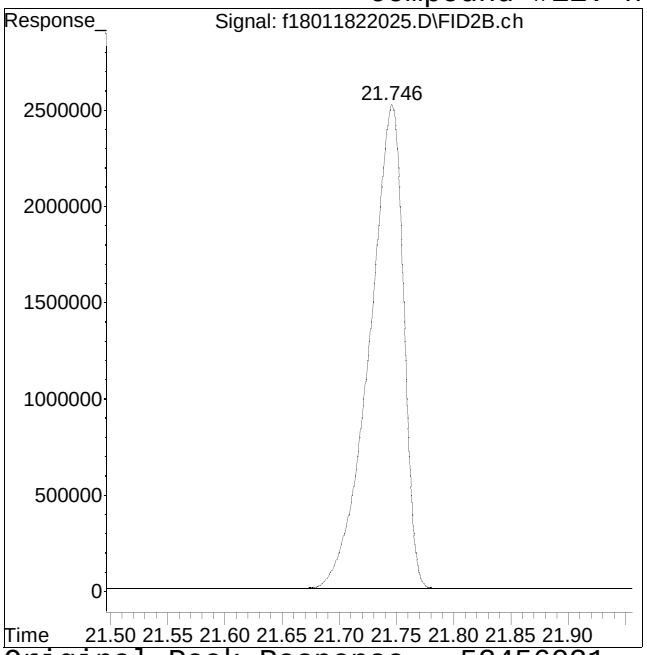
Original Peak Response = 51880008 Manual Peak Response = 51875378 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

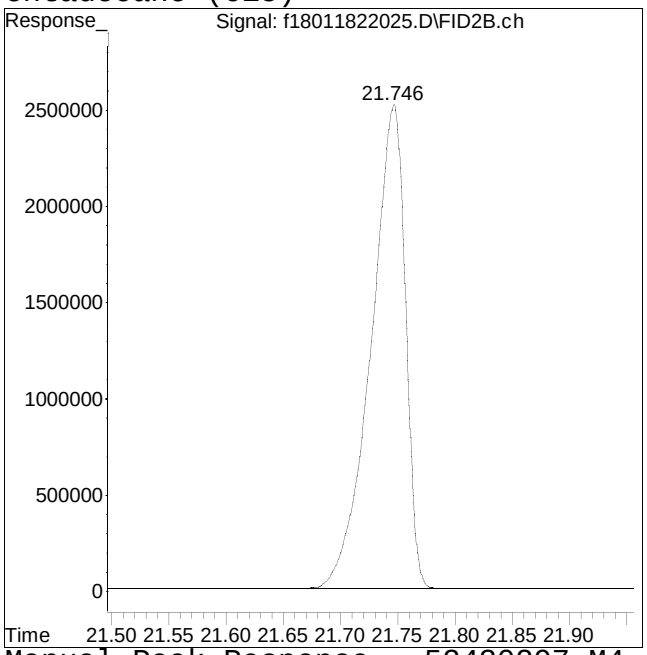
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #11: n-Pentadecane (C15)



Original Peak Response = 52456031



Manual Peak Response = 52430297 M4

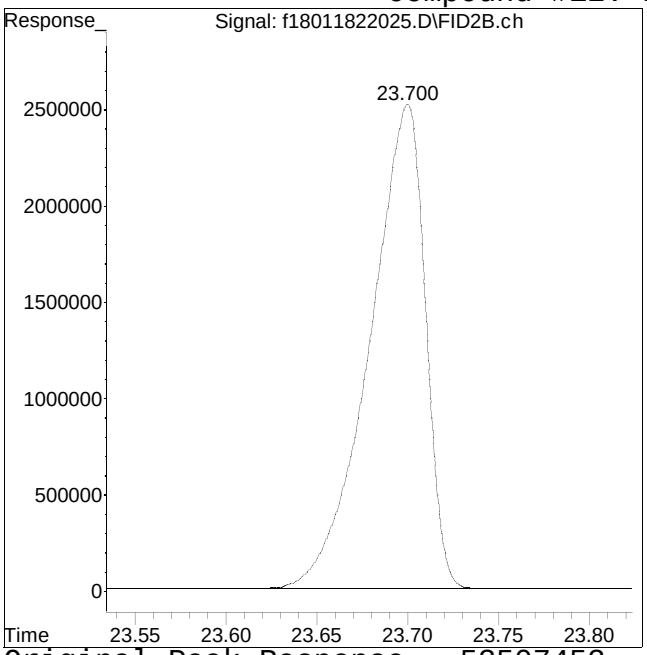
M4 = Poor automated baseline construction.

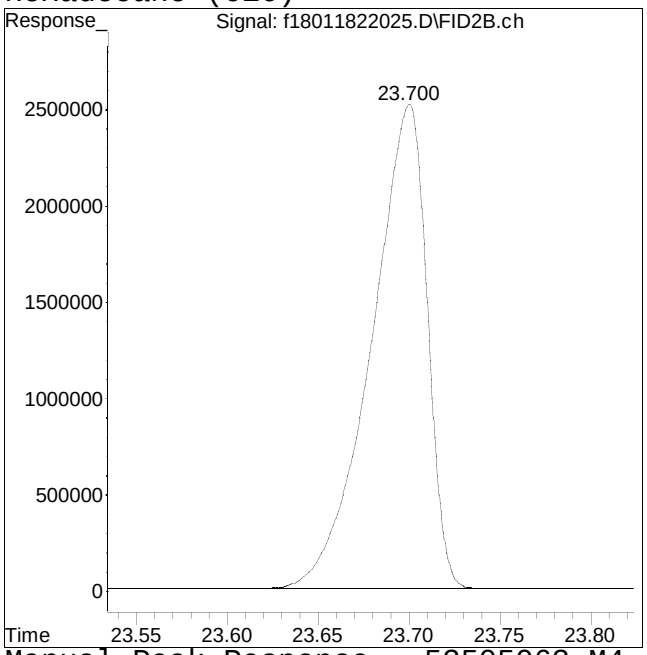
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #12: n-Hexadecane (C16)





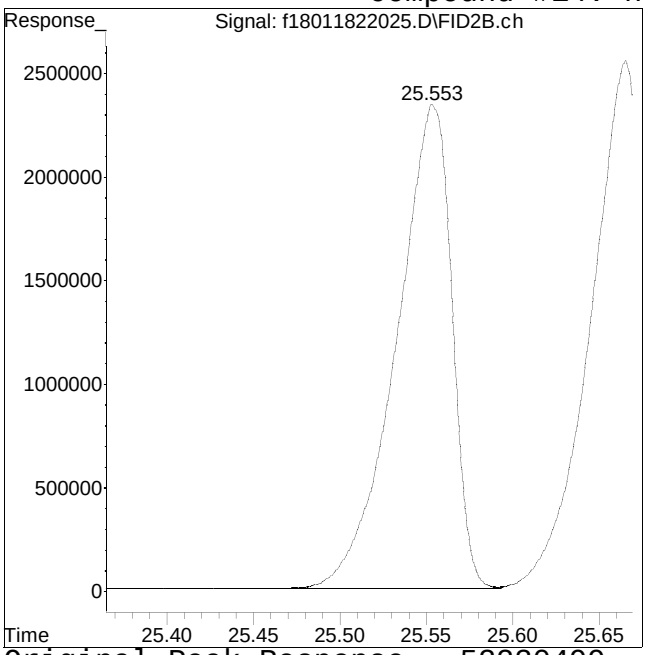
Original Peak Response = 53507453 Manual Peak Response = 53505063 M4
M4 = Poor automated baseline construction.

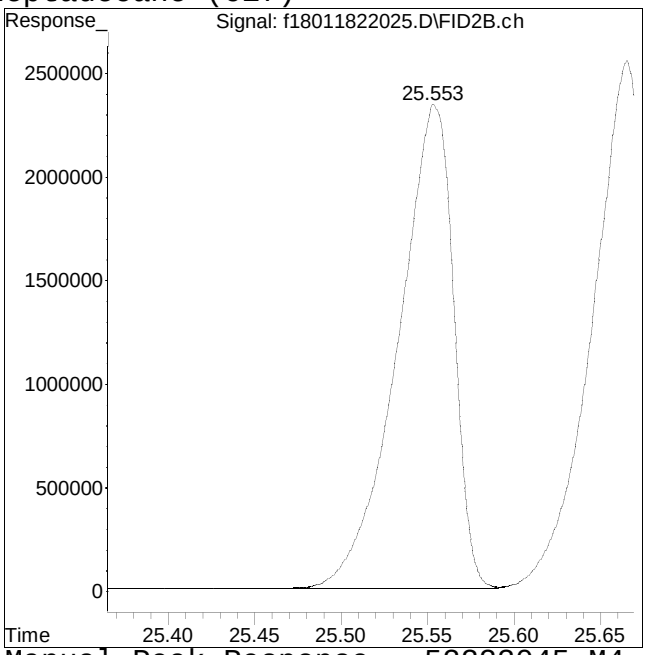
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #14: n-Heptadecane (C17)





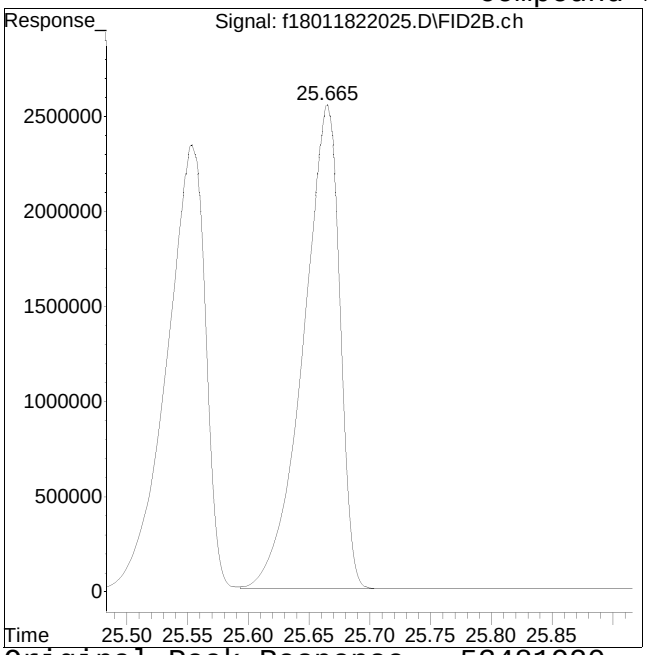
Original Peak Response = 52230499 Manual Peak Response = 52223045 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

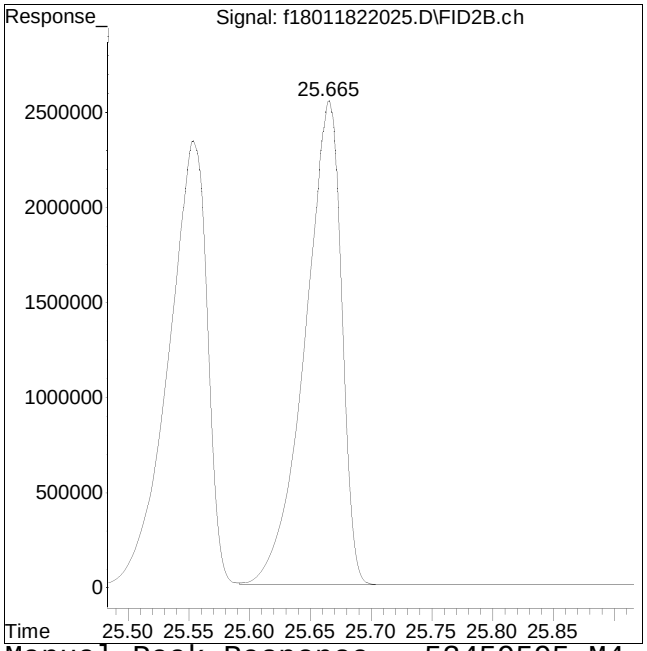
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #15: Pristane



Original Peak Response = 53481920



Manual Peak Response = 53459595 M4

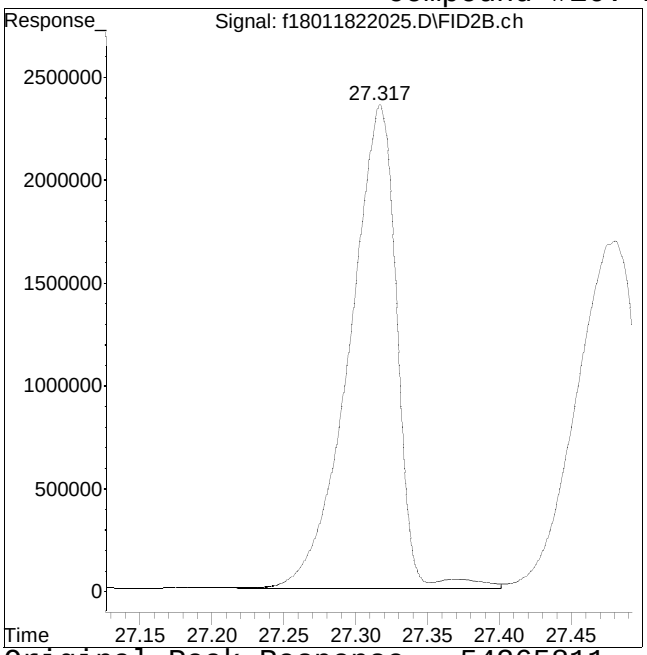
M4 = Poor automated baseline construction.

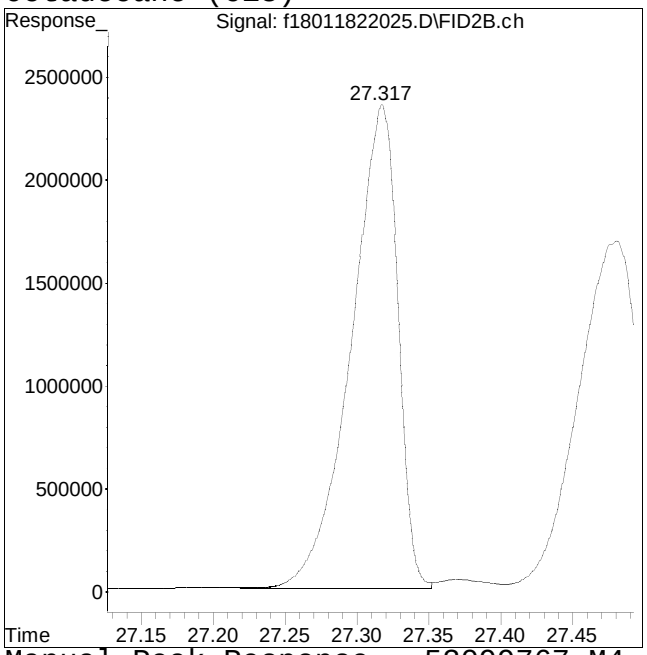
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #16: n-Octadecane (C18)





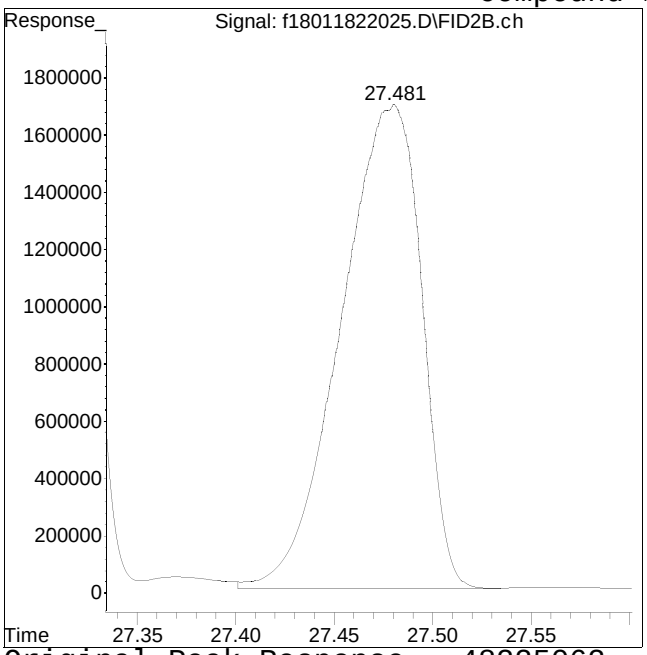
Original Peak Response = 54265811 Manual Peak Response = 53099767 M4
M4 = Poor automated baseline construction.

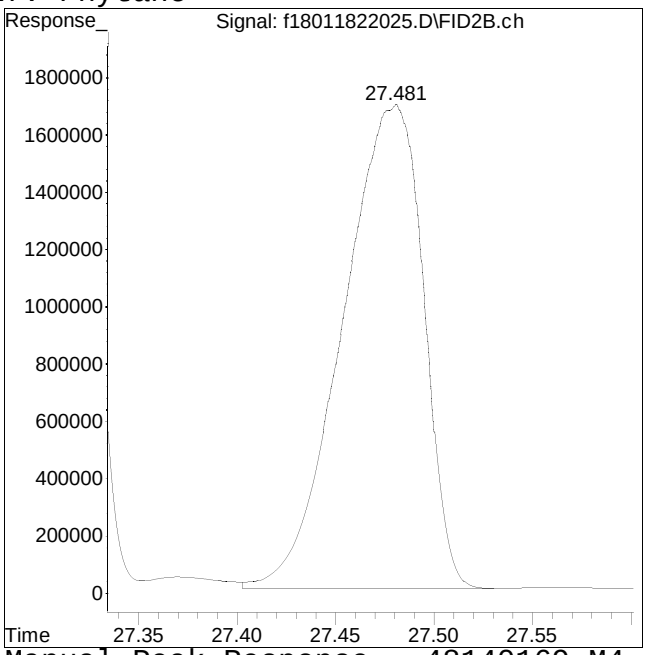
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #17: Phytane





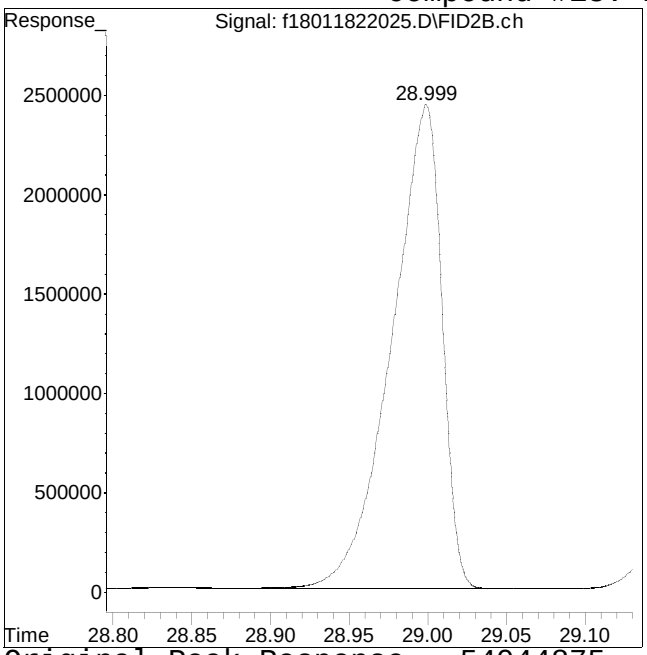
Original Peak Response = 48225062 Manual Peak Response = 48140169 M4
M4 = Poor automated baseline construction.

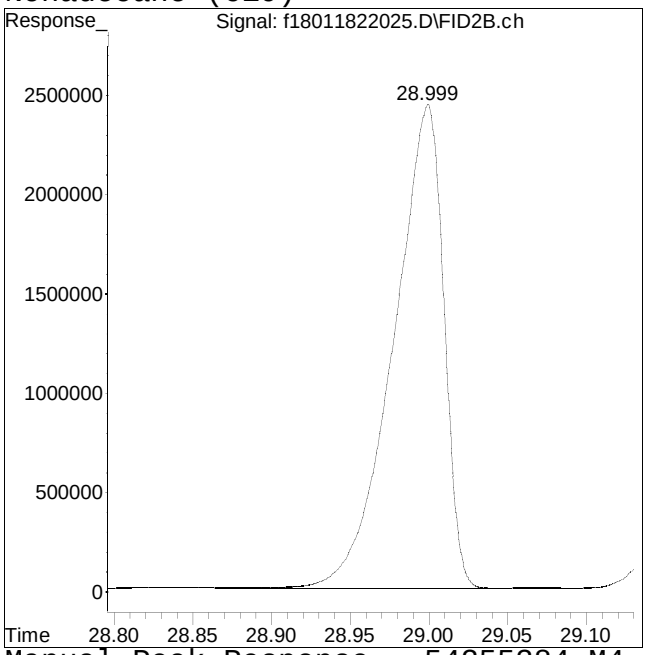
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #18: n-Nonadecane (C19)





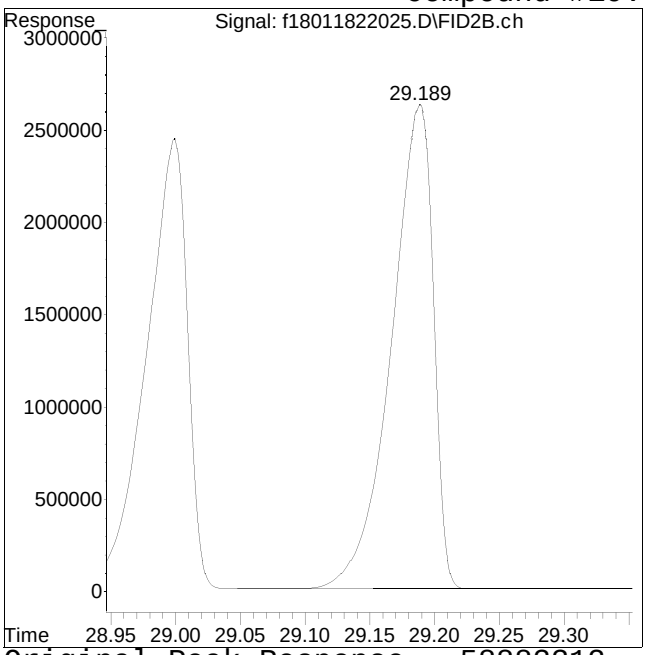
Original Peak Response = 54044875 Manual Peak Response = 54255384 M4
M4 = Poor automated baseline construction.

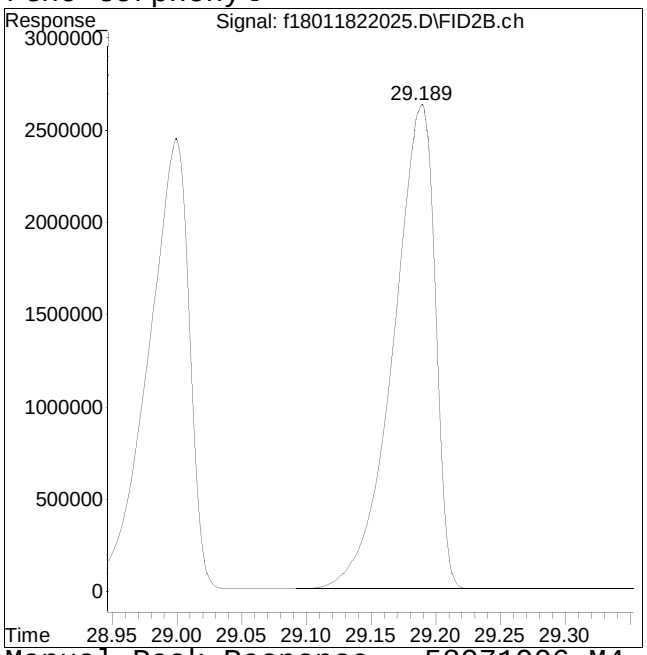
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #19: ortho-terphenyl





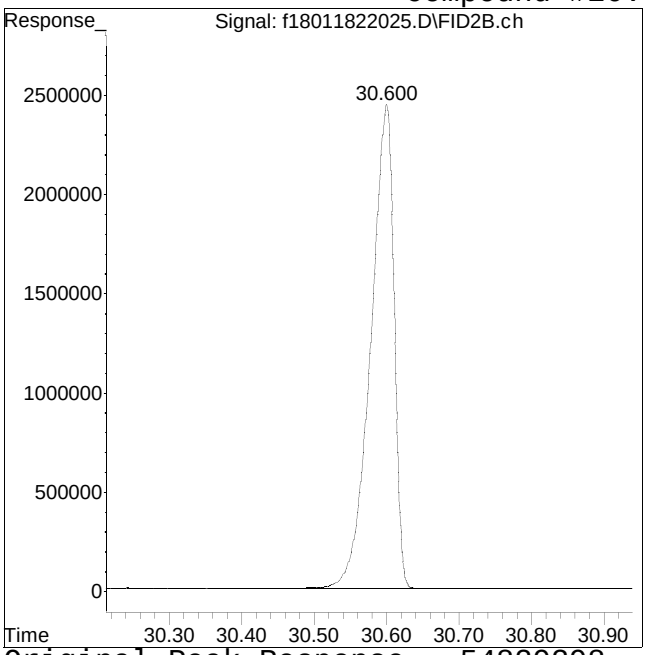
Original Peak Response = 58883312 Manual Peak Response = 58971906 M4
M4 = Poor automated baseline construction.

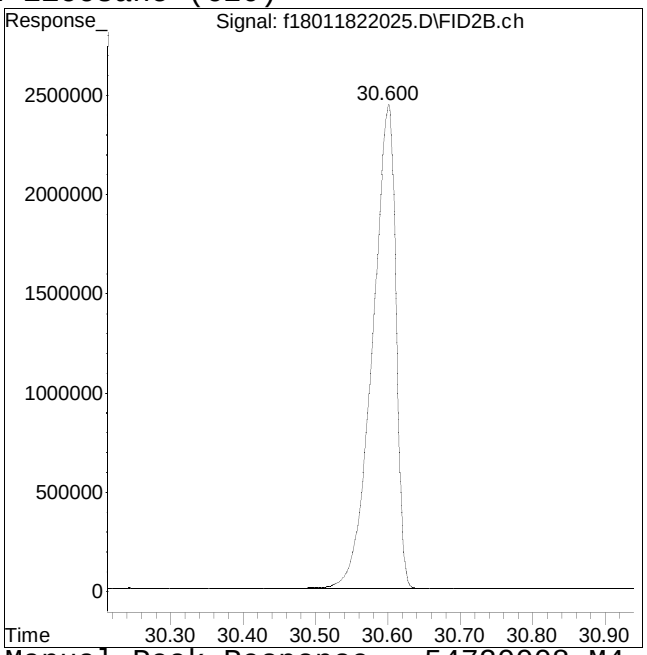
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #20: n-Eicosane (C20)





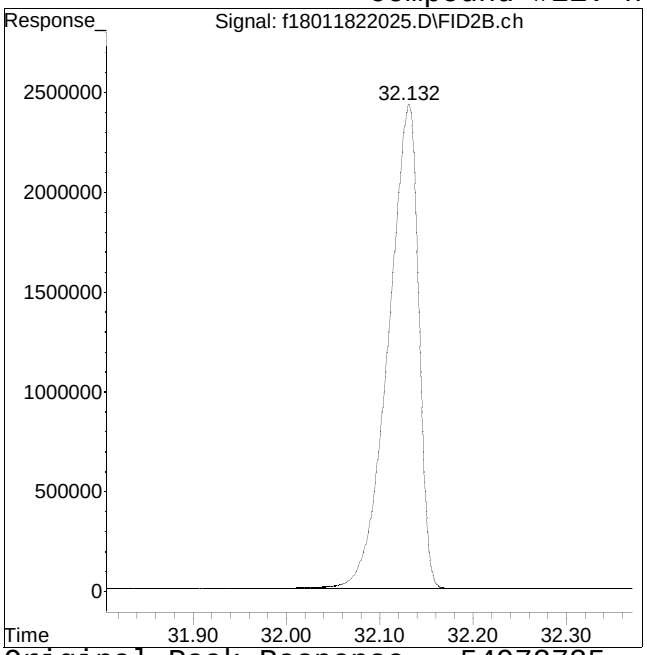
Original Peak Response = 54829298 Manual Peak Response = 54720008 M4
M4 = Poor automated baseline construction.

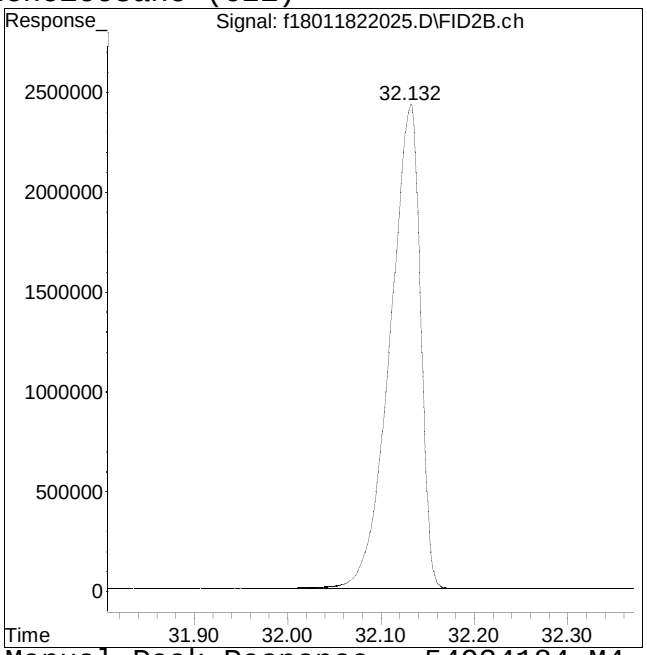
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #21: n-Heneicosane (C21)





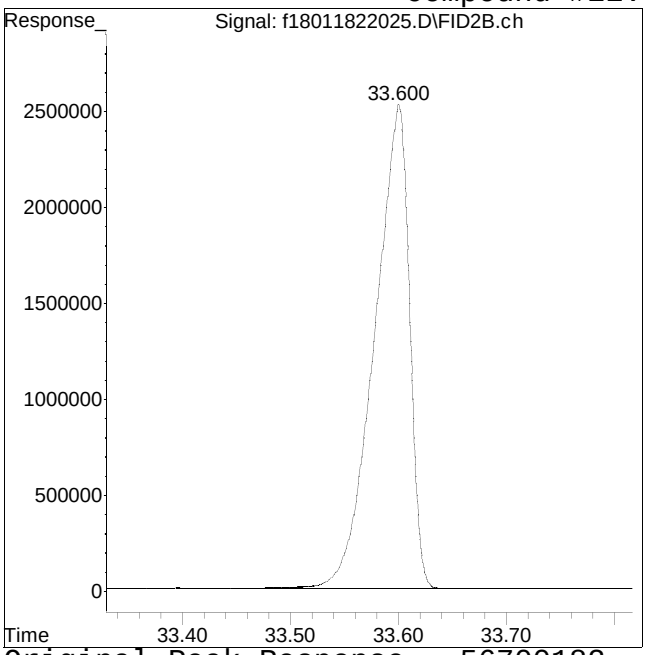
Original Peak Response = 54972735 Manual Peak Response = 54934184 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

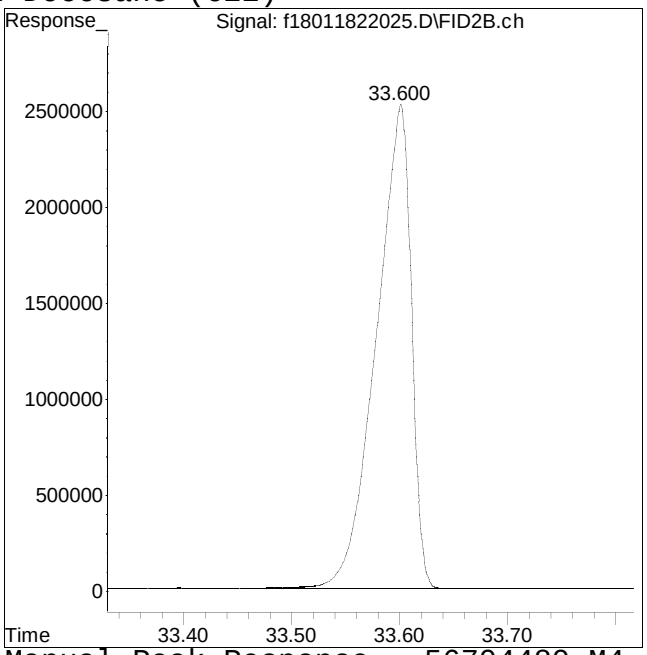
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #22: n-Docosane (C22)



Original Peak Response = 56700182



Manual Peak Response = 56704480 M4

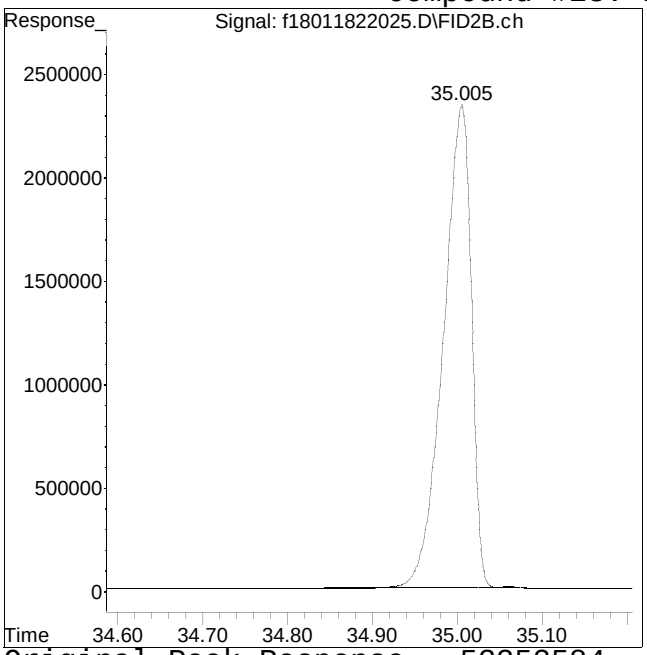
M4 = Poor automated baseline construction.

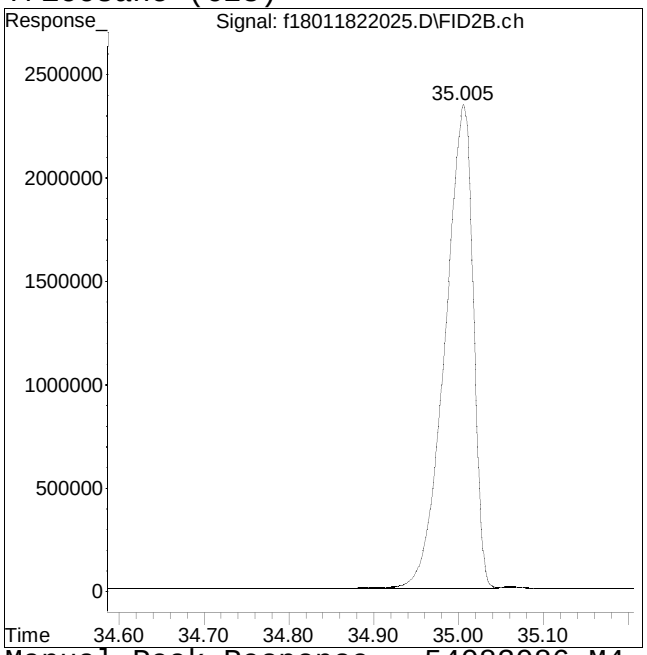
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #23: n-Tricosane (C23)





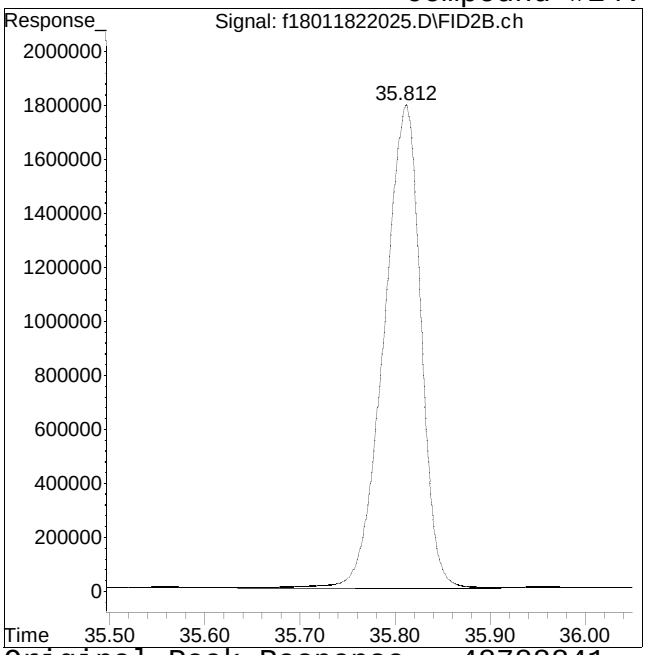
Original Peak Response = 53352584 Manual Peak Response = 54083086 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

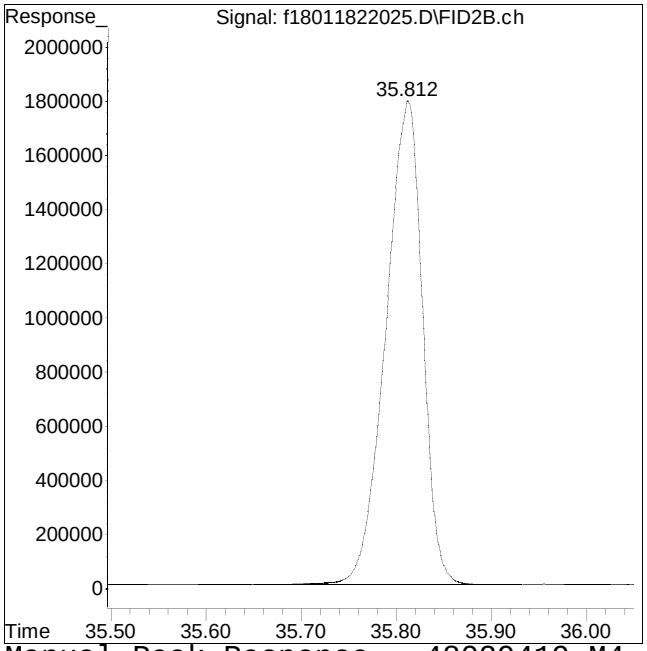
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #24: d50-Tetracosane



Original Peak Response = 48788841



Manual Peak Response = 48029419 M4

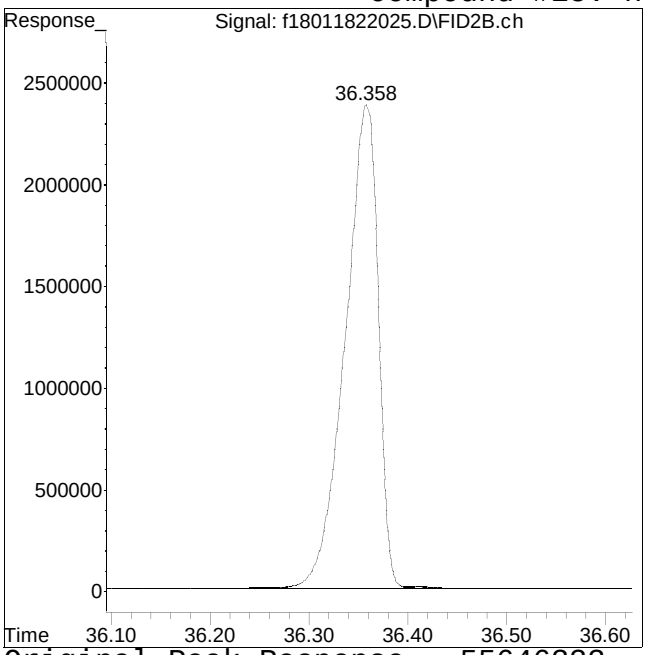
M4 = Poor automated baseline construction.

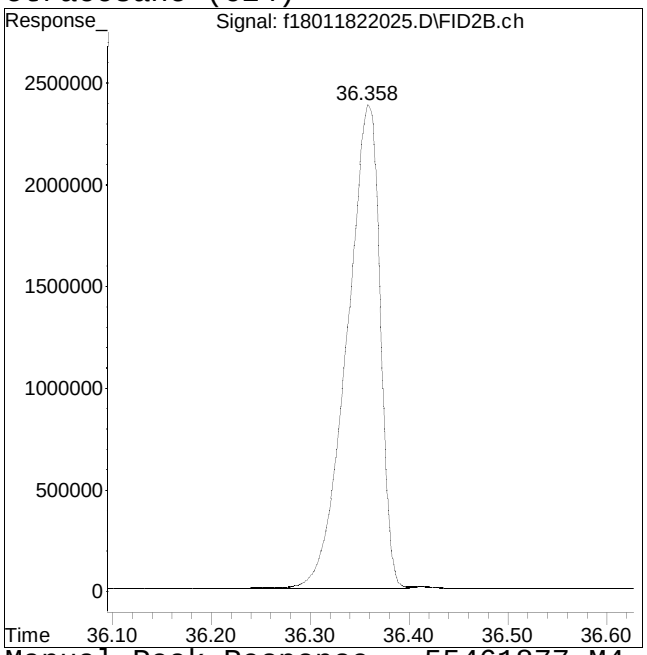
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #25: n-Tetracosane (C24)





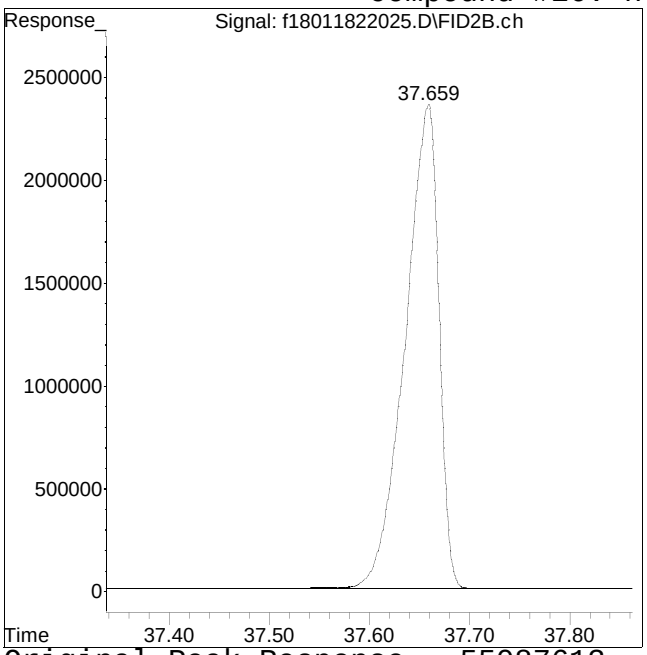
Original Peak Response = 55646333 Manual Peak Response = 55461877 M4
M4 = Poor automated baseline construction.

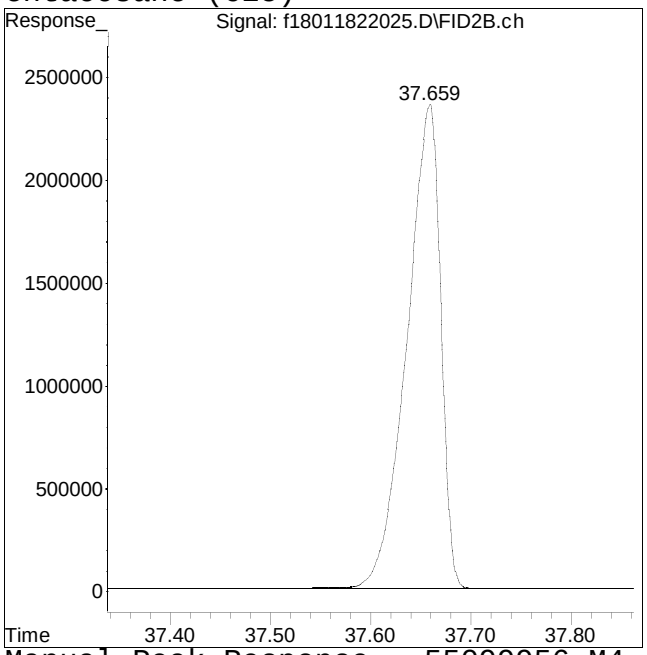
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #26: n-Pentacosane (C25)





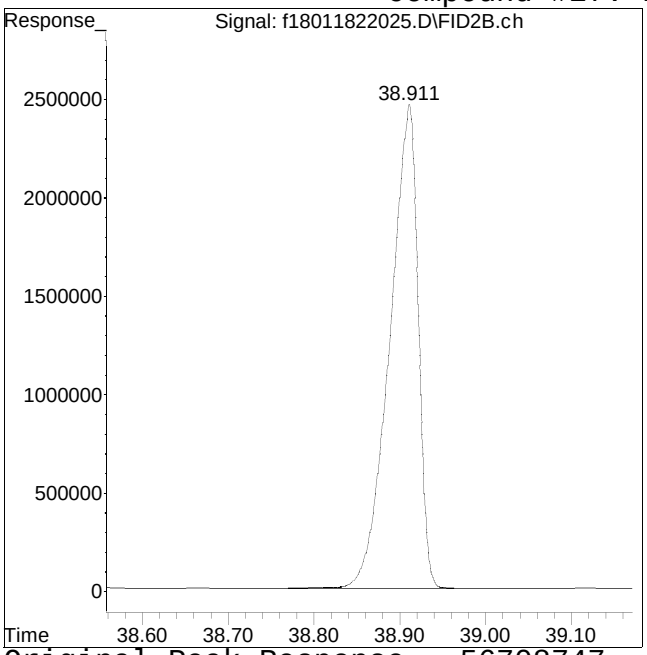
Original Peak Response = 55087613 Manual Peak Response = 55099956 M4
M4 = Poor automated baseline construction.

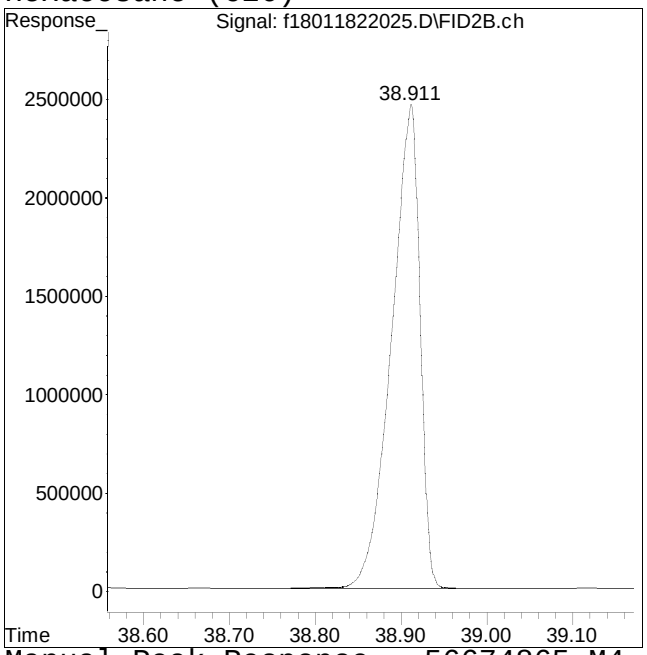
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #27: n-Hexacosane (C26)





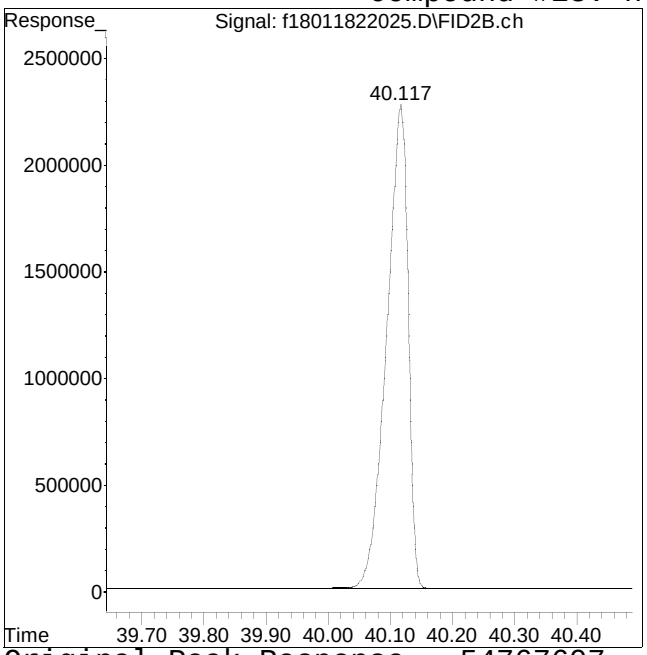
Original Peak Response = 56708747 Manual Peak Response = 56674865 M4
M4 = Poor automated baseline construction.

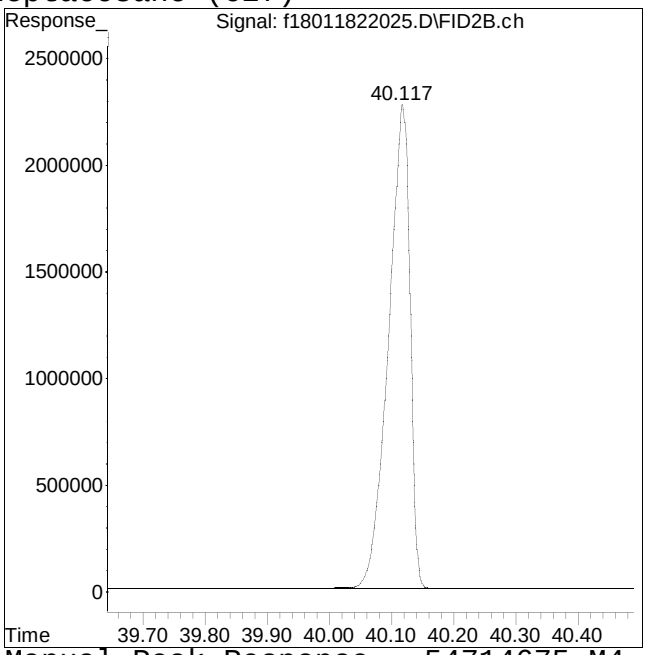
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #28: n-Heptacosane (C27)





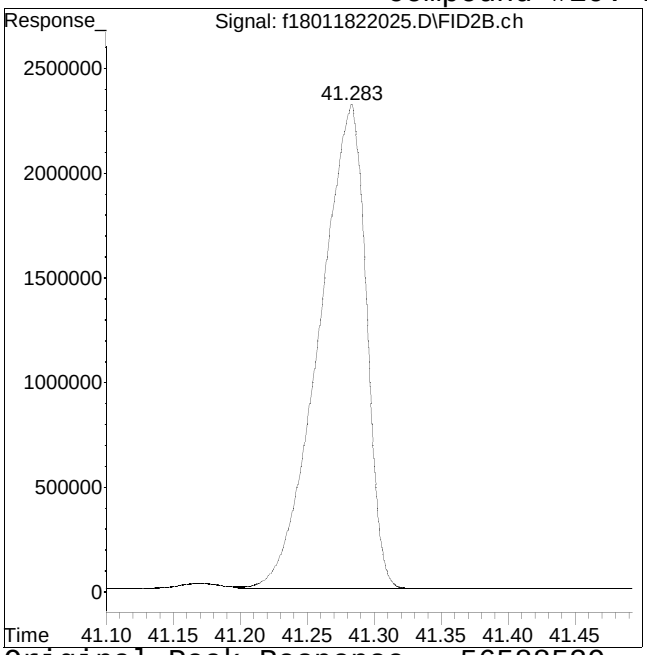
Original Peak Response = 54767607 Manual Peak Response = 54714675 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

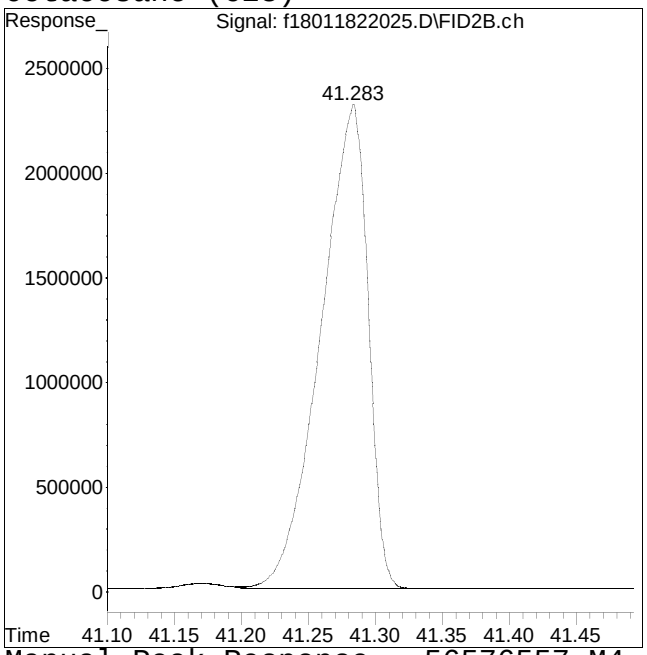
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #29: n-Octacosane (C28)



Original Peak Response = 56588539



Manual Peak Response = 56576557 M4

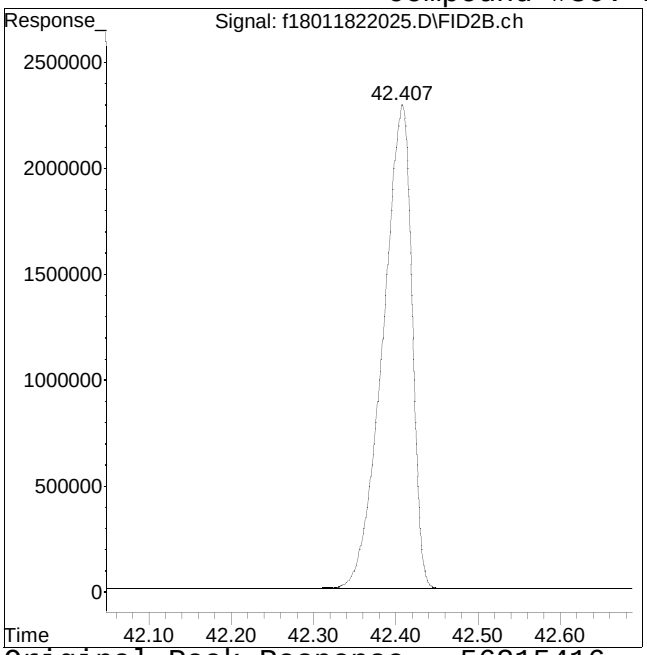
M4 = Poor automated baseline construction.

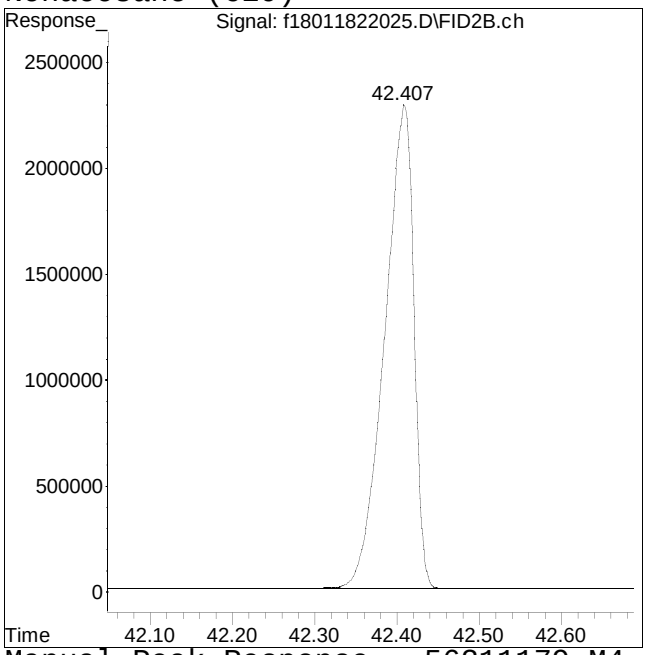
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #30: n-Nonacosane (C29)





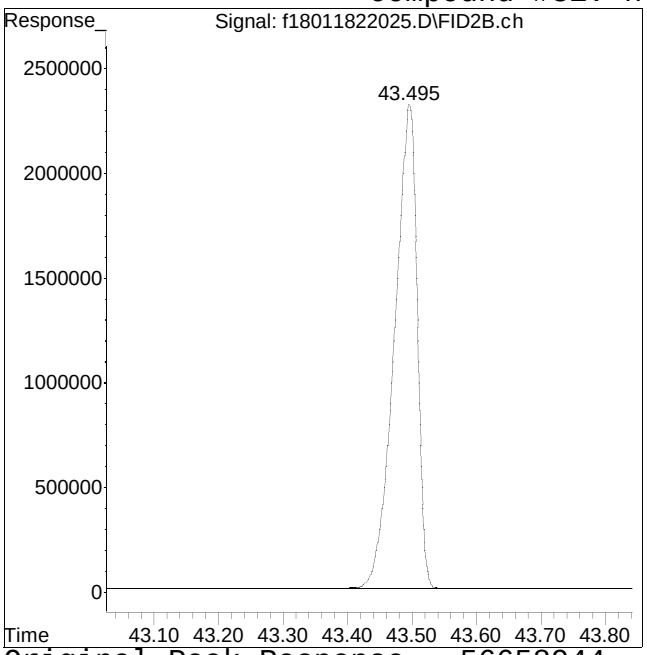
Original Peak Response = 56215416 Manual Peak Response = 56211179 M4
M4 = Poor automated baseline construction.

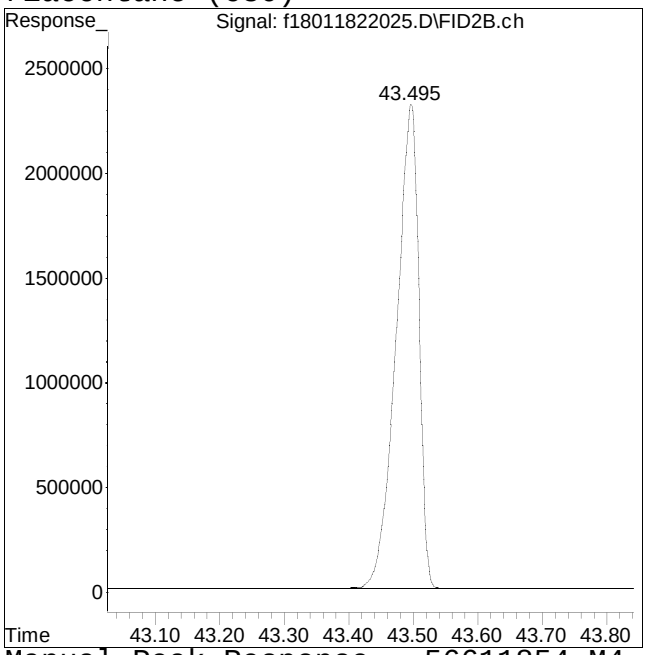
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #31: n-Triacontane (C30)





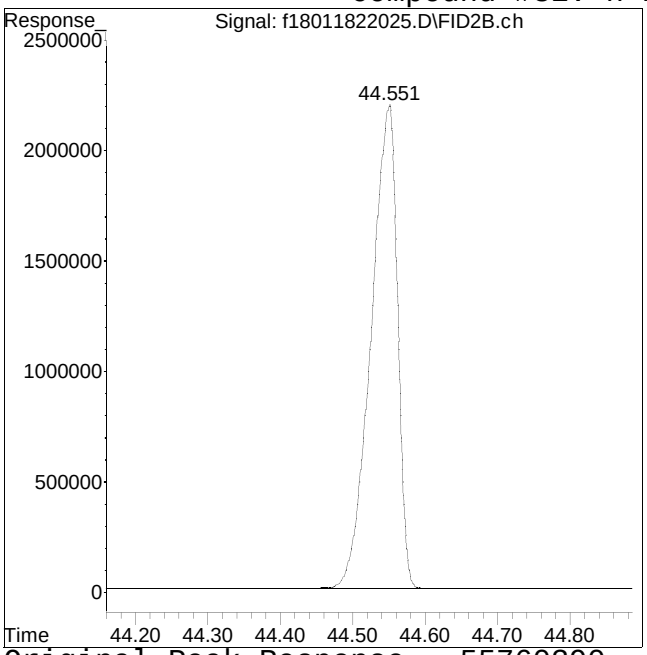
Original Peak Response = 56658944 Manual Peak Response = 56611854 M4
M4 = Poor automated baseline construction.

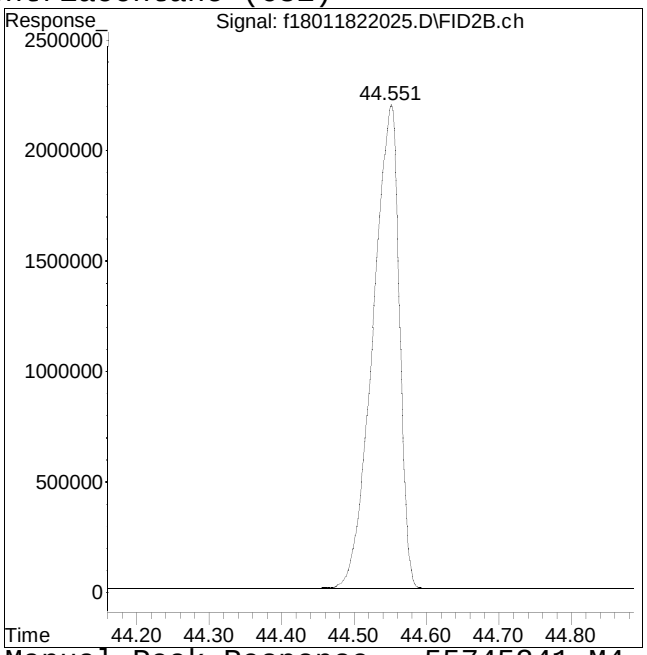
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #32: n-Hentriacontane (C31)





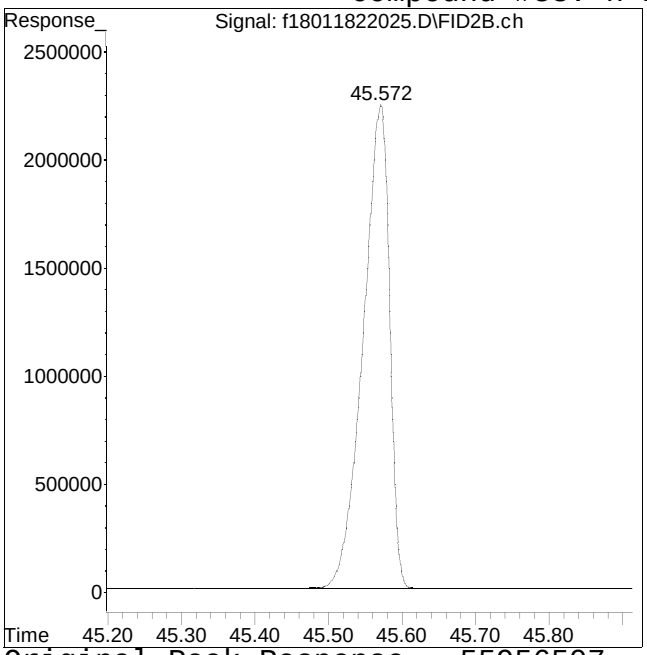
Original Peak Response = 55760390 Manual Peak Response = 55745241 M4
M4 = Poor automated baseline construction.

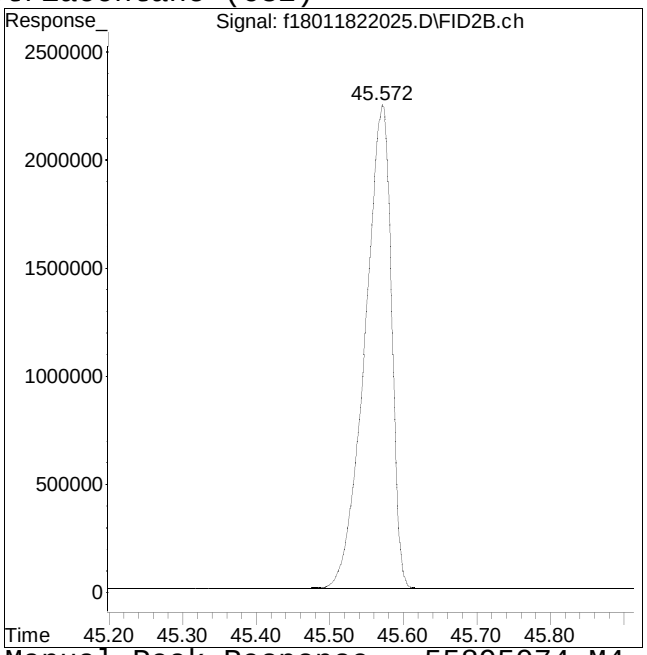
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #33: n-Dotriacontane (C32)





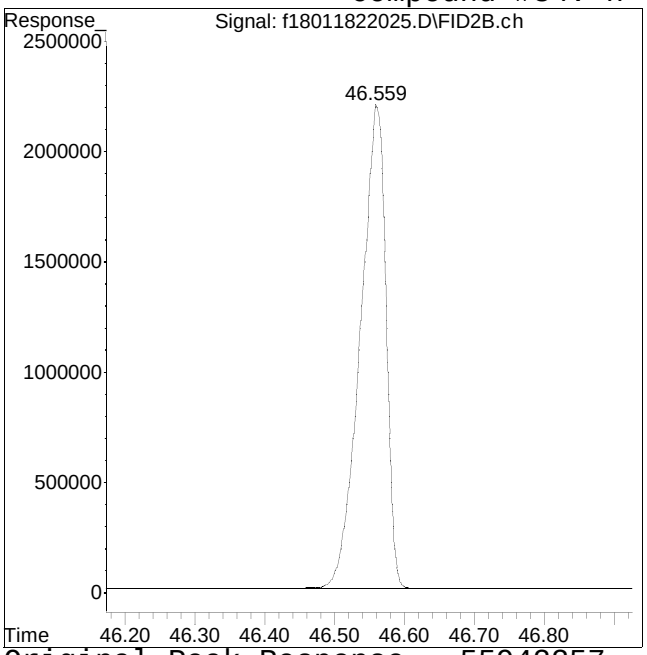
Original Peak Response = 55956507 Manual Peak Response = 55895074 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

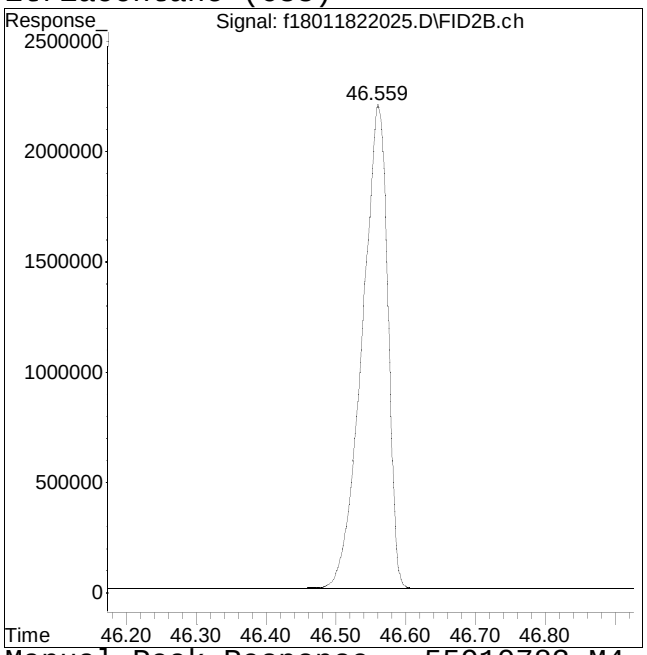
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #34: n-Tritriacontane (C33)



Original Peak Response = 55942257



Manual Peak Response = 55910783 M4

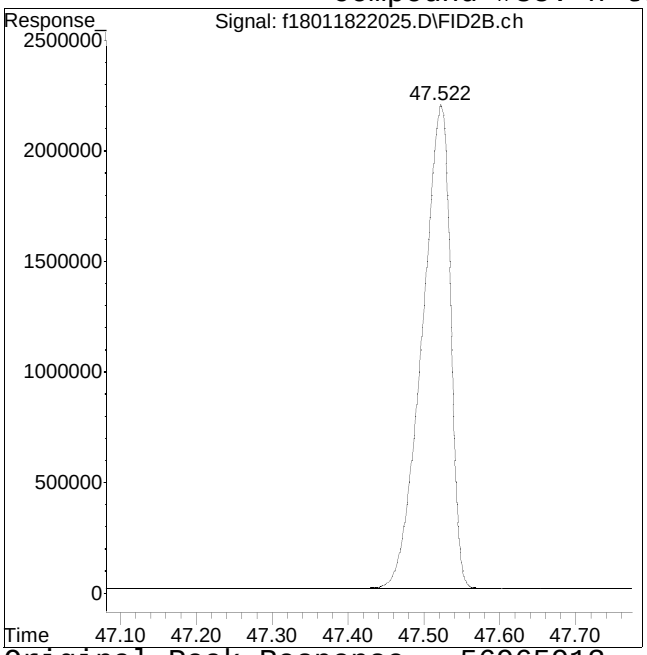
M4 = Poor automated baseline construction.

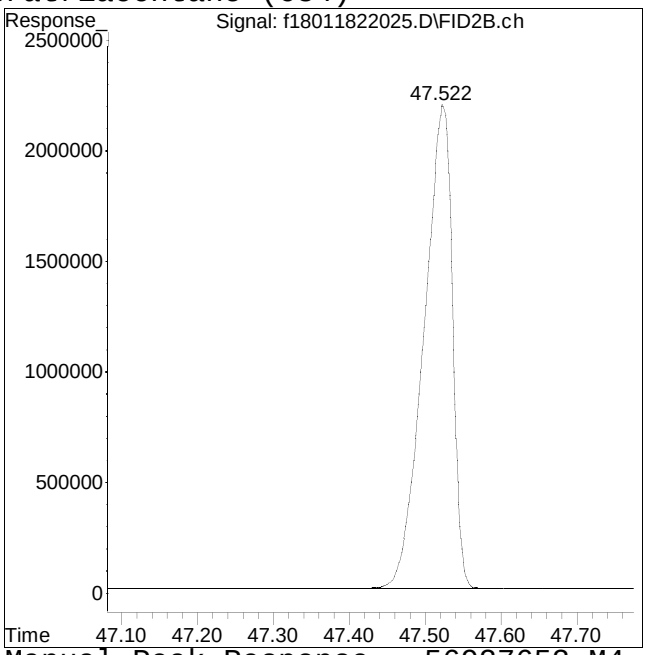
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #35: n-tetratriacontane (C34)





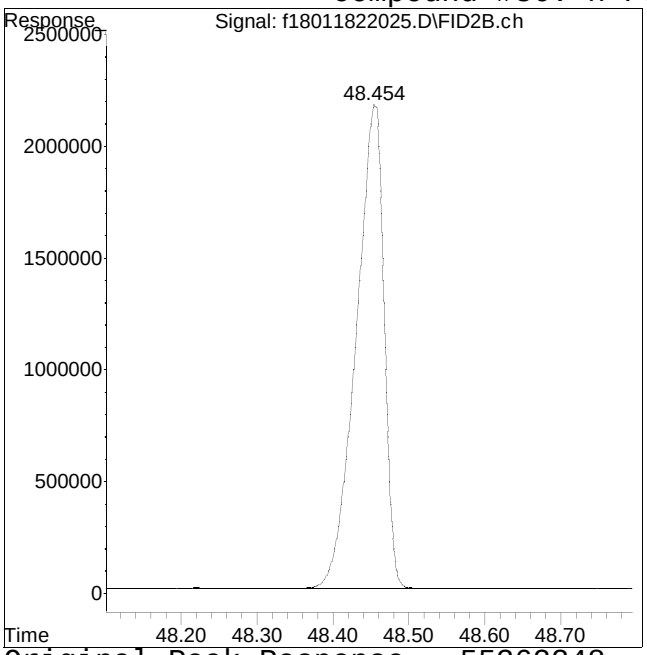
Original Peak Response = 56965913 Manual Peak Response = 56927652 M4
M4 = Poor automated baseline construction.

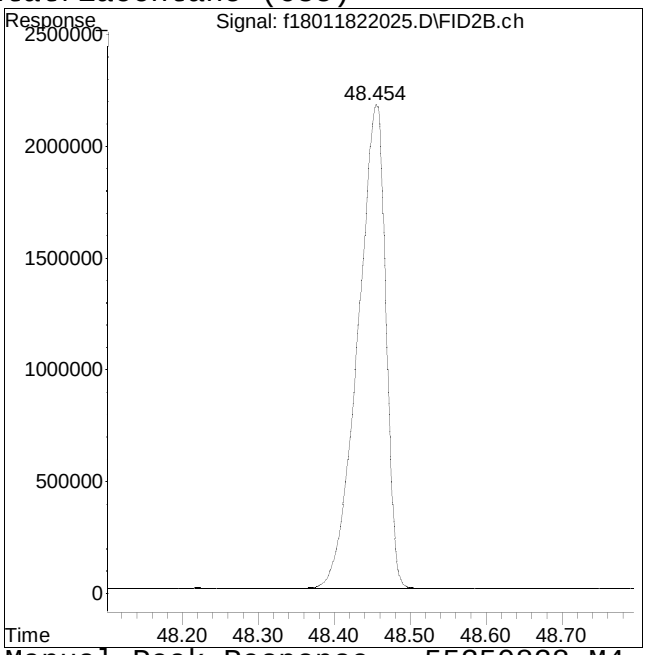
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #36: n-Pentatriacontane (C35)





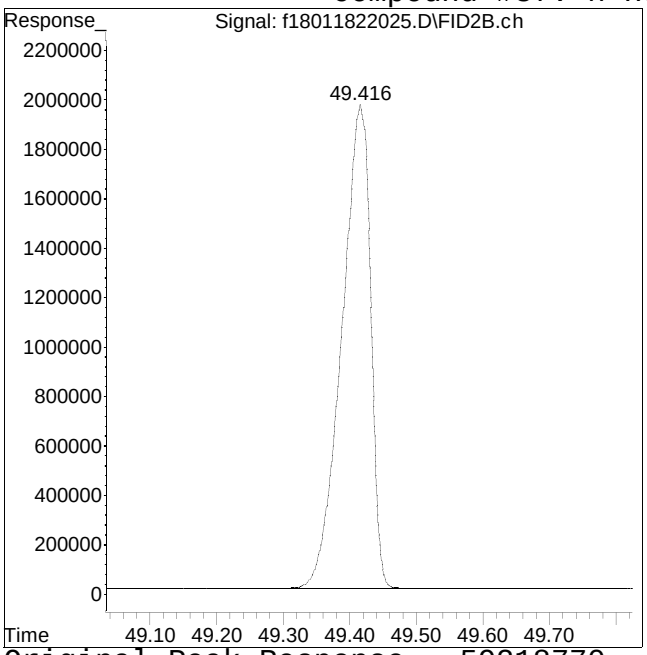
Original Peak Response = 55362248 Manual Peak Response = 55350838 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

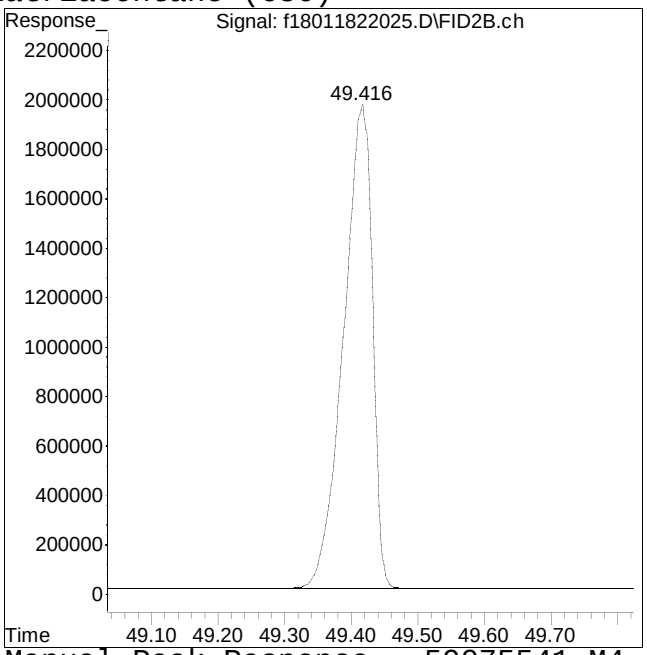
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #37: n-Hexatriacontane (C36)



Original Peak Response = 59218770



Manual Peak Response = 59075541 M4

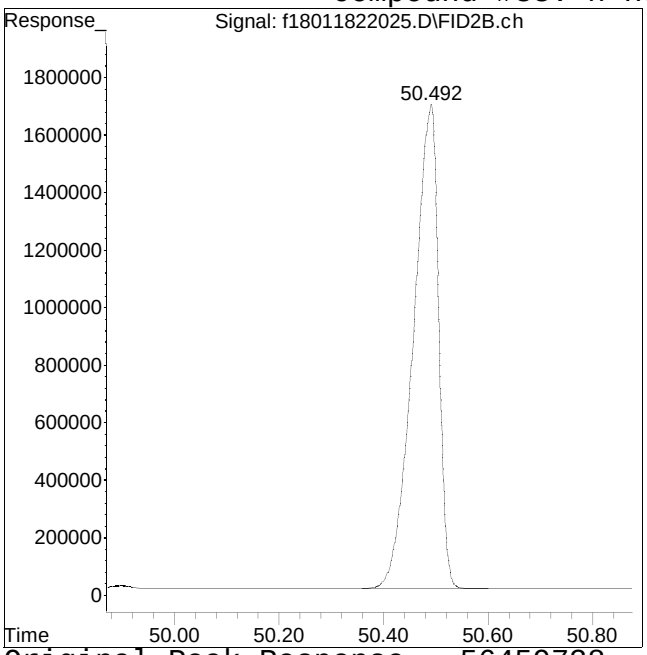
M4 = Poor automated baseline construction.

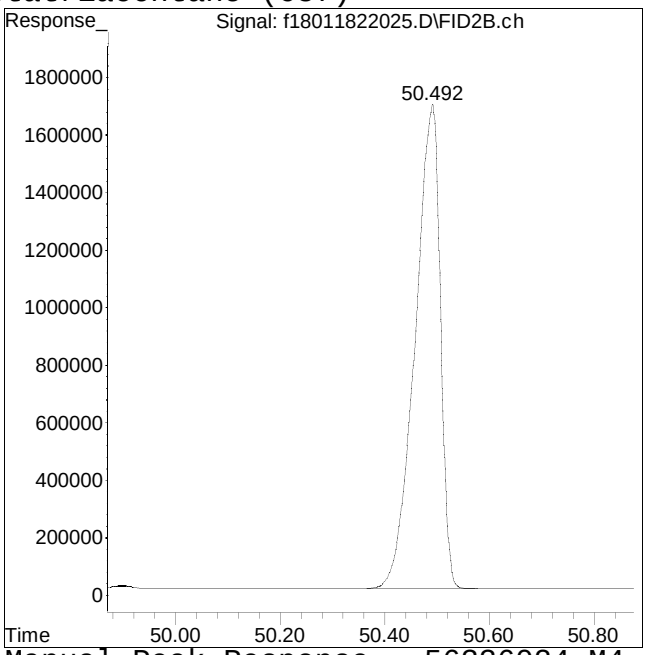
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #38: n-Heptatriacontane (C37)





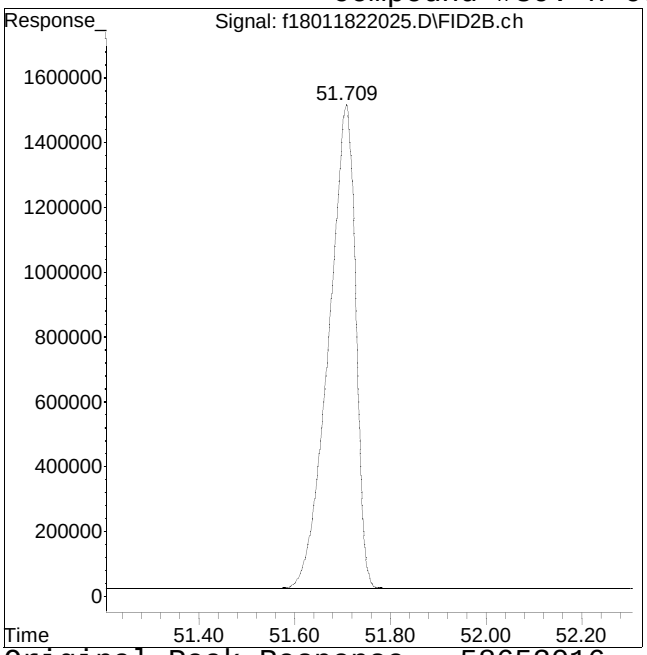
Original Peak Response = 56459738 Manual Peak Response = 56336024 M4
M4 = Poor automated baseline construction.

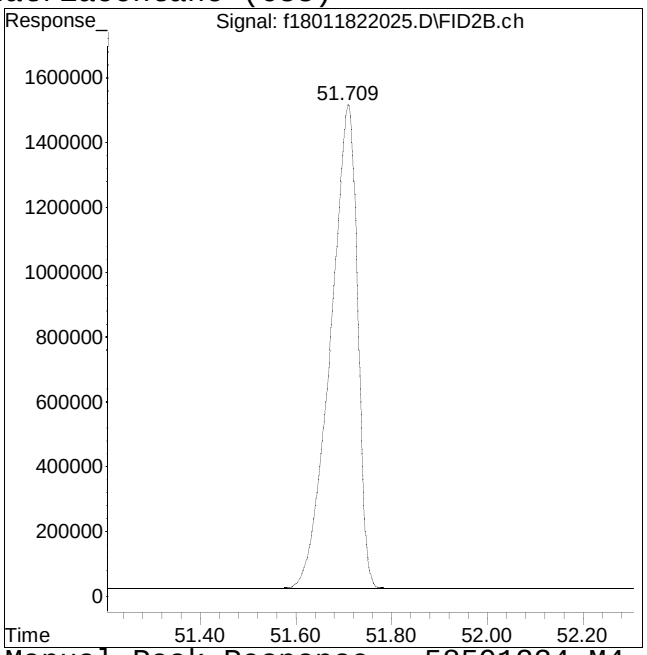
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #39: n-Octatriacontane (C38)





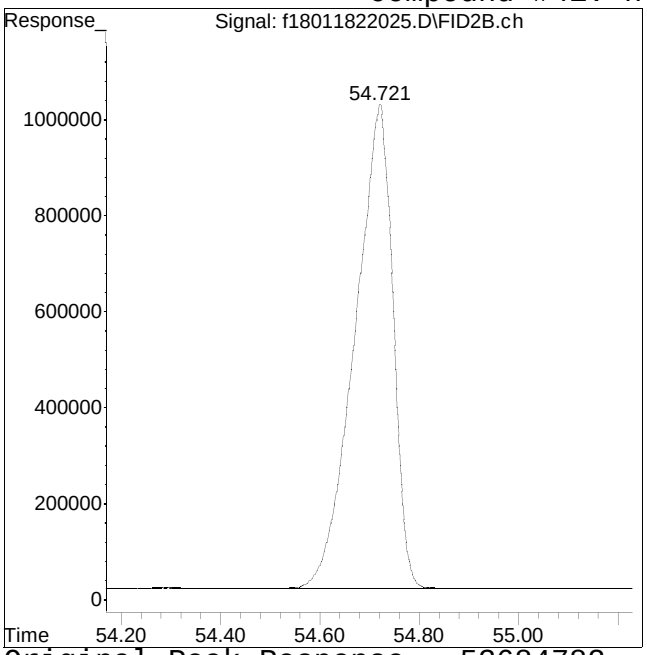
Original Peak Response = 58653016 Manual Peak Response = 58591234 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

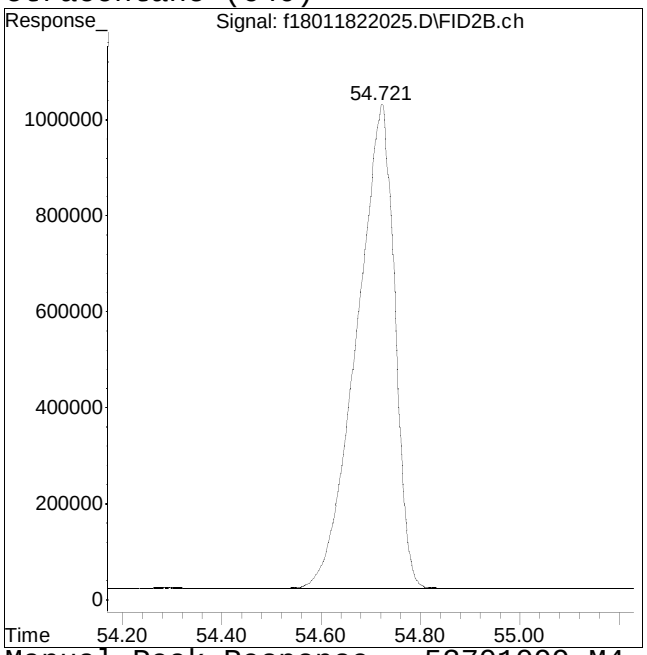
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822025.D
Date Inj'd : 1/19/2022 5:51 am
Sample : CQ1801182201R

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:24 am

Compound #41: n-Tetracontane (C40)



Original Peak Response = 53684782



Manual Peak Response = 53701099 M4

M4 = Poor automated baseline construction.

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822029.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 08:44 am
Operator : FID18:WR
Sample : WG1596727-1,0.1028
Misc : WG1596727,FRBE48,10.28ug/ml
ALS Vial : 65 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 21 10:46:08 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Fri Jan 21 10:22:37 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1801182201R
Blank File : f18011822027.D

Sub List : SHC - SHC

	Compound	R.T.	Response	Conc Units
	Internal Standards			
1) I	5-alpha-androstane	31.200	57802663	50.000 ug/mL M4
	System Monitoring Compounds			
19) s	ortho-terphenyl	29.191	59283591	49.420 ug/mL M4
Spiked Amount	50.000 Range	50 - 130	Recovery =	98.84%
24) s	d50-Tetracosane	35.817	50810806	52.093 ug/mL M4
Spiked Amount	50.000 Range	50 - 130	Recovery =	104.19%
	Target Compounds			
2) t	n-Octane (C8)	5.554	83811732	89.834 ug/mL M4
3) t	n-Nonane (C9)	7.775	67673762	70.042 ug/mL M4
4) t	n-Decane (C10)	10.265	55982787	55.755 ug/mL M4
5) t	n-Undecane (C11)	12.778	51791610	51.324 ug/mL M4
6) t	n-Dodecane (C12)	15.201	47787109	46.758 ug/mL M4
7) t	n-Tridecane (C13)	17.506	44171564	42.920 ug/mL M4
8) t	1380	19.177	11069734	10.450 ug/mL M4
9) t	n-Tetradecane (C14)	19.685	41333372	39.018 ug/mL M4
10) t	1470	20.967	15234545	14.261 ug/mL M4
11) t	n-Pentadecane (C15)	21.747	41576622	38.921 ug/mL M4
12) t	n-Hexadecane (C16)	23.698	38060815	35.579 ug/mL M4
13) t	1650	24.603	11959187	10.980 ug/mL M4
14) t	n-Heptadecane (C17)	25.554	33237023	30.517 ug/mL M4
15) t	Pristane	25.649	26236574	23.752 ug/mL M4
16) t	n-Octadecane (C18)	27.313	29241756	26.554 ug/mL M4
17) t	Phytane	27.472	13843555	13.589 ug/mL M4
18) t	n-Nonadecane (C19)	28.993	28320620	25.603 ug/mL M4
20) t	n-Eicosane (C20)	30.596	25875907	23.201 ug/mL M4
21) t	n-Heneicosane (C21)	32.126	24410584	21.725 ug/mL M4
22) t	n-Docosane (C22)	33.594	23607973	20.909 ug/mL M4
23) t	n-Tricosane (C23)	35.002	21154650	18.778 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822029.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 08:44 am
Operator : FID18:WR
Sample : WG1596727-1,0.1028
Misc : WG1596727,FRBE48,10.28ug/ml
ALS Vial : 65 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 21 10:46:08 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Fri Jan 21 10:22:37 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1801182201R
Blank File : f18011822027.D

Sub List : SHC - SHC

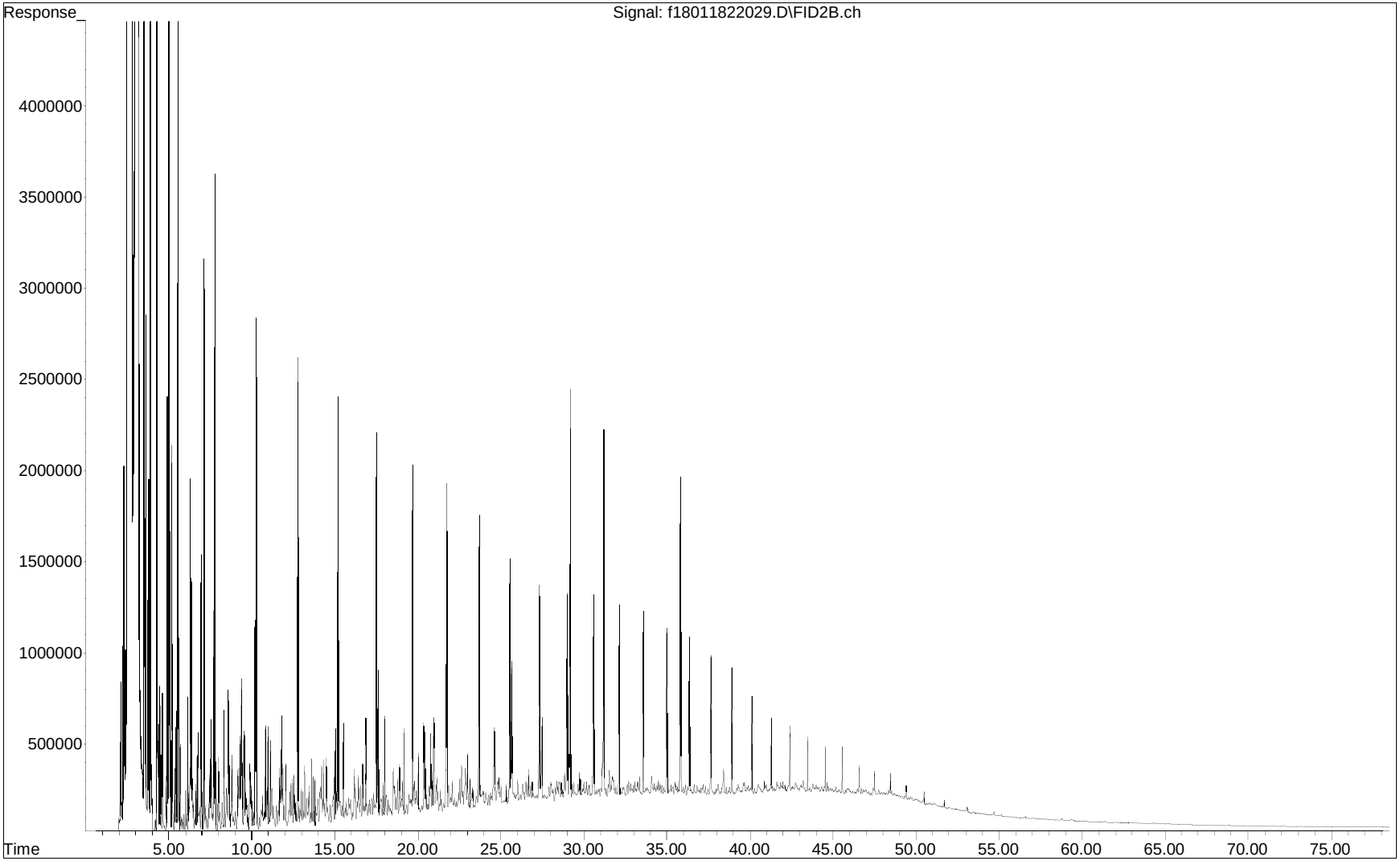
	Compound	R.T.	Response	Conc	Units	
25) t	n-Tetracosane (C24)	36.352	19784986	17.741	ug/mL	M4
26) t	n-Pentacosane (C25)	37.651	21124306	19.070	ug/mL	M4
27) t	n-Hexacosane (C26)	38.902	17060787	14.982	ug/mL	M4
28) t	n-Heptacosane (C27)	40.107	12785161	11.256	ug/mL	M4
29) t	n-Octacosane (C28)	41.269	9542817	8.215	ug/mL	M4
30) t	n-Nonacosane (C29)	42.396	9527105	8.224	ug/mL	M4
31) t	n-Triacontane (C30)	43.484	7467558	6.414	ug/mL	M4
32) t	n-Hentriacontane (C31)	44.536	6049441	5.350	ug/mL	M4
33) t	n-Dotriacontane (C32)	45.553	6512410	5.498	ug/mL	M4
34) t	n-Tritriacontane (C33)	46.544	3884472	3.374	ug/mL	M4
35) t	n-tetratriacontane (C34)	47.503	3759681	3.275	ug/mL	M4
36) t	n-Pentatriacontane (C35)	48.437	3680105	3.358	ug/mL	M4
37) t	n-Hexatriacontane (C36)	49.391	2366015	1.830	ug/mL	M4
38) t	n-Heptatriacontane (C37)	50.461	2420078	2.049	ug/mL	M4
39) t	n-Octatriacontane (C38)	51.679	1699834	1.414	ug/mL	M4
40) t	n-Nonatriacontane (C39)	53.071	1134183	0.949	ug/mL	M4
41) t	n-Tetracontane (C40)	54.678	982027	0.822	ug/mL	M4
42) h	C9-C44 Total Petroleu...	36.052	6746086869	6065.007	ug/mL	m
42) h	C9-C44 Total Petroleu BS	36.052	6608499137	5941.310	ug/mL	m
46) h	Total Resolved Hydroc...	37.870	2215564315	1991.883	ug/mL	m

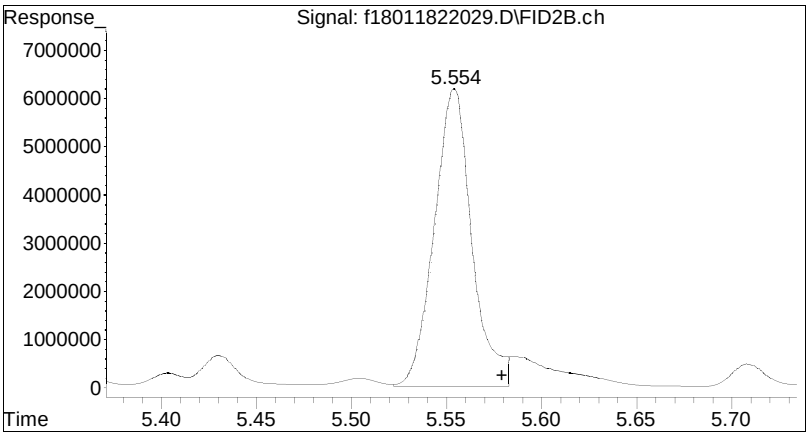
SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

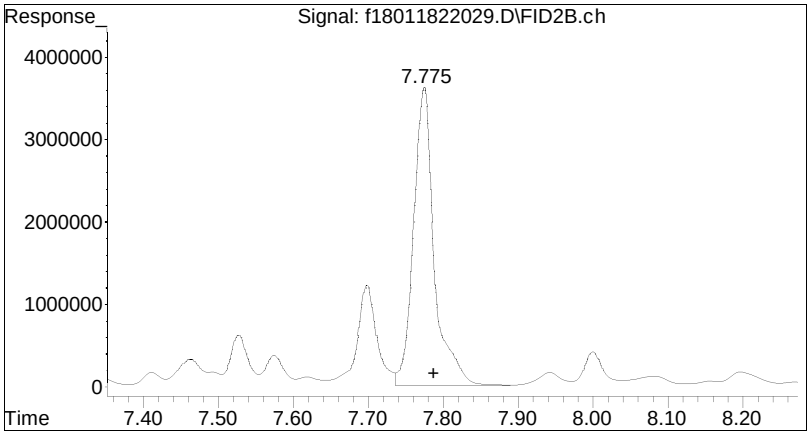
File :O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\f18011822029.D
Operator : FID18:WR
Acquired : 19 Jan 2022 08:44 am using AcqMethod FID18.M
Sample Name: WG1596727-1,0.1028
Instrument: FID 18
Misc Info : WG1596727,FRBE48,10.28ug/ml
Vial Number: 65
CurrentMeth: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M





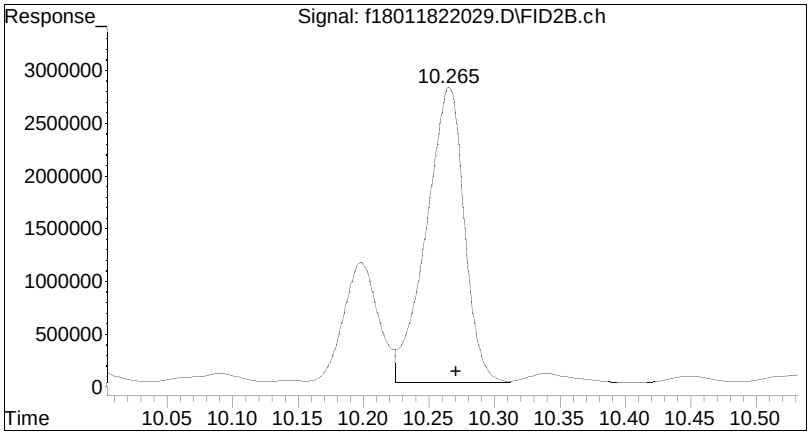
#2 n-Octane (C8)

R.T.: 5.554 min
Delta R.T.: -0.025 min
Response: 83811732
Conc: 89.83 ug/mL M4



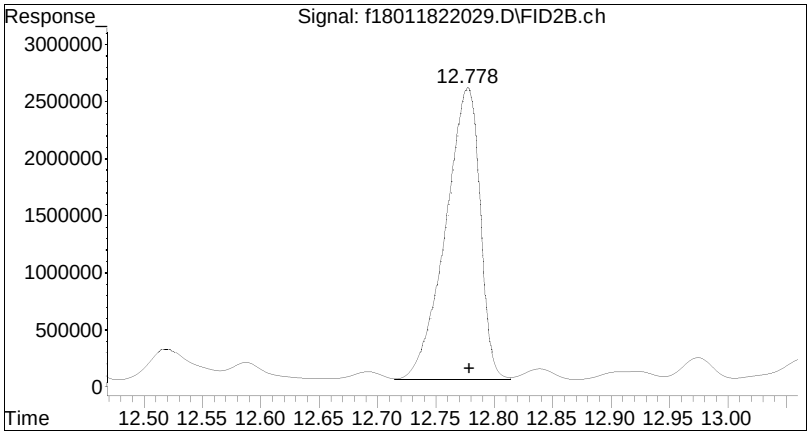
#3 n-Nonane (C9)

R.T.: 7.775 min
Delta R.T.: -0.013 min
Response: 67673762
Conc: 70.04 ug/mL M4



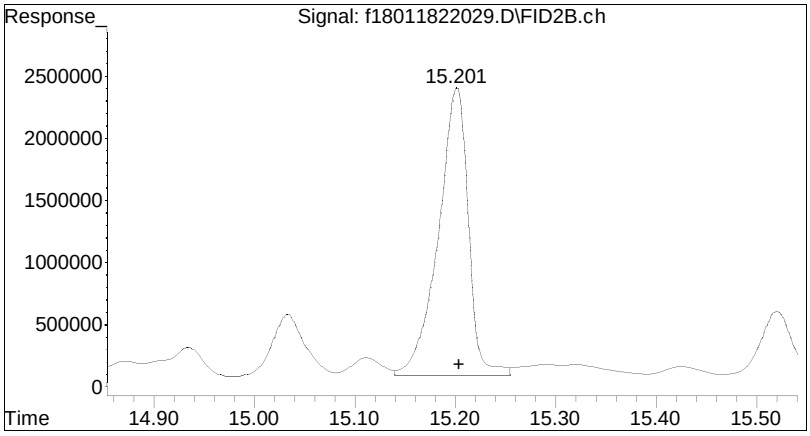
#4 n-Decane (C10)

R.T.: 10.265 min
Delta R.T.: -0.005 min
Response: 55982787
Conc: 55.75 ug/mL M4



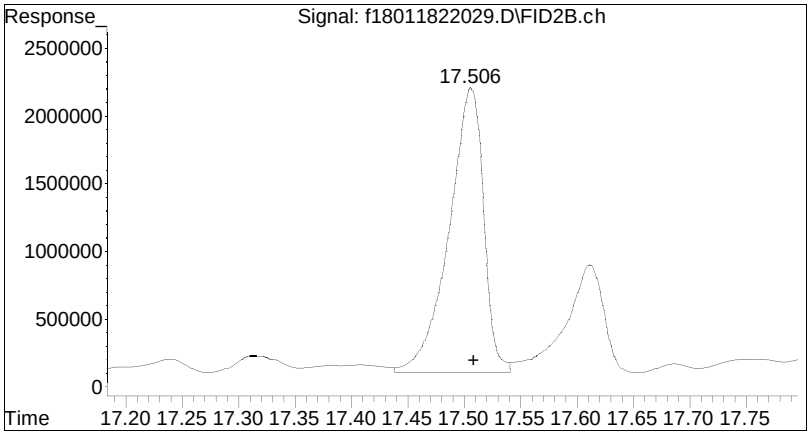
#5 n-Undecane (C11)

R.T.: 12.778 min
Delta R.T.: -0.001 min
Response: 51791610
Conc: 51.32 ug/mL M4



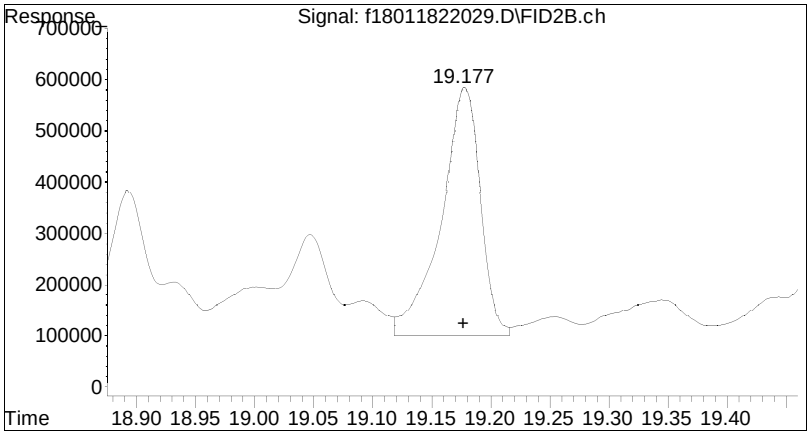
#6 n-Dodecane (C12)

R.T.: 15.201 min
Delta R.T.: -0.002 min
Response: 47787109
Conc: 46.76 ug/mL M4



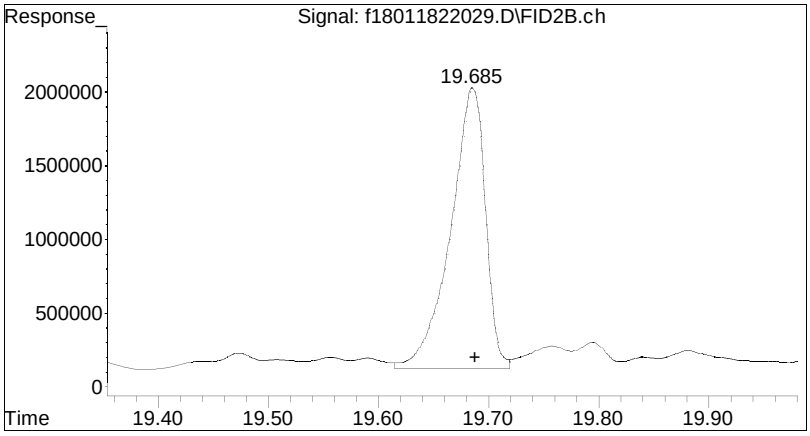
#7 n-Tridecane (C13)

R.T.: 17.506 min
Delta R.T.: -0.003 min
Response: 44171564
Conc: 42.92 ug/mL M4



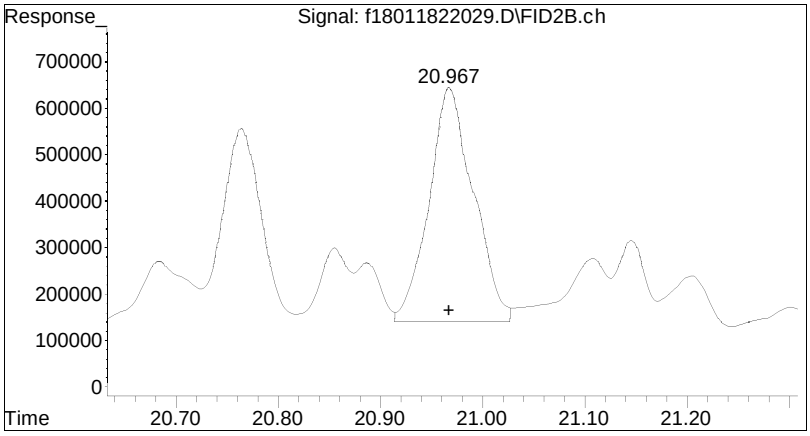
#8 1380

R.T.: 19.177 min
Delta R.T.: 0.000 min
Response: 11069734
Conc: 10.45 ug/mL M4



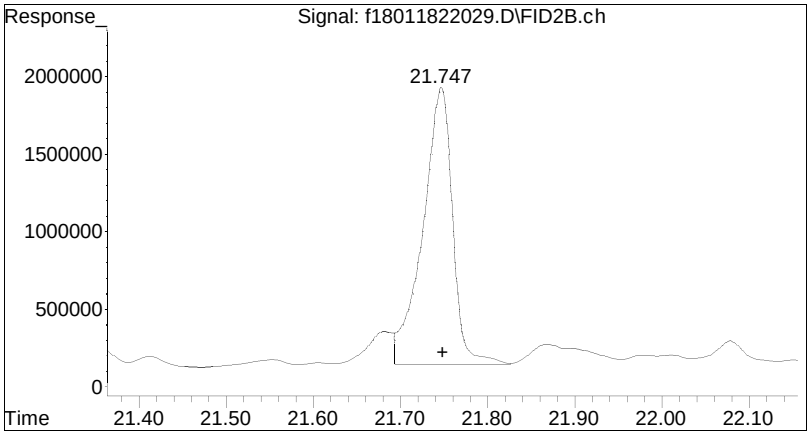
#9 n-Tetradecane (C14)

R.T.: 19.685 min
Delta R.T.: -0.003 min
Response: 41333372
Conc: 39.02 ug/mL M4



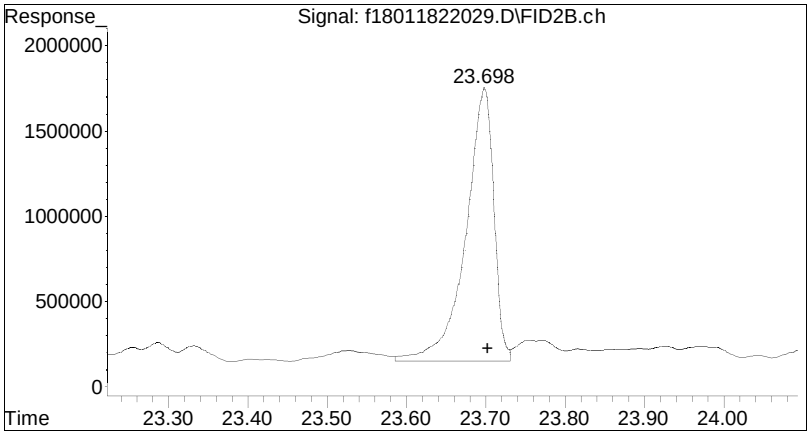
#10 1470

R.T.: 20.967 min
Delta R.T.: 0.000 min
Response: 15234545
Conc: 14.26 ug/mL M4



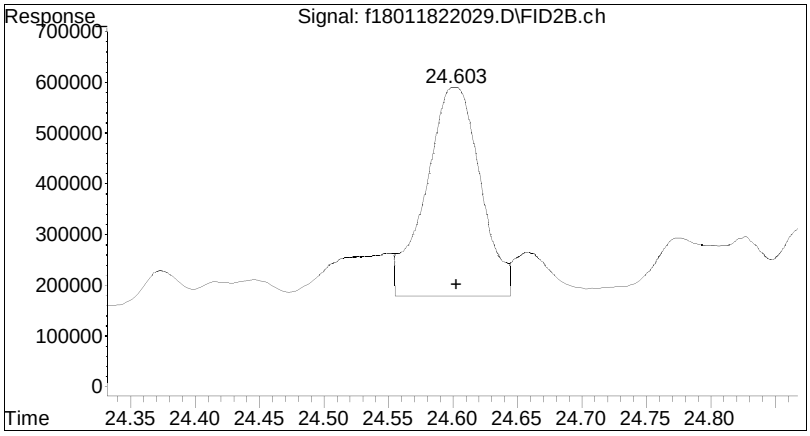
#11 n-Pentadecane (C15)

R.T.: 21.747 min
Delta R.T.: -0.002 min
Response: 41576622
Conc: 38.92 ug/mL M4



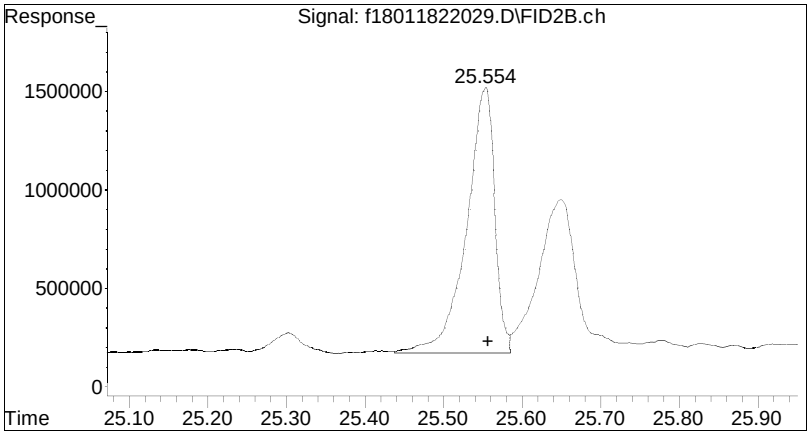
#12 n-Hexadecane (C16)

R.T.: 23.698 min
Delta R.T.: -0.005 min
Response: 38060815
Conc: 35.58 ug/mL M4



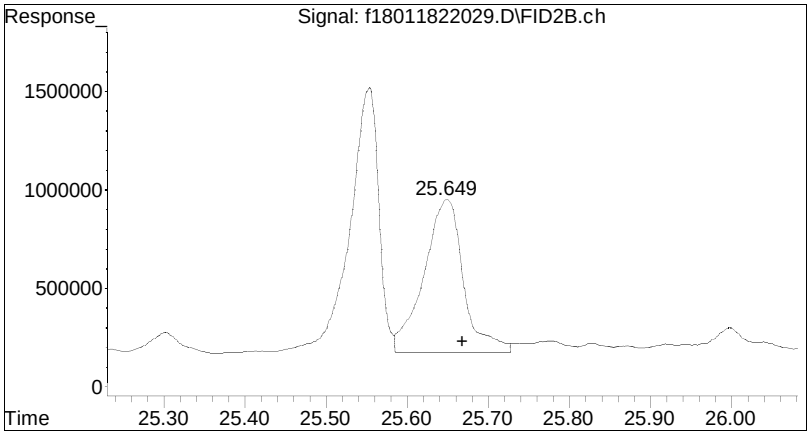
#13 1650

R.T.: 24.603 min
Delta R.T.: 0.000 min
Response: 11959187
Conc: 10.98 ug/mL M4



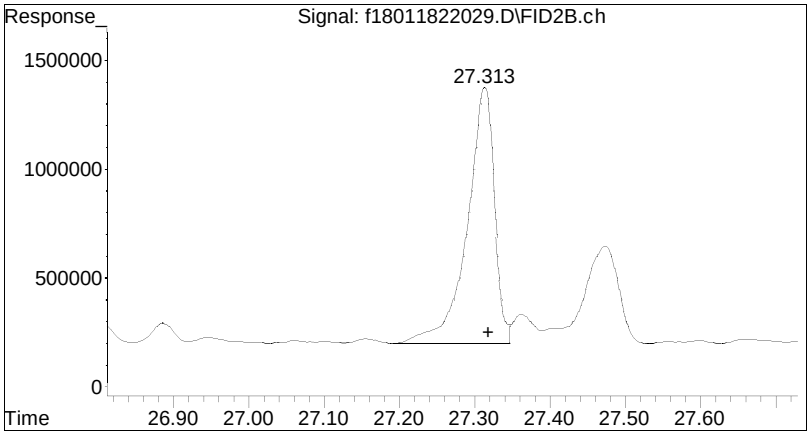
#14 n-Heptadecane (C17)

R.T.: 25.554 min
Delta R.T.: -0.003 min
Response: 33237023
Conc: 30.52 ug/mL M4



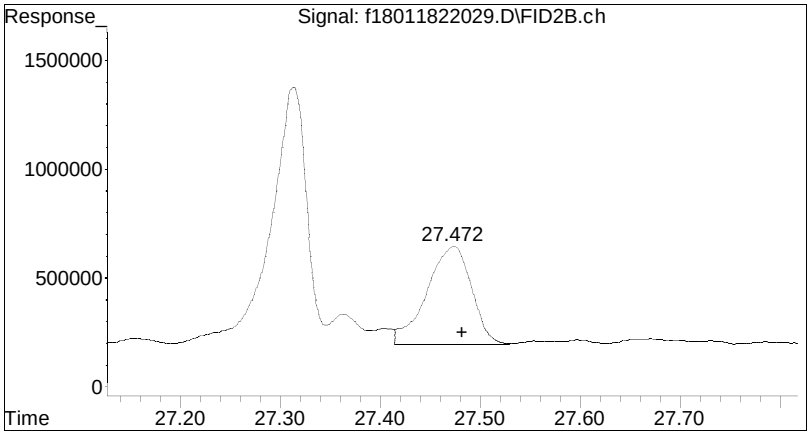
#15 Pristane

R.T.: 25.649 min
Delta R.T.: -0.019 min
Response: 26236574
Conc: 23.75 ug/mL M4



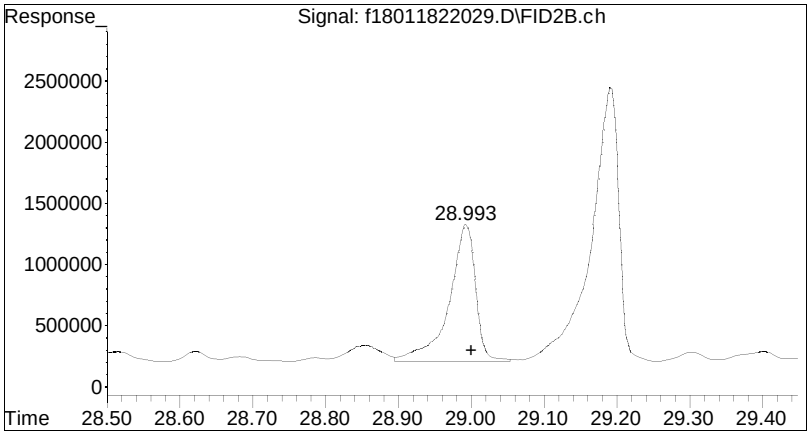
#16 n-Octadecane (C18)

R.T.: 27.313 min
Delta R.T.: -0.005 min
Response: 29241756
Conc: 26.55 ug/mL M4



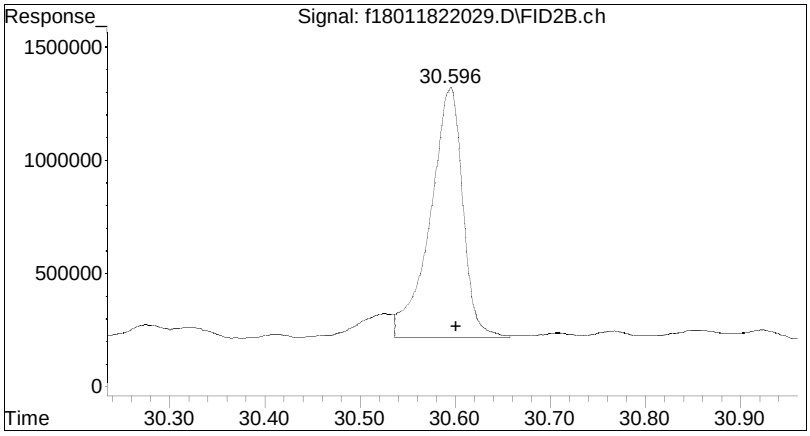
#17 Phytane

R.T.: 27.472 min
Delta R.T.: -0.009 min
Response: 13843555
Conc: 13.59 ug/mL M4



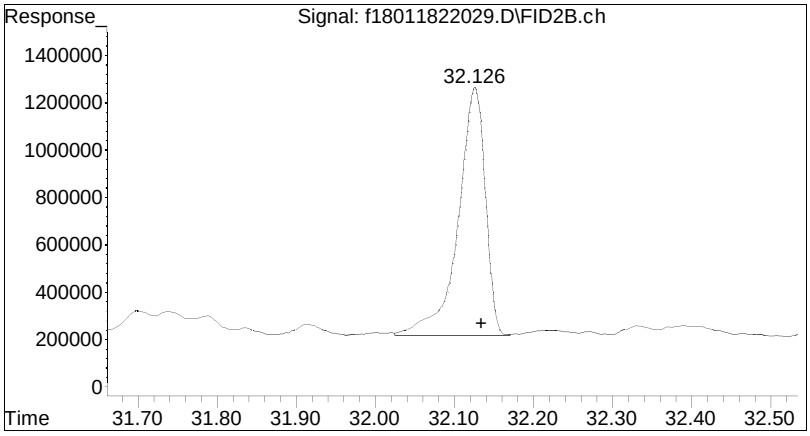
#18 n-Nonadecane (C19)

R.T.: 28.993 min
Delta R.T.: -0.007 min
Response: 28320620
Conc: 25.60 ug/mL M4



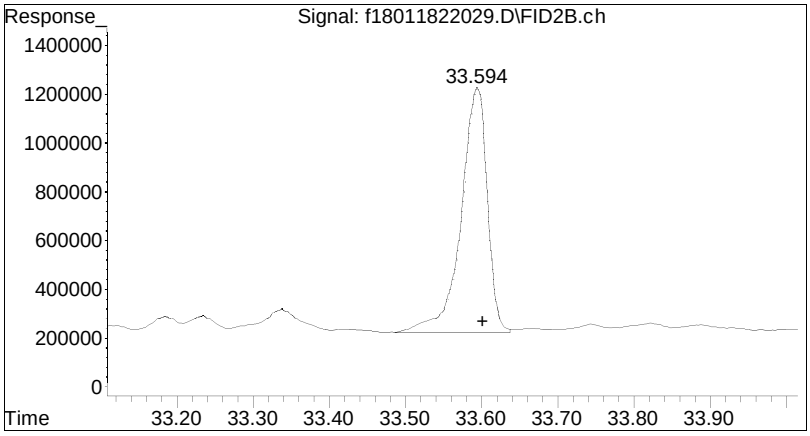
#20 n-Eicosane (C20)

R.T.: 30.596 min
Delta R.T.: -0.006 min
Response: 25875907
Conc: 23.20 ug/mL M4



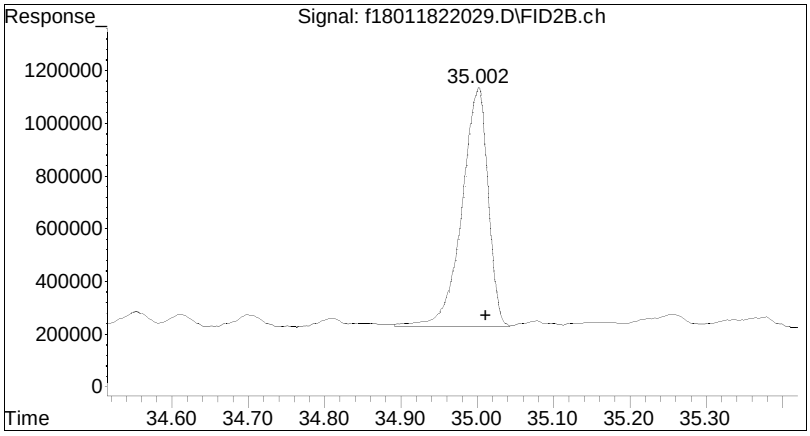
#21 n-Heneicosane (C21)

R.T.: 32.126 min
Delta R.T.: -0.009 min
Response: 24410584
Conc: 21.73 ug/mL M4



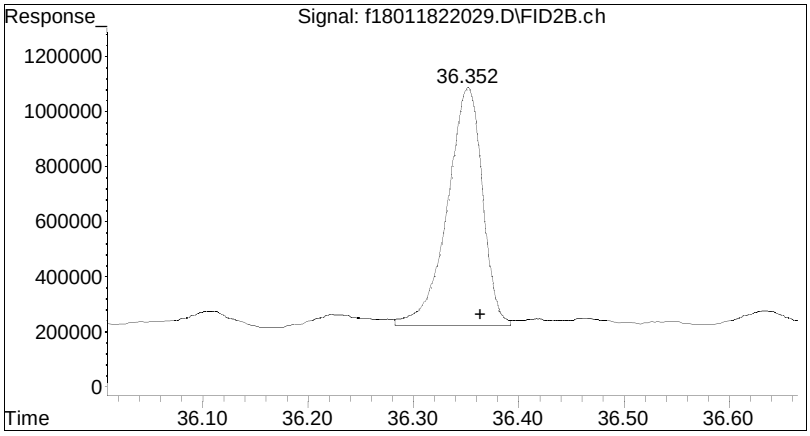
#22 n-Docosane (C22)

R.T.: 33.594 min
Delta R.T.: -0.008 min
Response: 23607973
Conc: 20.91 ug/mL M4



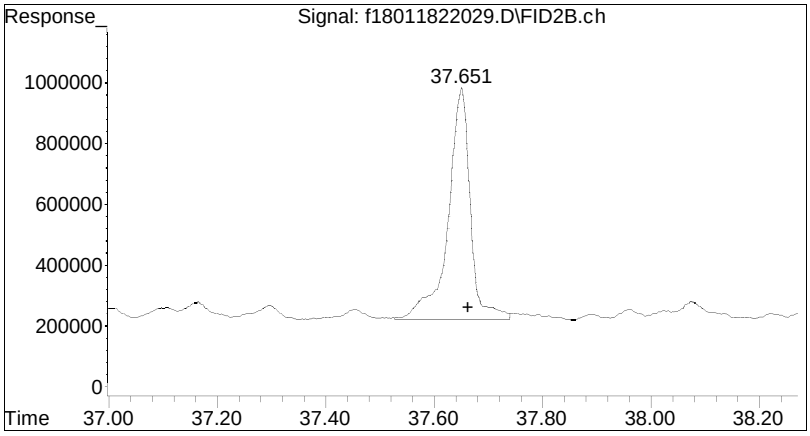
#23 n-Tricosane (C23)

R.T.: 35.002 min
Delta R.T.: -0.010 min
Response: 21154650
Conc: 18.78 ug/mL M4



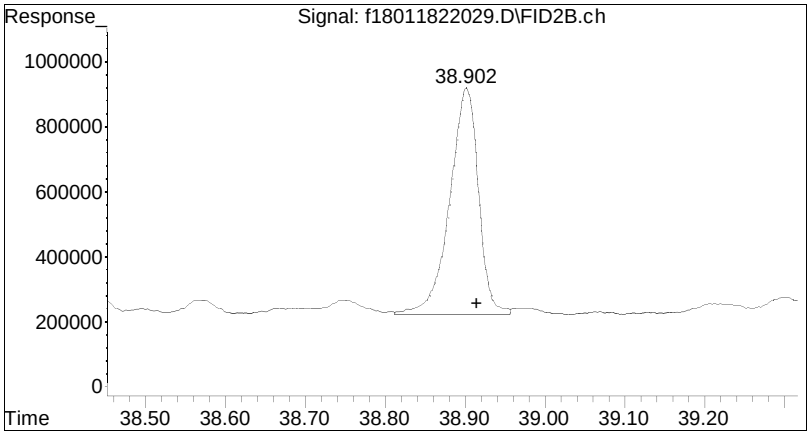
#25 n-Tetracosane (C24)

R.T.: 36.352 min
Delta R.T.: -0.012 min
Response: 19784986
Conc: 17.74 ug/mL M4



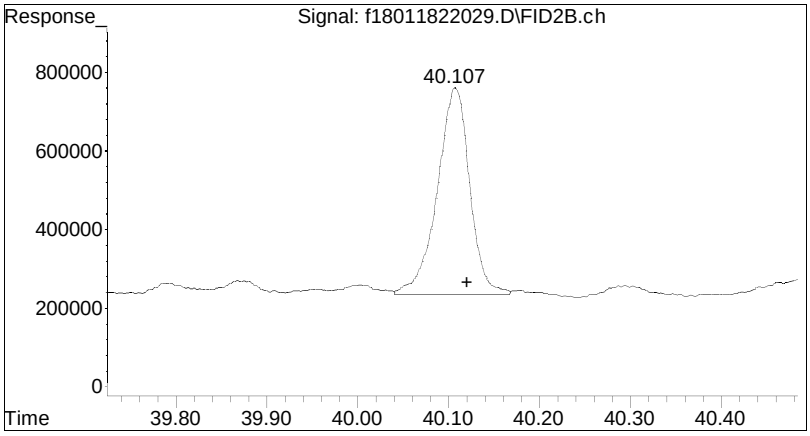
#26 n-Pentacosane (C25)

R.T.: 37.651 min
Delta R.T.: -0.012 min
Response: 21124306
Conc: 19.07 ug/mL M4



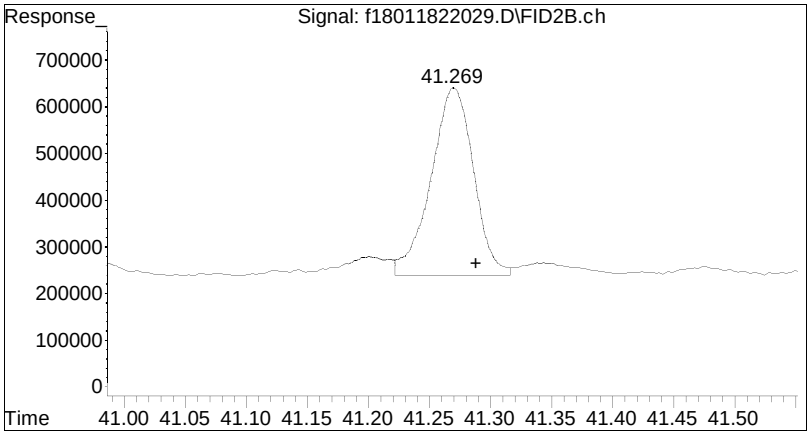
#27 n-Hexacosane (C26)

R.T.: 38.902 min
Delta R.T.: -0.013 min
Response: 17060787
Conc: 14.98 ug/mL M4



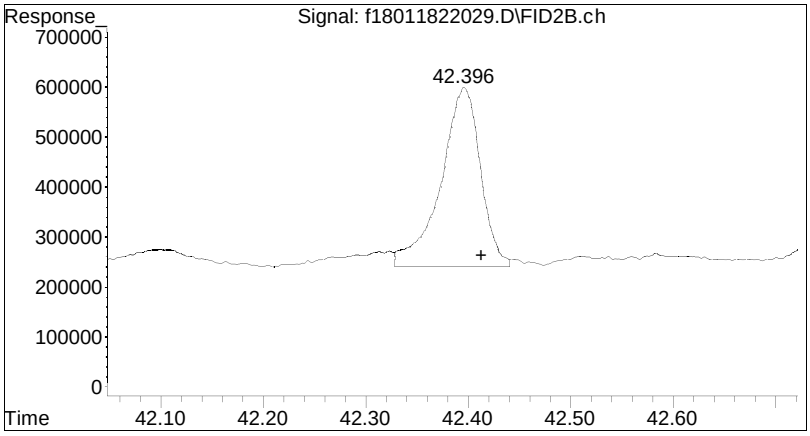
#28 n-Heptacosane (C27)

R.T.: 40.107 min
Delta R.T.: -0.014 min
Response: 12785161
Conc: 11.26 ug/mL M4



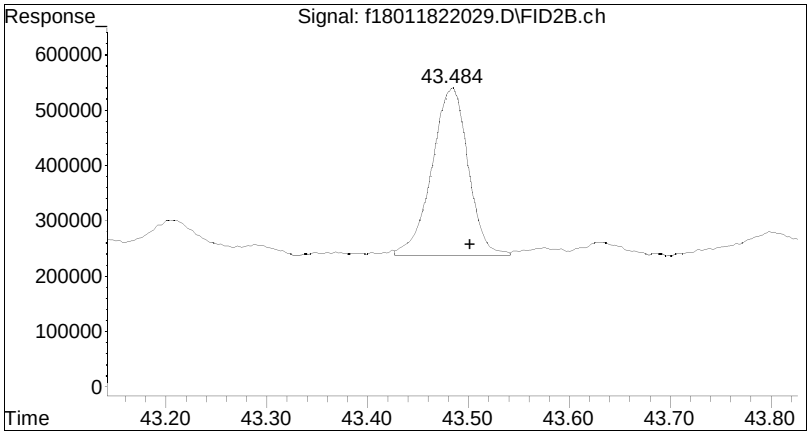
#29 n-Octacosane (C28)

R.T.:	41.269 min
Delta R.T.:	-0.019 min
Response:	9542817
Conc:	8.22 ug/mL M4



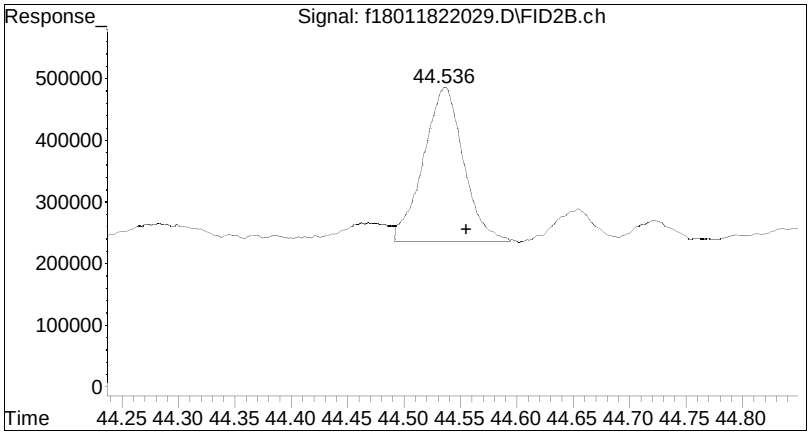
#30 n-Nonacosane (C29)

R.T.:	42.396 min
Delta R.T.:	-0.017 min
Response:	9527105
Conc:	8.22 ug/mL M4



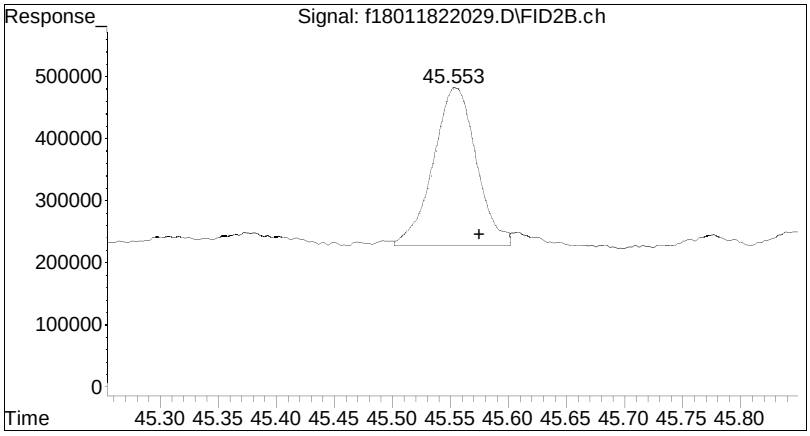
#31 n-Triacontane (C30)

R.T.:	43.484 min
Delta R.T.:	-0.017 min
Response:	7467558
Conc:	6.41 ug/mL M4



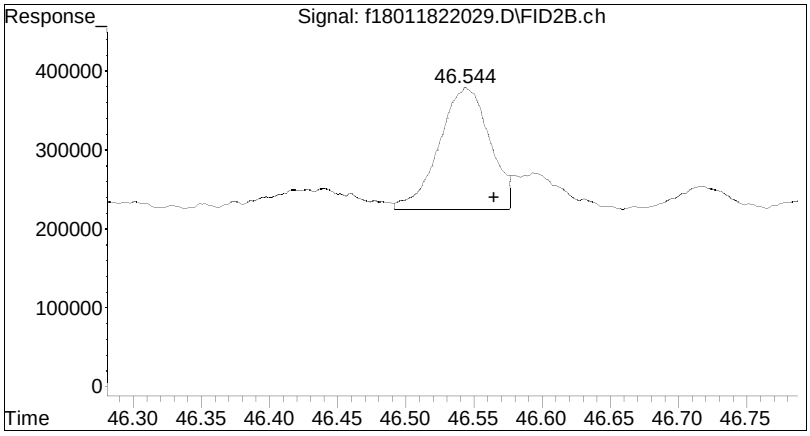
#32 n-Hentriacontane (C31)

R.T.:	44.536 min
Delta R.T.:	-0.019 min
Response:	6049441
Conc:	5.35 ug/mL M4



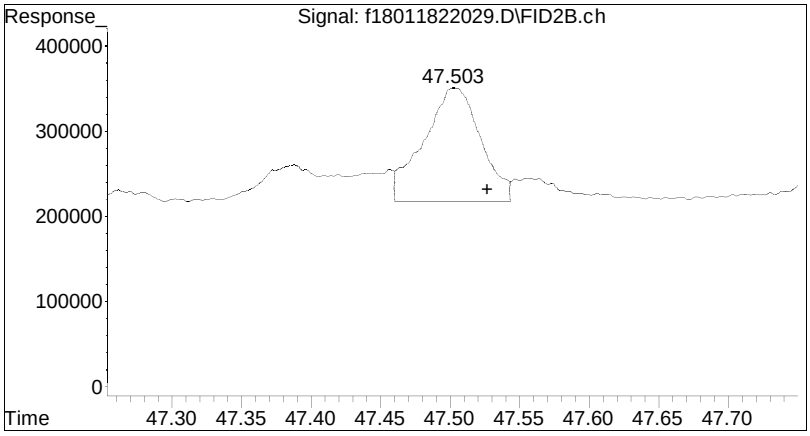
#33 n-Dotriacontane (C32)

R.T.:	45.553 min
Delta R.T.:	-0.022 min
Response:	6512410
Conc:	5.50 ug/mL M4



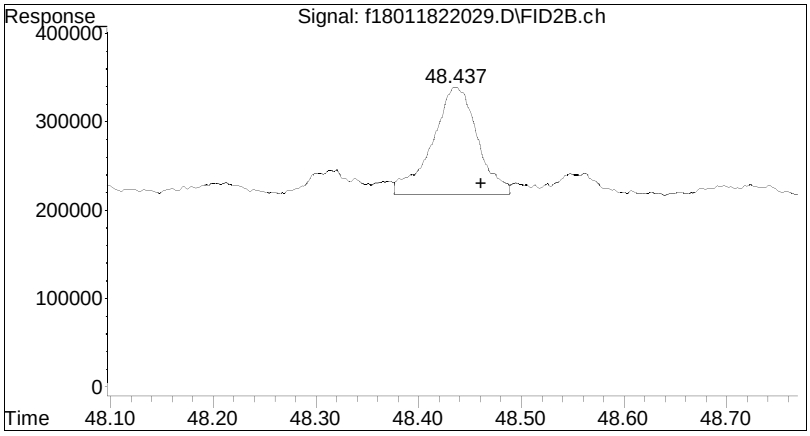
#34 n-Tritriacontane (C33)

R.T.:	46.544 min
Delta R.T.:	-0.021 min
Response:	3884472
Conc:	3.37 ug/mL M4



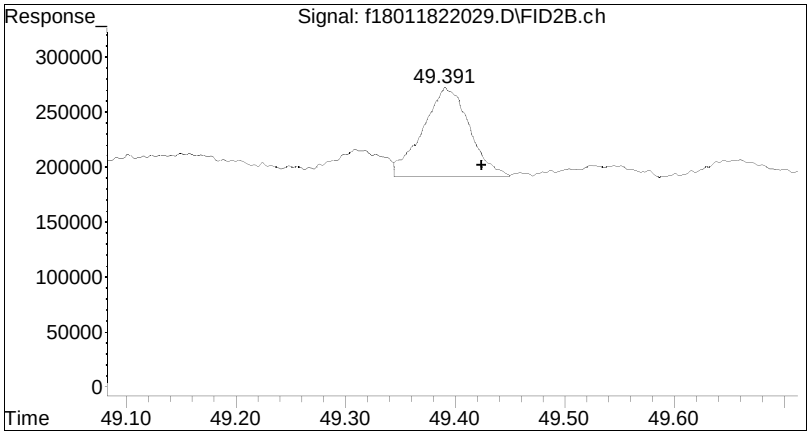
#35 n-tetratriacontane (C34)

R.T.: 47.503 min
Delta R.T.: -0.024 min
Response: 3759681
Conc: 3.27 ug/mL M4



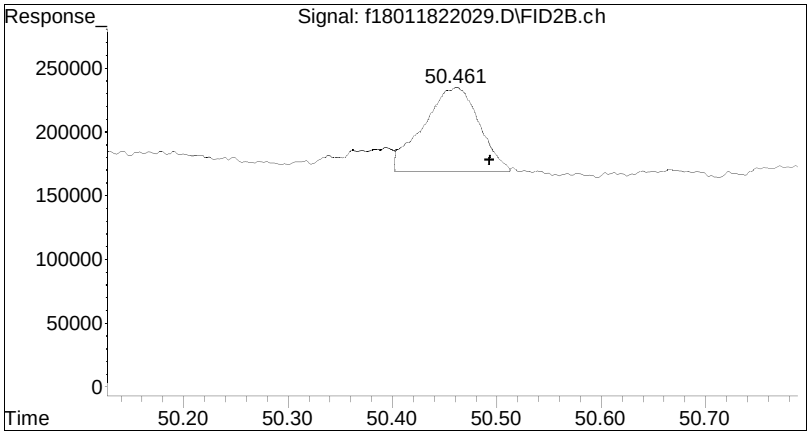
#36 n-Pentatriacontane (C35)

R.T.:	48.437 min
Delta R.T.:	-0.024 min
Response:	3680105
Conc:	3.36 ug/mL M4



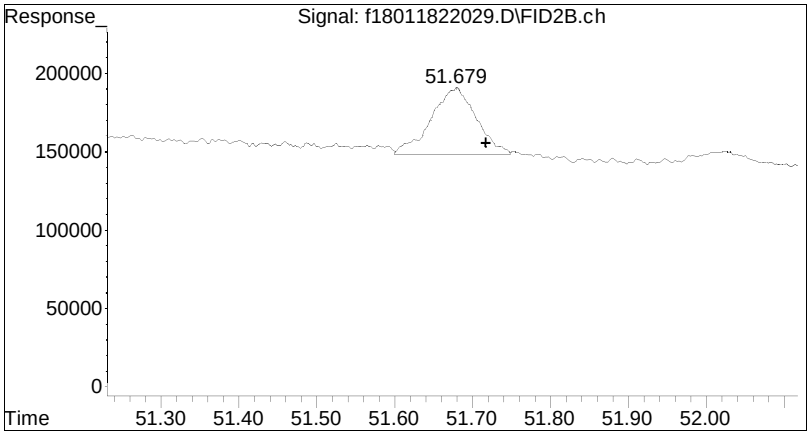
#37 n-Hexatriacontane (C36)

R.T.: 49.391 min
Delta R.T.: -0.034 min
Response: 2366015
Conc: 1.83 ug/mL M4



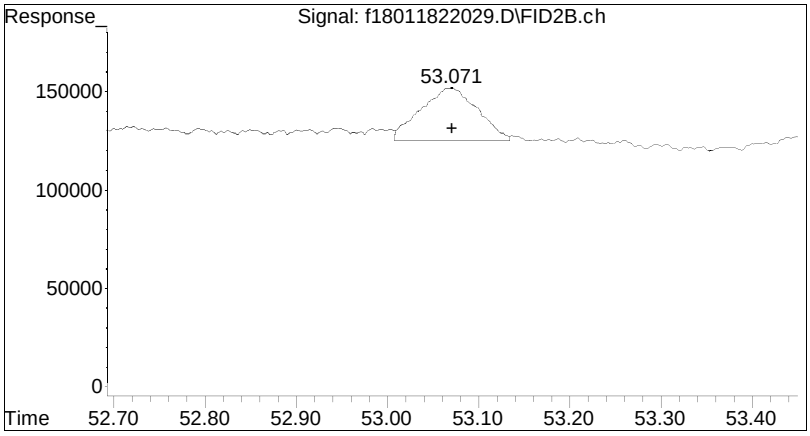
#38 n-Heptatriacontane (C37)

R.T.: 50.461 min
Delta R.T.: -0.032 min
Response: 2420078
Conc: 2.05 ug/mL M4



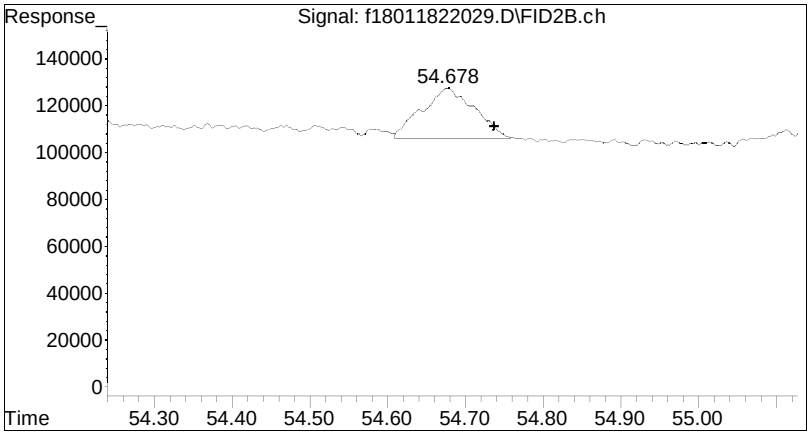
#39 n-Octatriacontane (C38)

R.T.:	51.679 min
Delta R.T.:	-0.038 min
Response:	1699834
Conc:	1.41 ug/mL M4



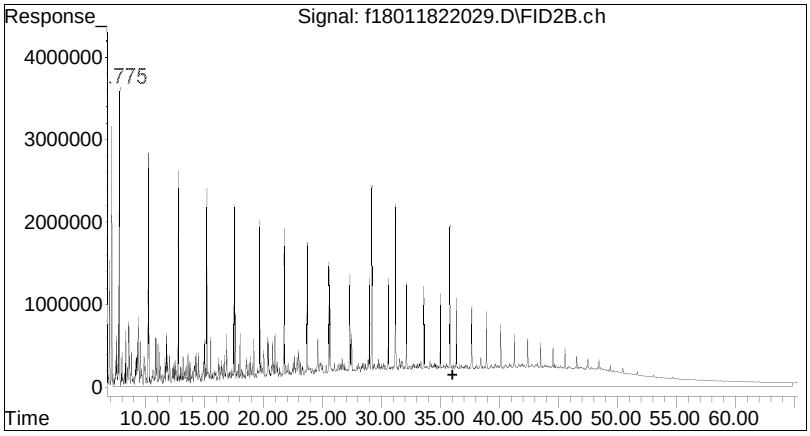
#40 n-Nonatriacontane (C39)

R.T.: 53.071 min
Delta R.T.: 0.000 min
Response: 1134183
Conc: 0.95 ug/mL M4



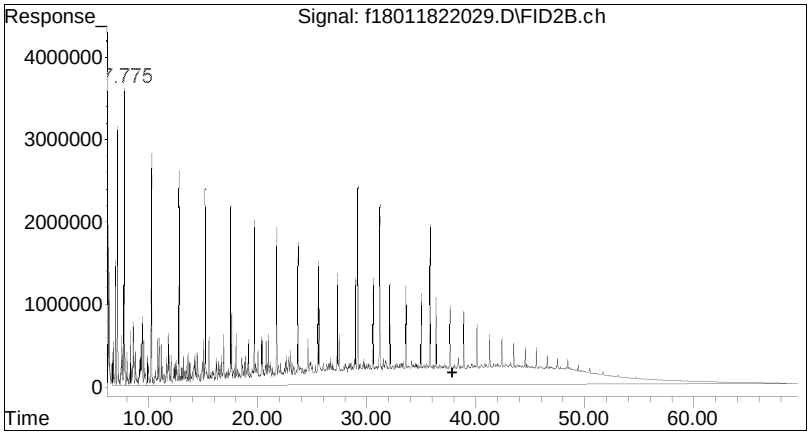
#41 n-Tetracontane (C40)

R.T.: 54.678 min
Delta R.T.: -0.059 min
Response: 982027
Conc: 0.82 ug/mL M4



#42 C9-C44 Total Petroleum Hy

R.T.: 36.052 min
Delta R.T.: 0.000 min
Response: 6746086869
Conc: 6065.01 ug/mL m



#46 Total Resolved Hydrocarbo

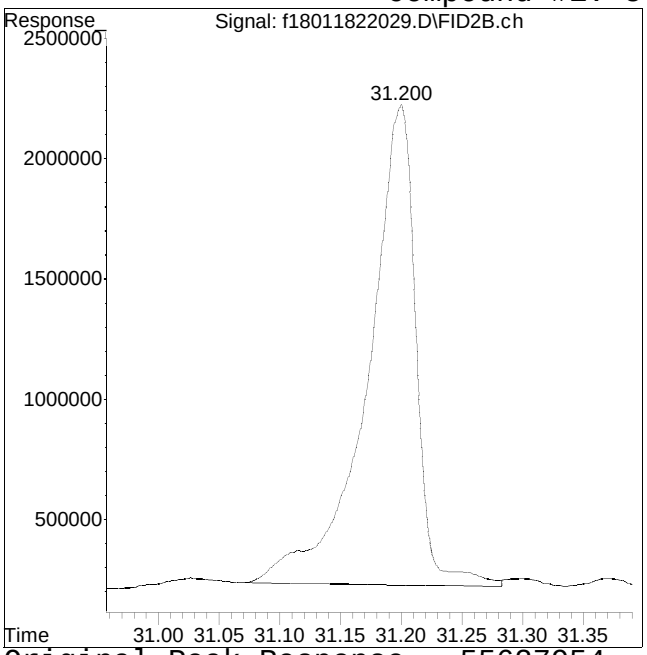
R.T.: 37.870 min
Delta R.T.: 0.000 min
Response: 2215564315
Conc: 1991.88 ug/mL m

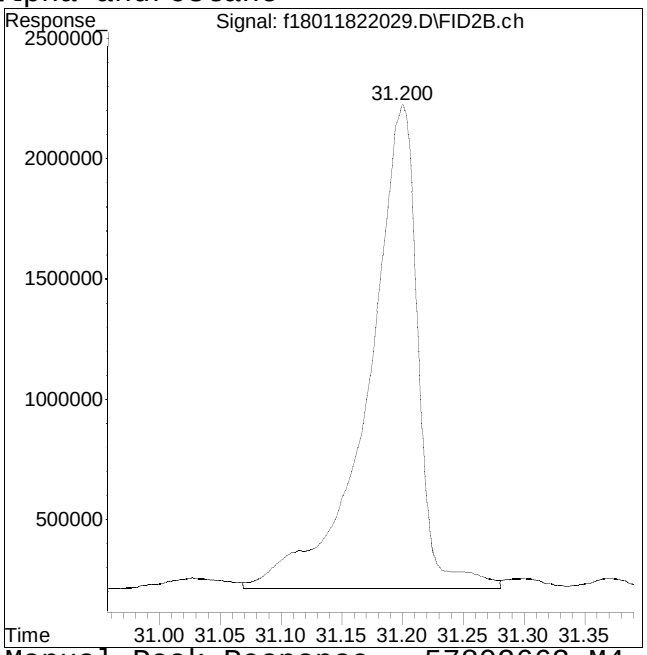
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #1: 5-alpha-androstane





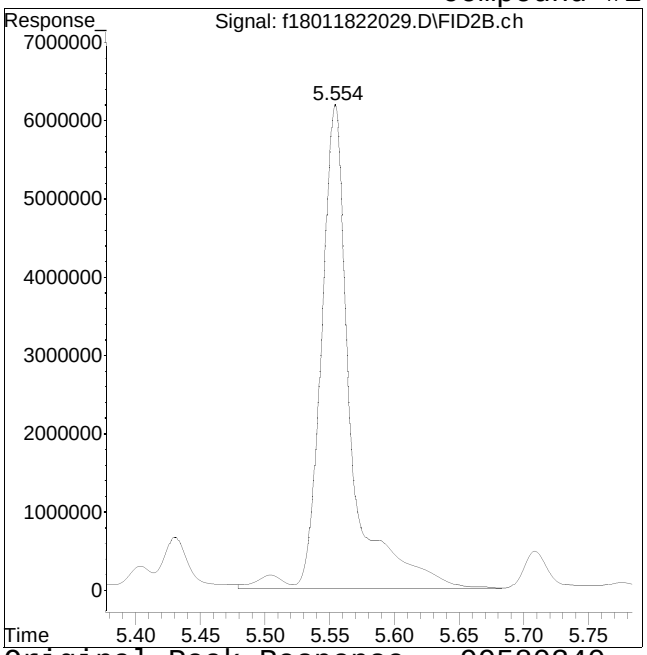
Original Peak Response = 55627954 Manual Peak Response = 57802663 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

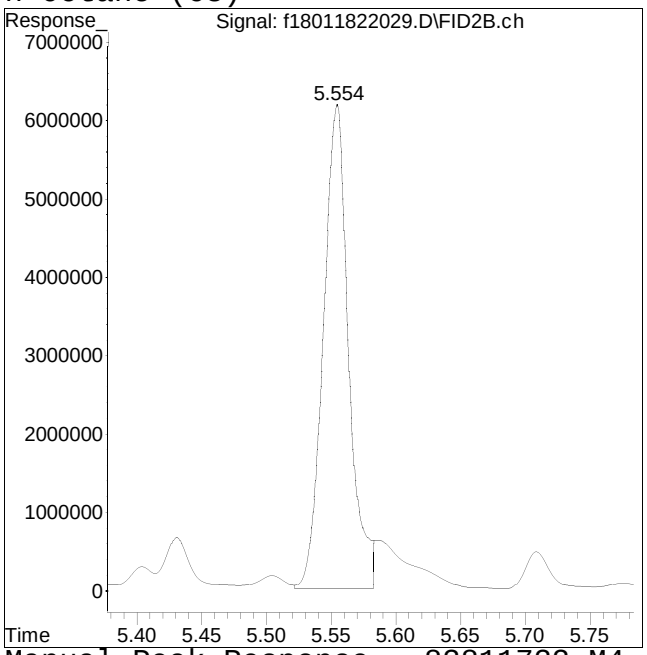
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #2: n-Octane (C8)



Original Peak Response = 99580340



Manual Peak Response = 83811732 M4

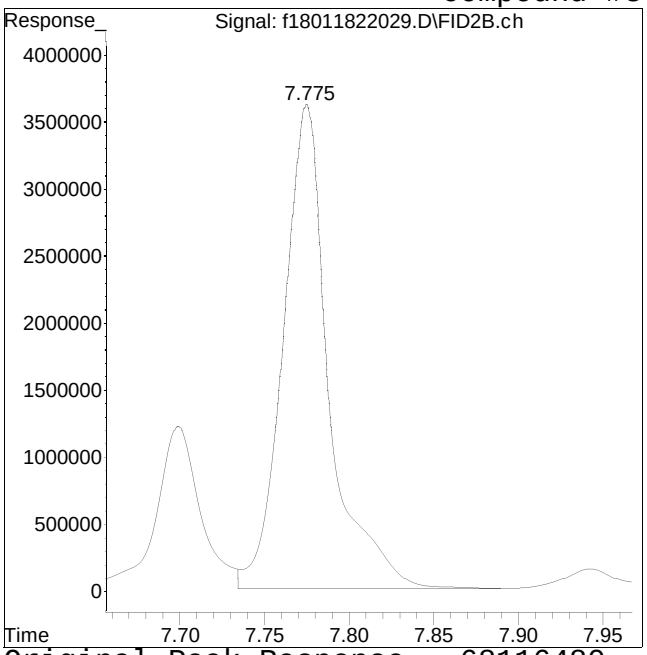
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

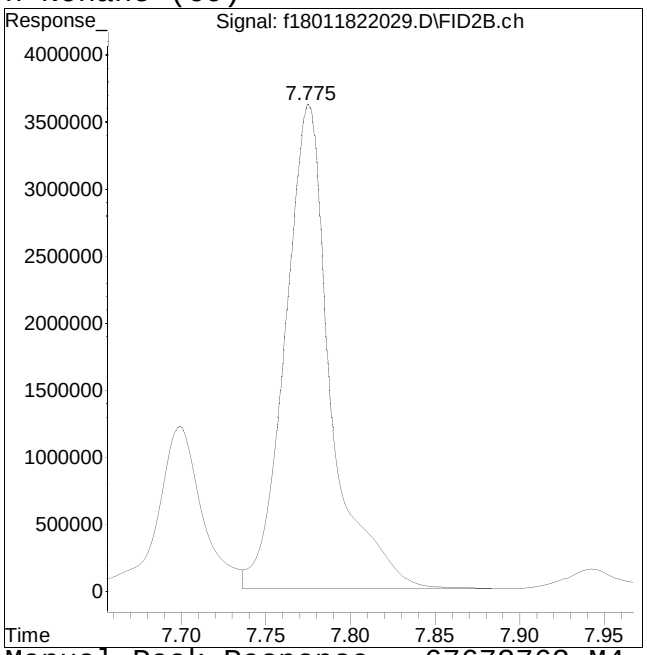
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #3: n-Nonane (C9)



Original Peak Response = 68116480



Manual Peak Response = 67673762 M4

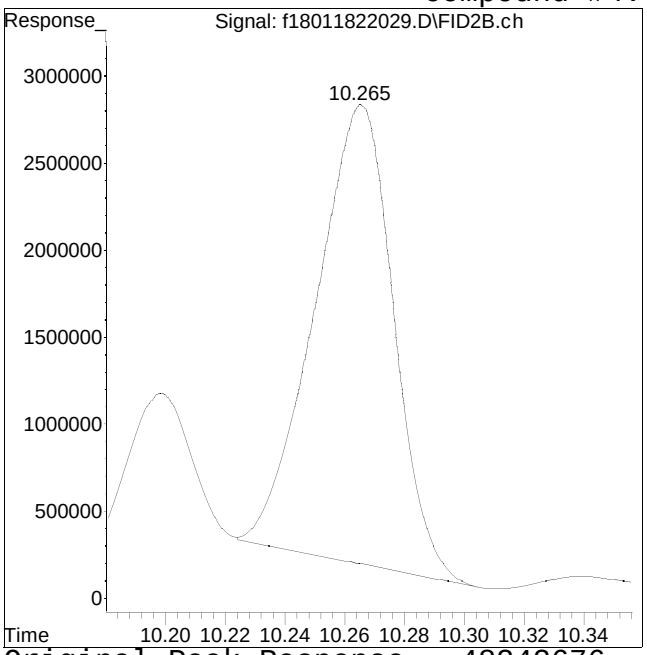
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

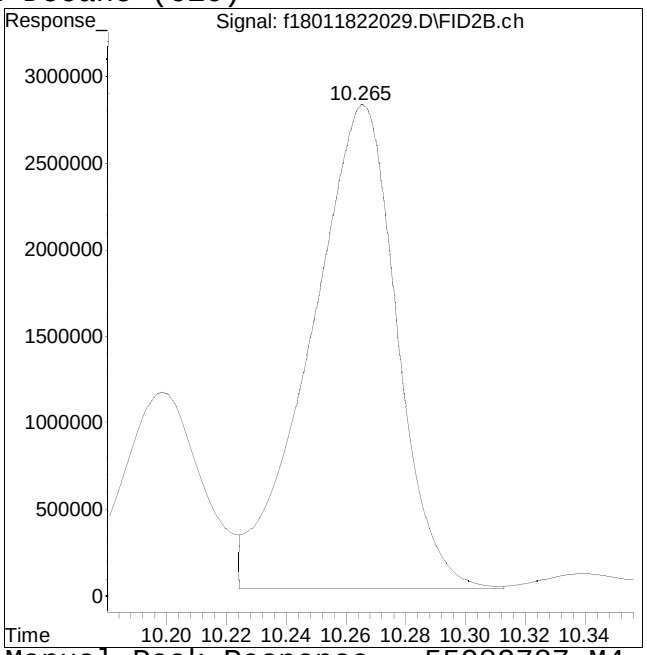
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #4: n-Decane (C10)



Original Peak Response = 48242676



Manual Peak Response = 55982787 M4

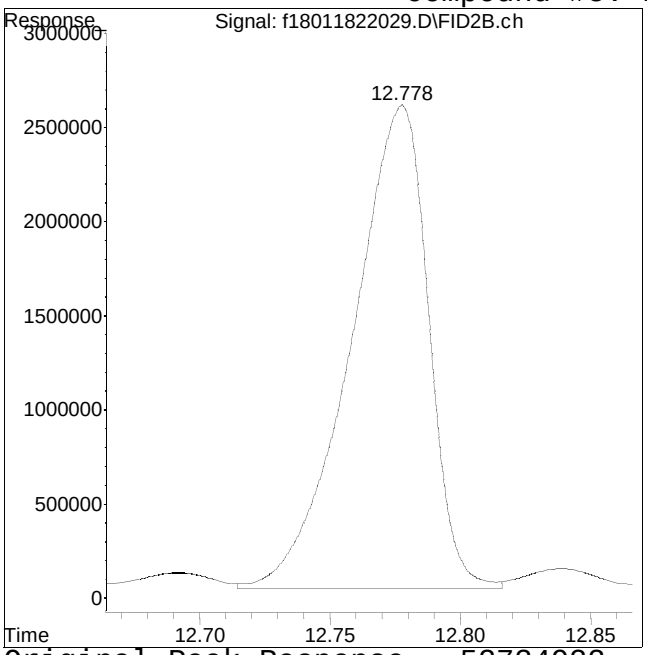
M4 = Poor automated baseline construction.

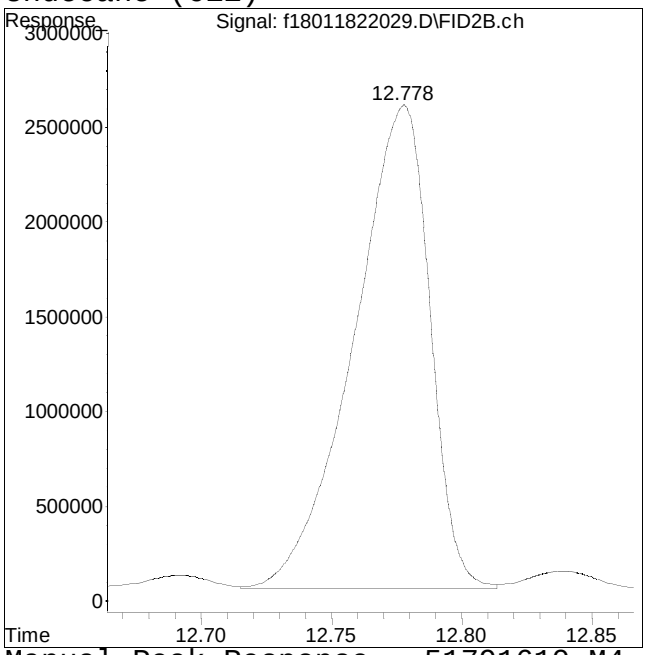
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #5: n-Undecane (C11)





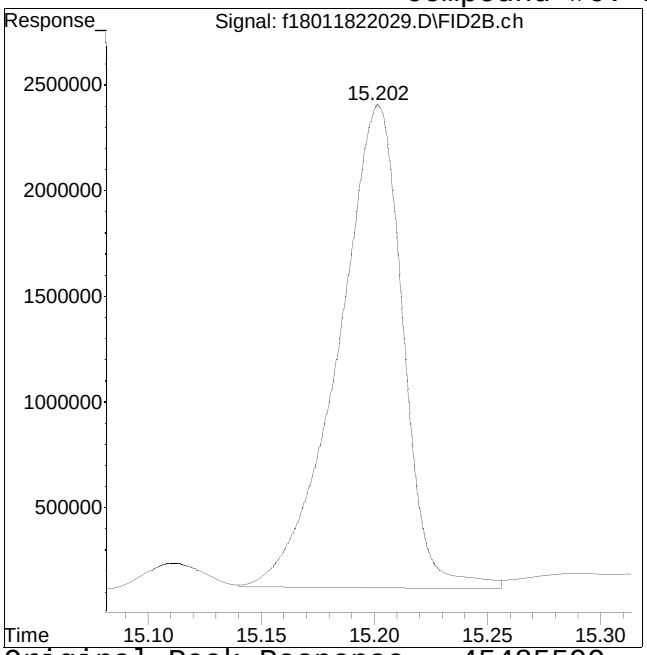
Original Peak Response = 52734922 Manual Peak Response = 51791610 M4
M4 = Poor automated baseline construction.

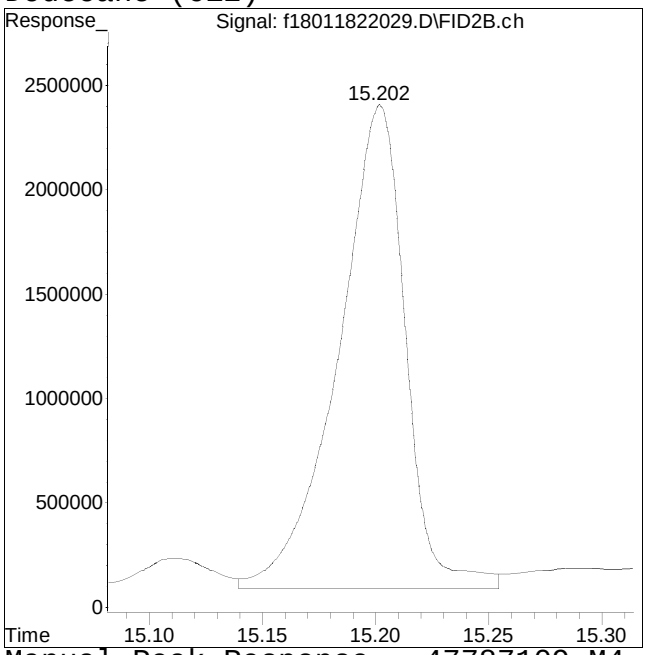
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #6: n-Dodecane (C12)





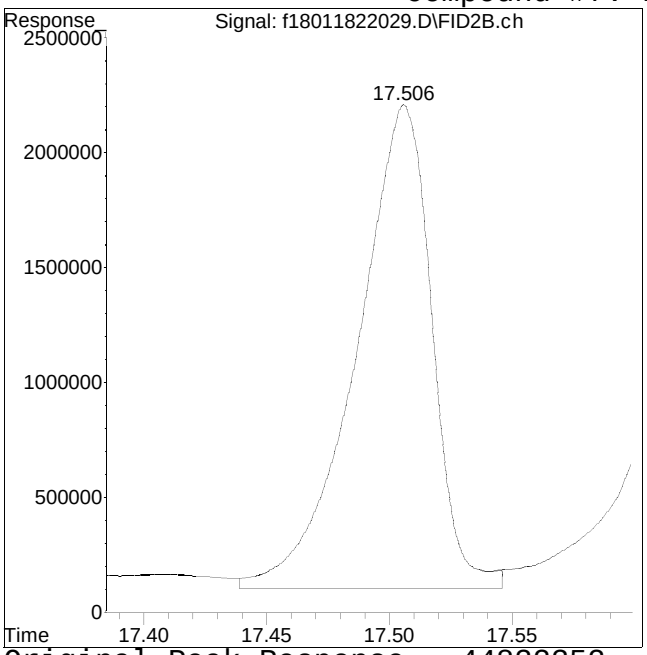
Original Peak Response = 45485599 Manual Peak Response = 47787109 M4
M4 = Poor automated baseline construction.

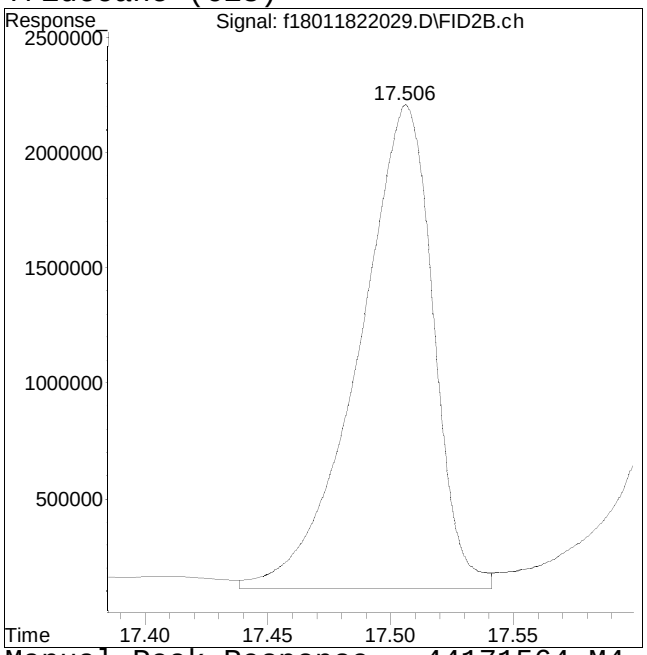
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #7: n-Tridecane (C13)





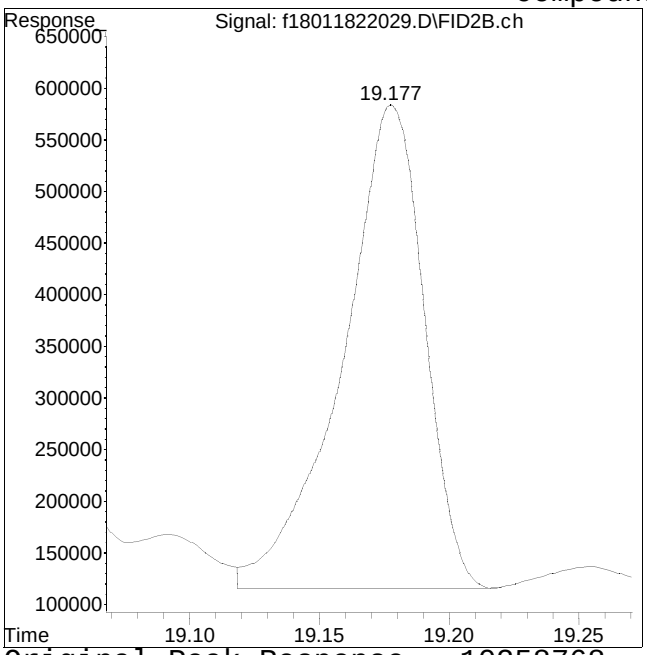
Original Peak Response = 44832352 Manual Peak Response = 44171564 M4
M4 = Poor automated baseline construction.

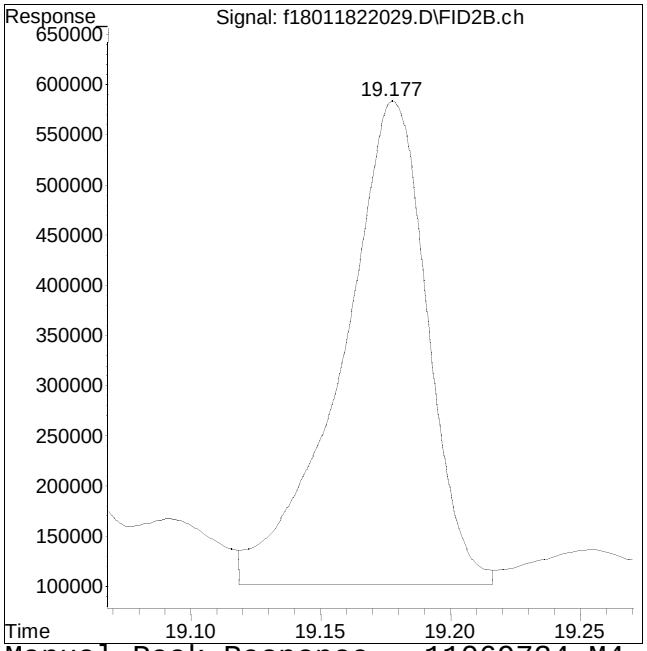
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #8: 1380





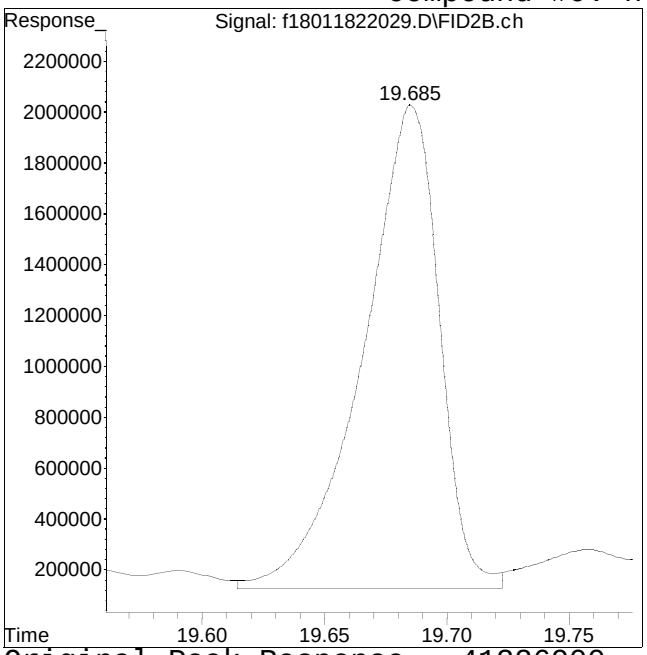
Original Peak Response = 10258768 Manual Peak Response = 11069734 M4
M4 = Poor automated baseline construction.

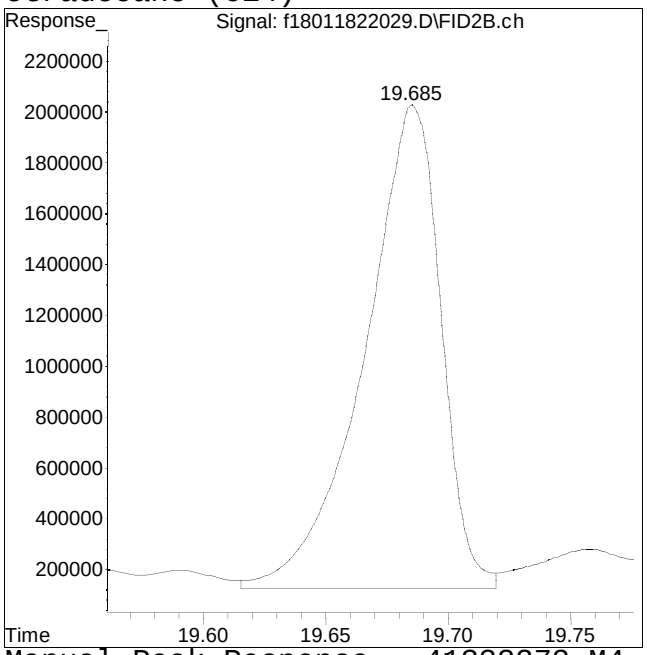
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #9: n-Tetradecane (C14)





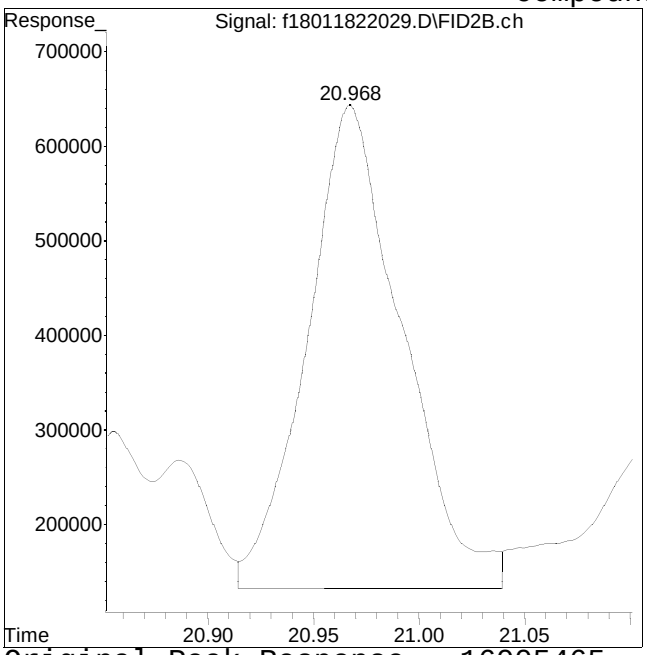
Original Peak Response = 41226900 Manual Peak Response = 41333372 M4
M4 = Poor automated baseline construction.

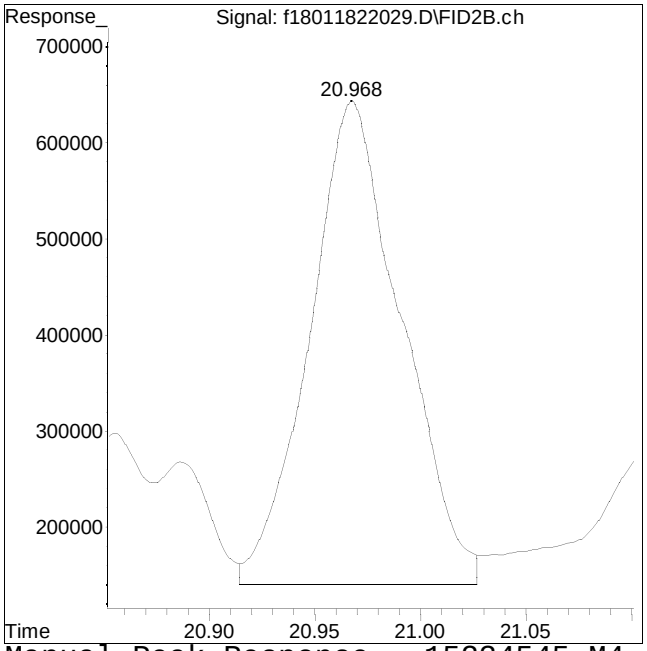
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #10: 1470





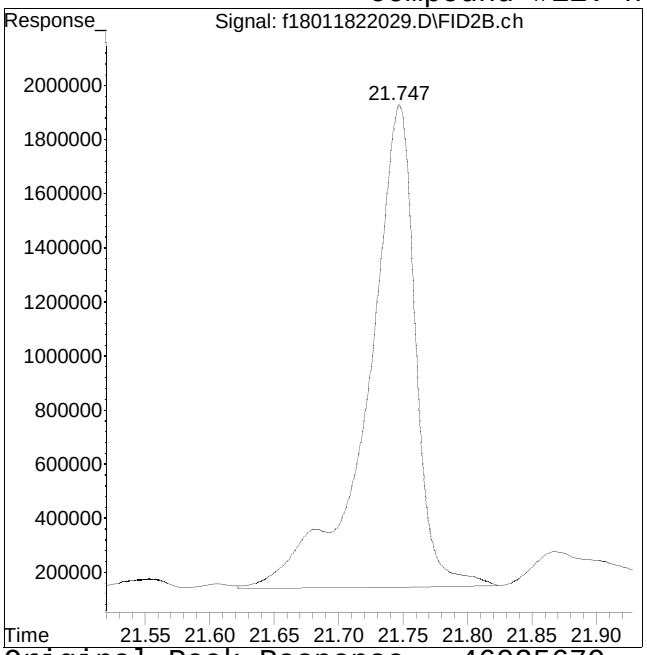
Original Peak Response = 16005465 Manual Peak Response = 15234545 M4
M4 = Poor automated baseline construction.

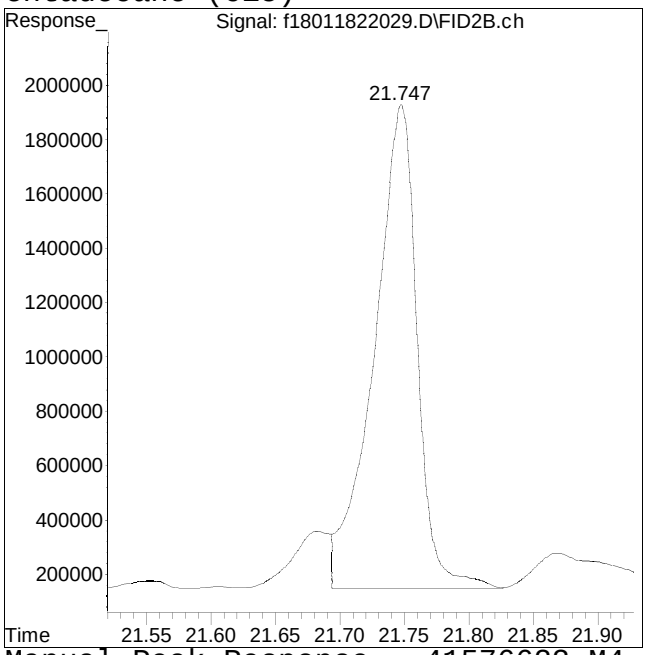
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #11: n-Pentadecane (C15)





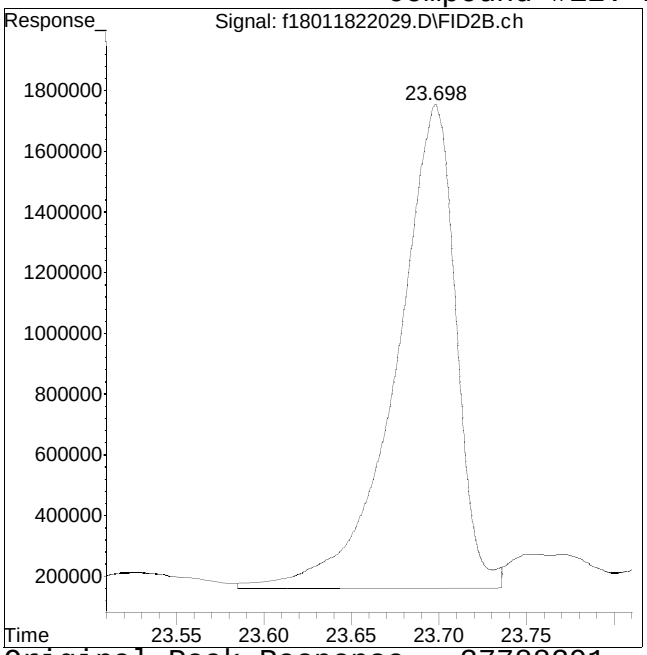
Original Peak Response = 46025679 Manual Peak Response = 41576622 M4
M4 = Poor automated baseline construction.

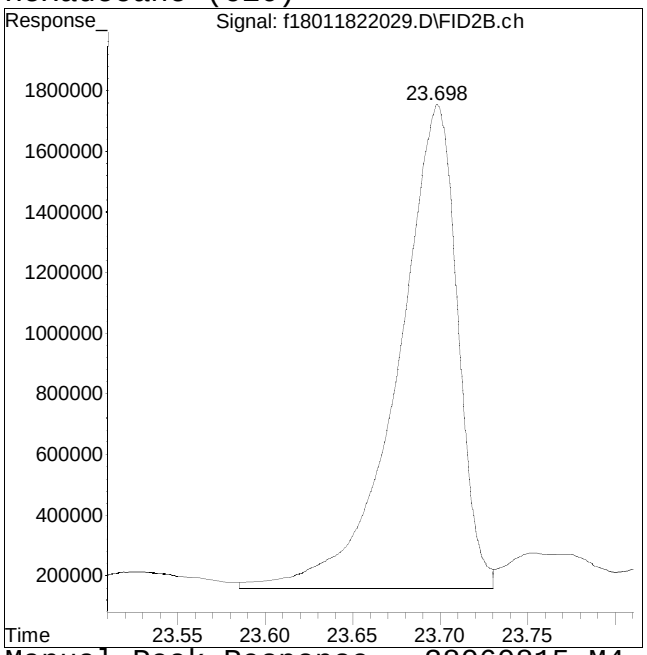
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #12: n-Hexadecane (C16)





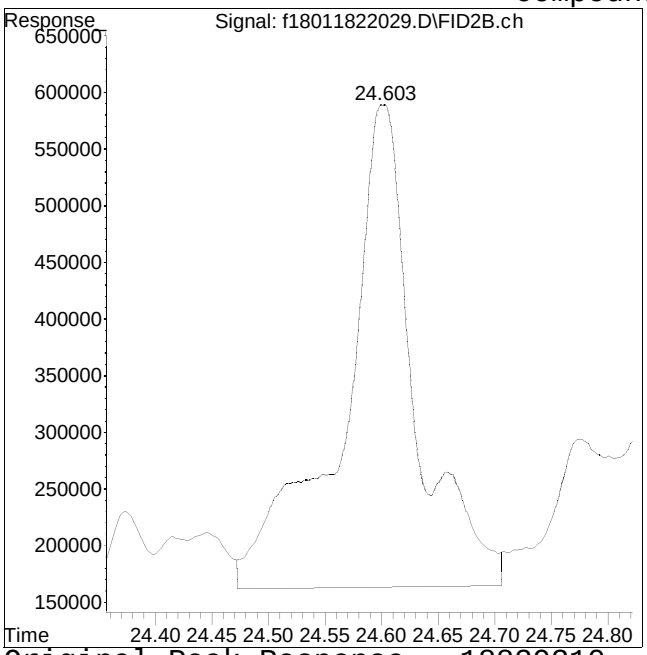
Original Peak Response = 37788291 Manual Peak Response = 38060815 M4
M4 = Poor automated baseline construction.

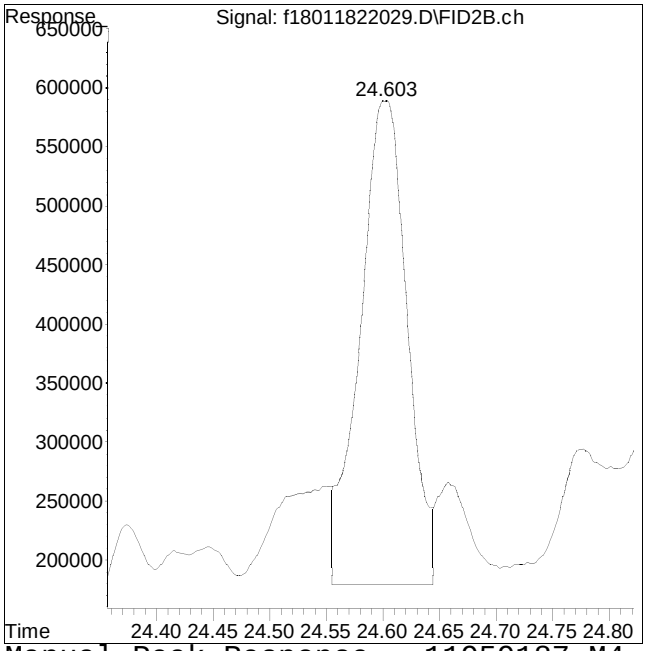
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #13: 1650





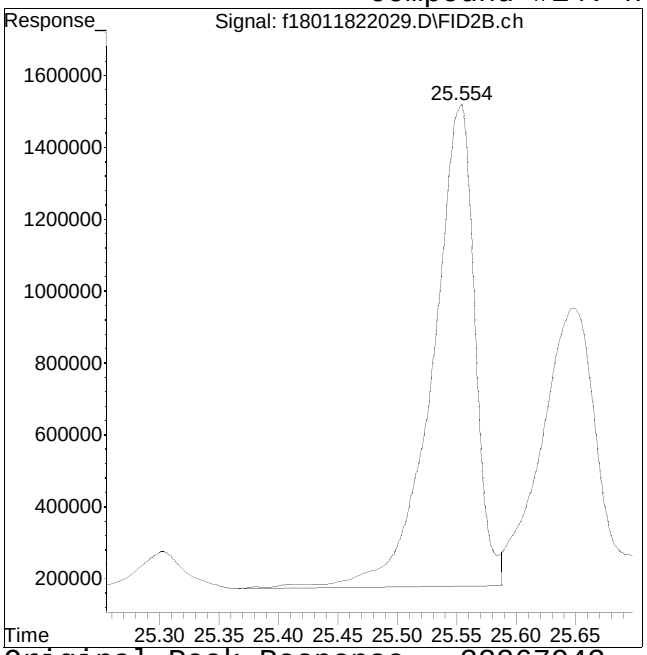
Original Peak Response = 18839310 Manual Peak Response = 11959187 M4
M4 = Poor automated baseline construction.

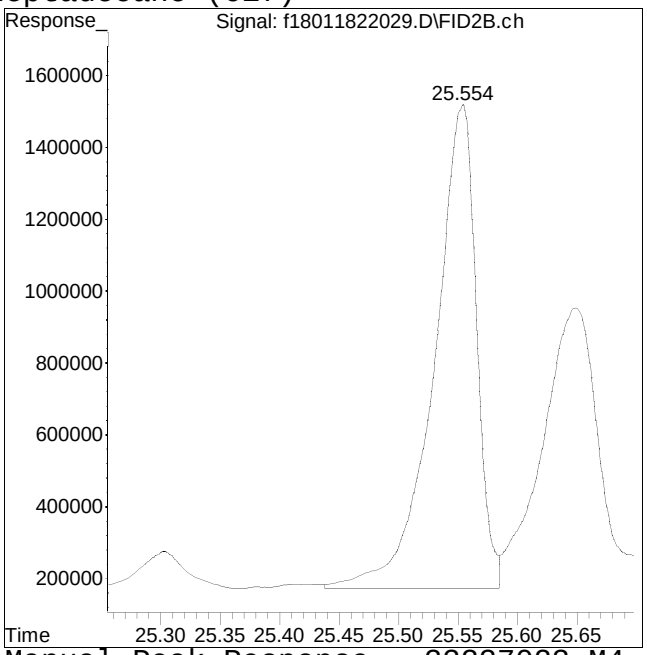
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #14: n-Heptadecane (C17)





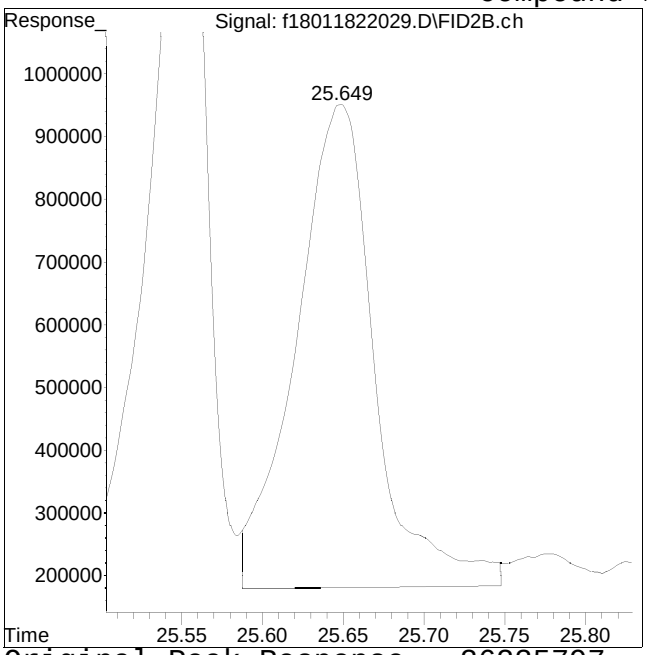
Original Peak Response = 33267943 Manual Peak Response = 33237023 M4
M4 = Poor automated baseline construction.

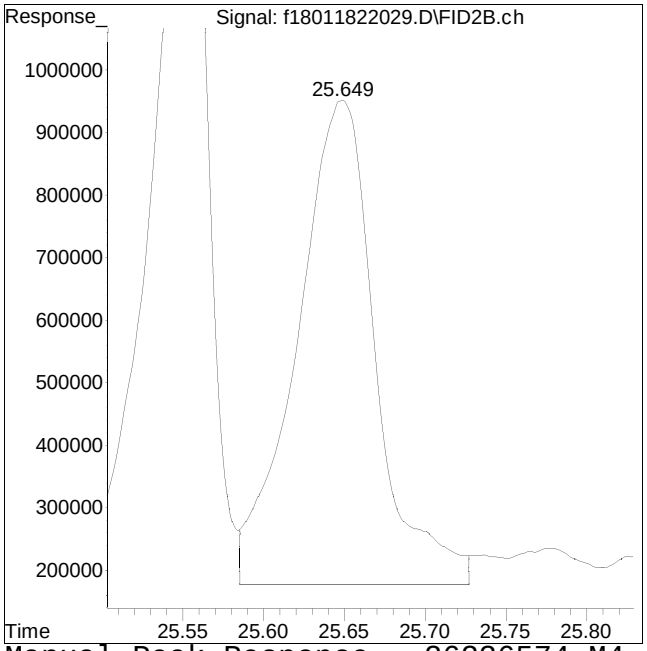
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #15: Pristane





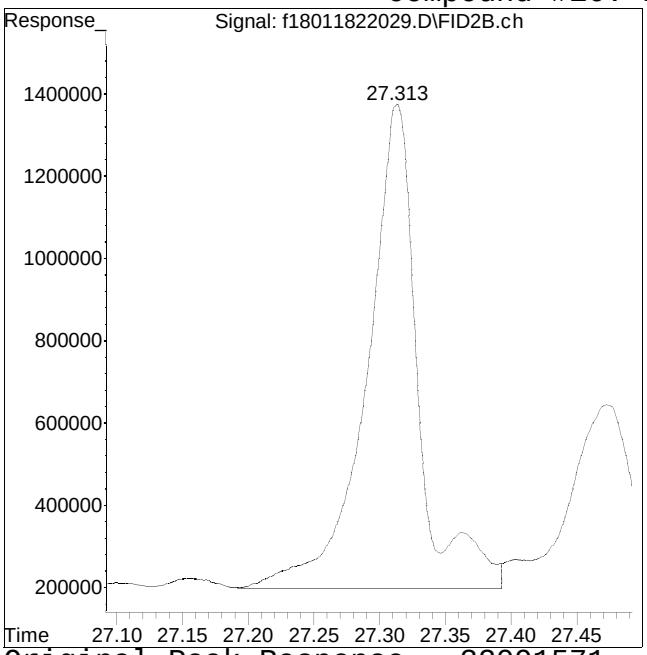
Original Peak Response = 26235797 Manual Peak Response = 26236574 M4
M4 = Poor automated baseline construction.

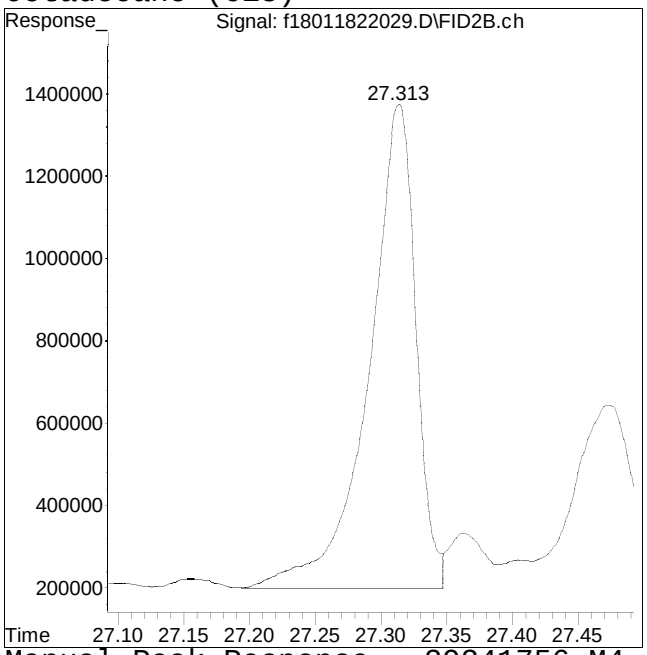
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #16: n-Octadecane (C18)





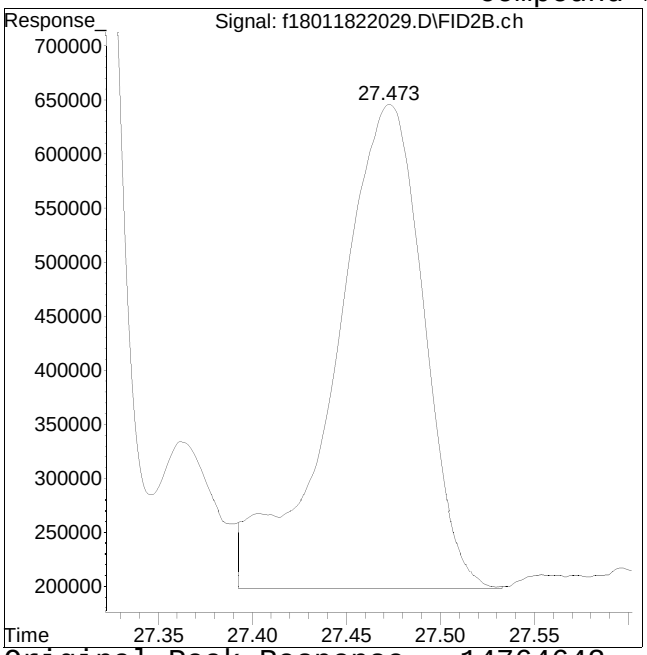
Original Peak Response = 32091571 Manual Peak Response = 29241756 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

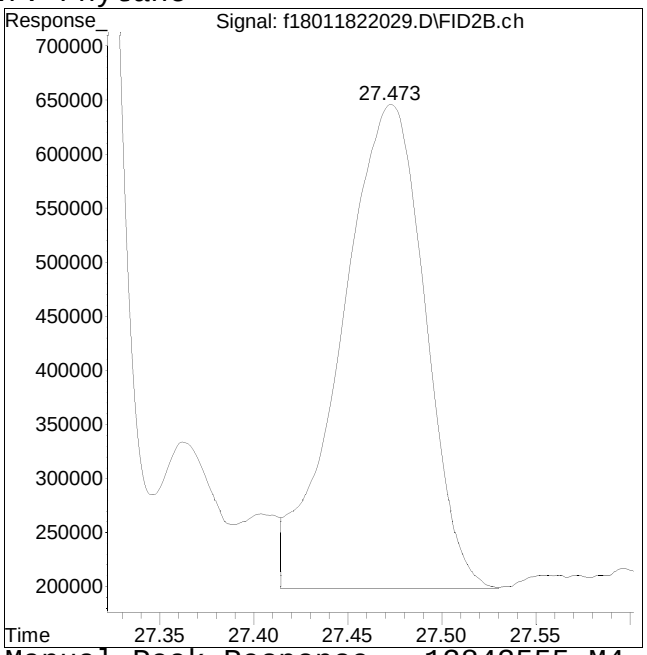
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #17: Phytane



Original Peak Response = 14764642



Manual Peak Response = 13843555 M4

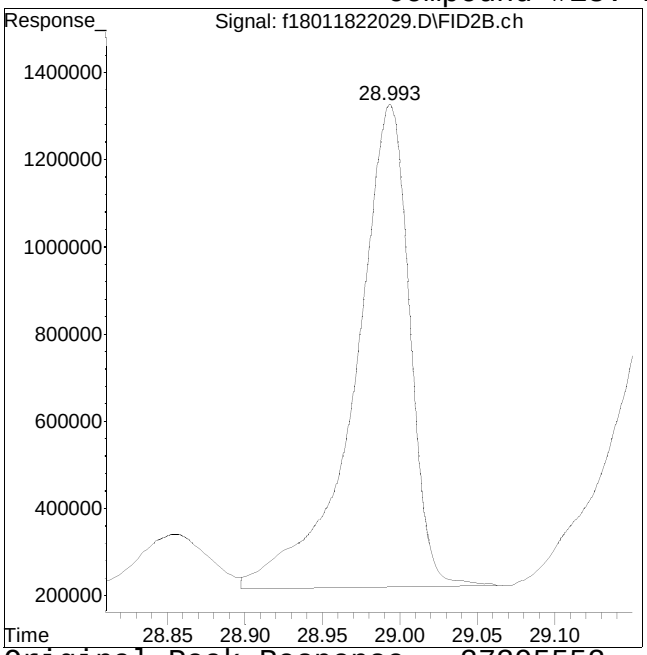
M4 = Poor automated baseline construction.

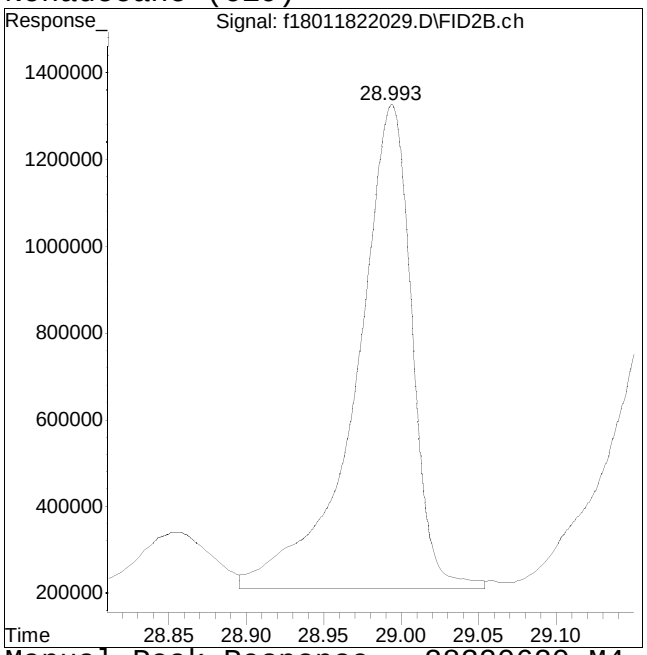
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #18: n-Nonadecane (C19)





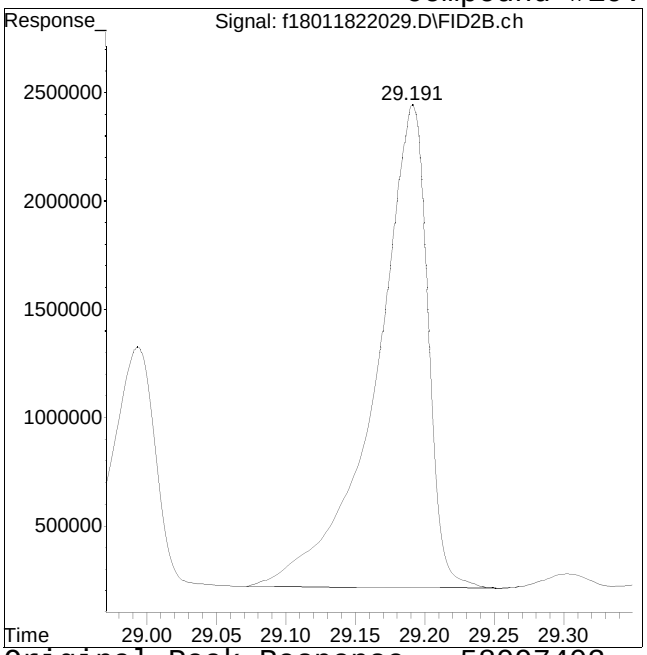
Original Peak Response = 27395552 Manual Peak Response = 28320620 M4
M4 = Poor automated baseline construction.

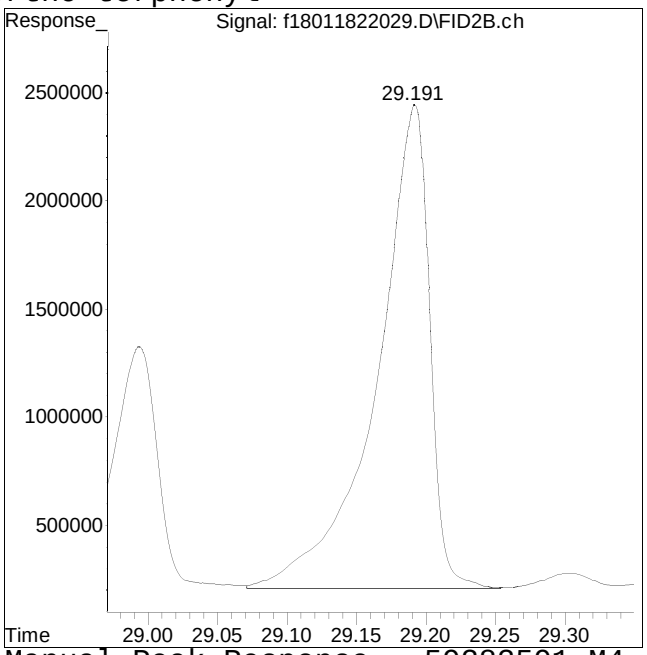
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #19: ortho-terphenyl





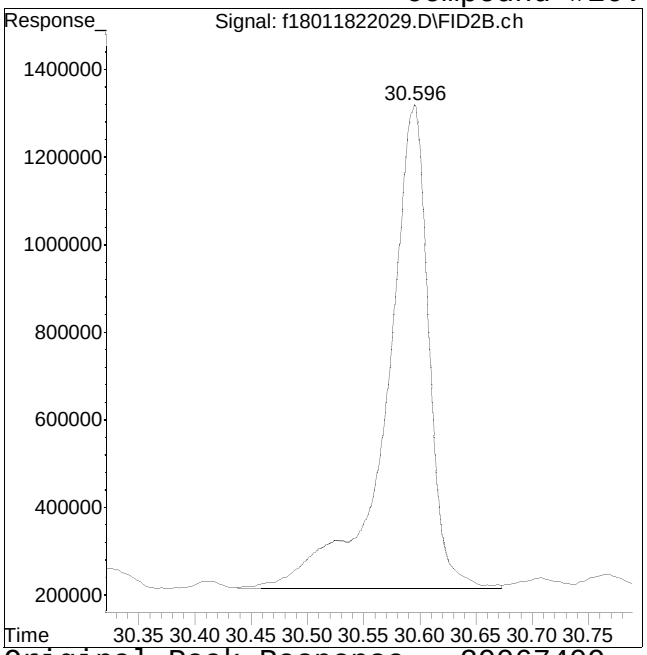
Original Peak Response = 58097403 Manual Peak Response = 59283591 M4
M4 = Poor automated baseline construction.

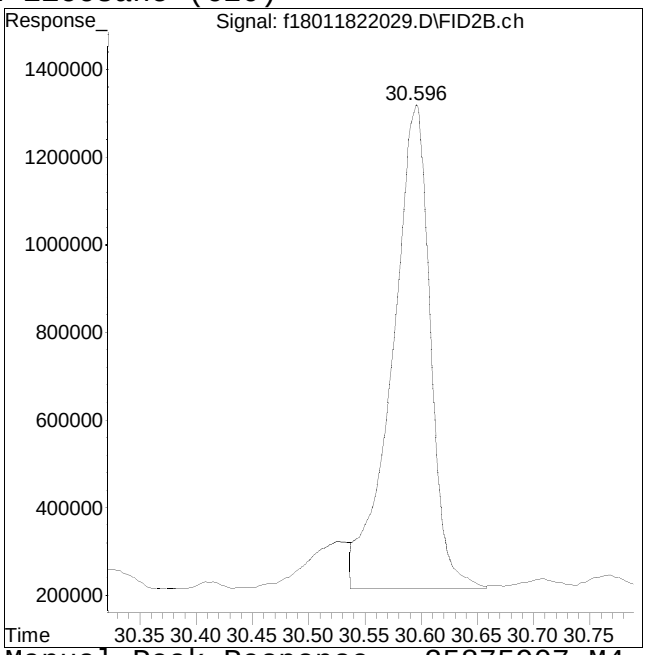
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #20: n-Eicosane (C20)





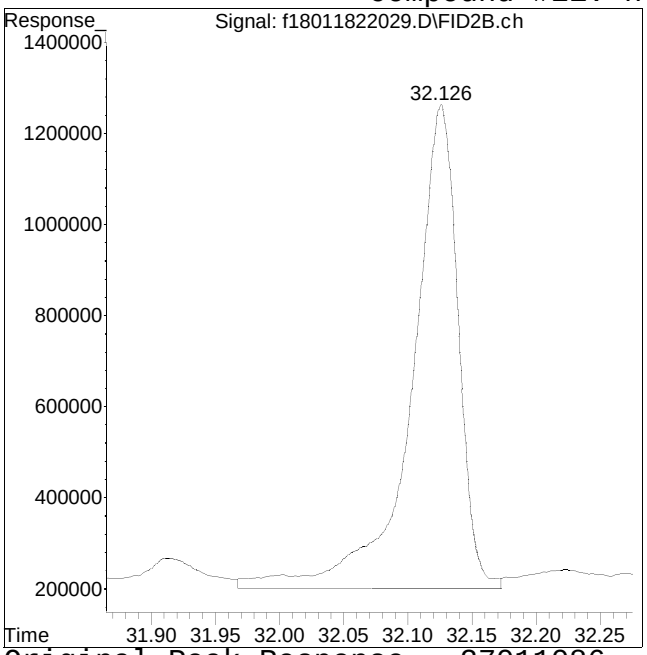
Original Peak Response = 29067409 Manual Peak Response = 25875907 M4
M4 = Poor automated baseline construction.

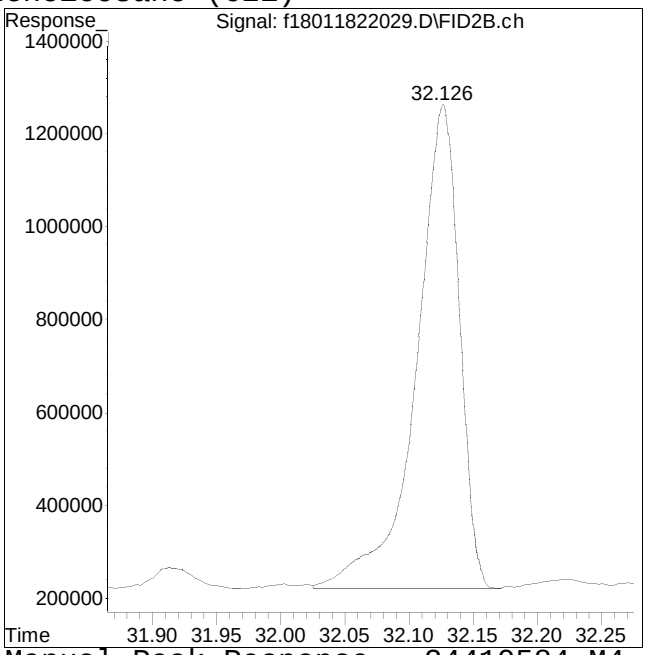
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #21: n-Heneicosane (C21)





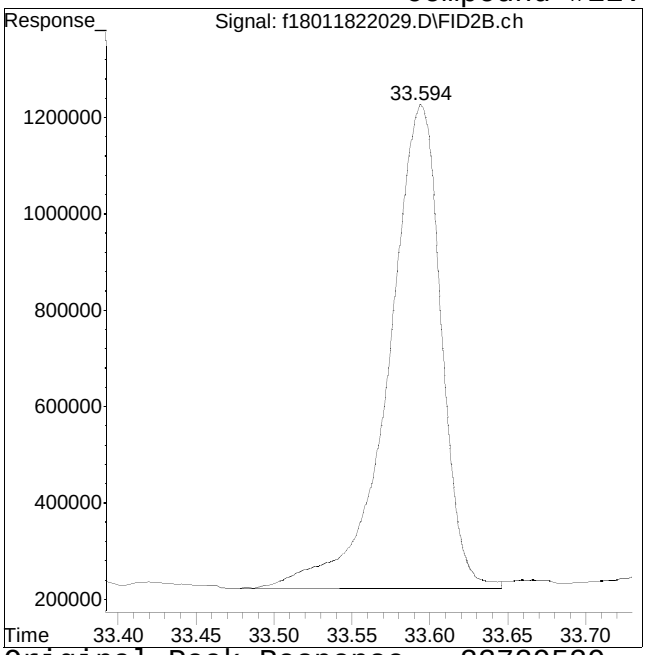
Original Peak Response = 27011086 Manual Peak Response = 24410584 M4
M4 = Poor automated baseline construction.

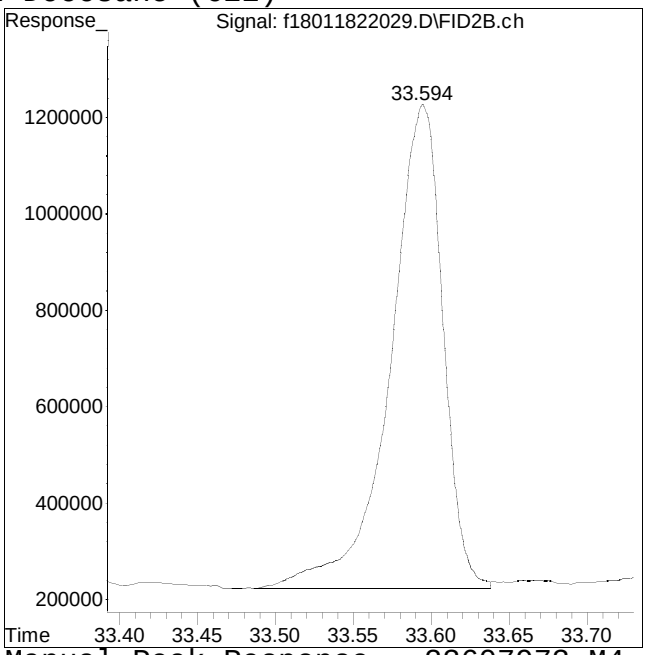
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #22: n-Docosane (C22)





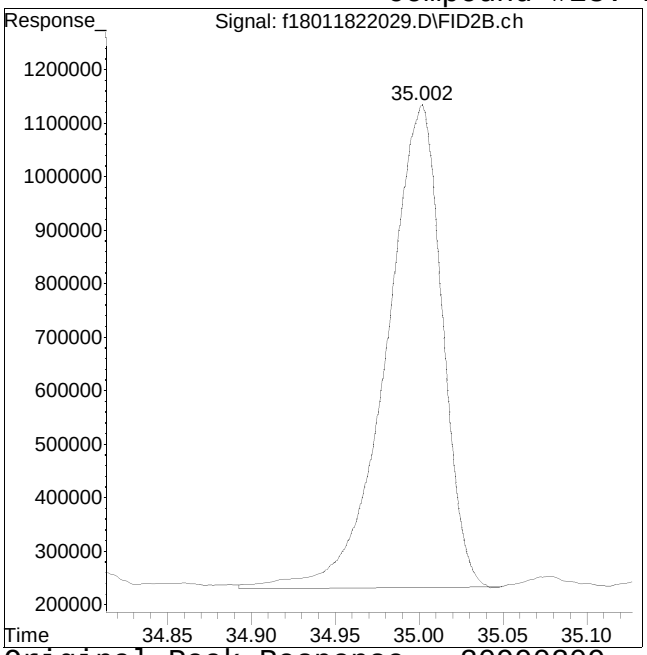
Original Peak Response = 23729539 Manual Peak Response = 23607973 M4
M4 = Poor automated baseline construction.

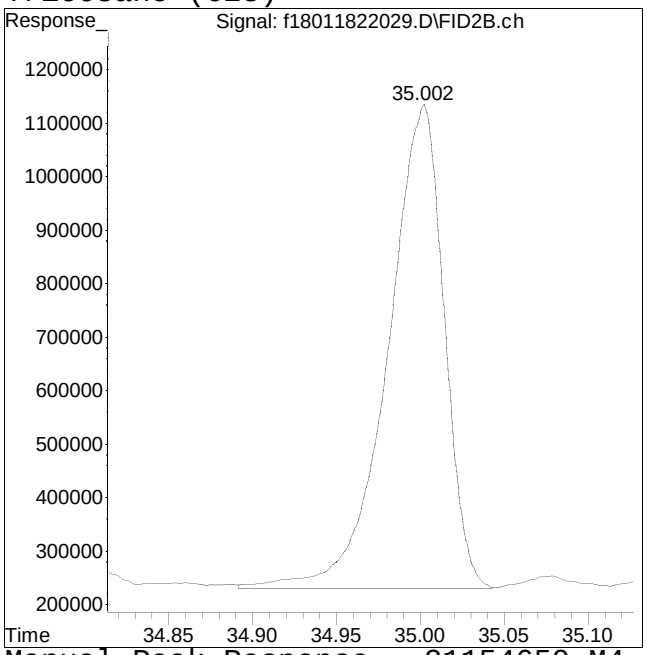
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #23: n-Tricosane (C23)





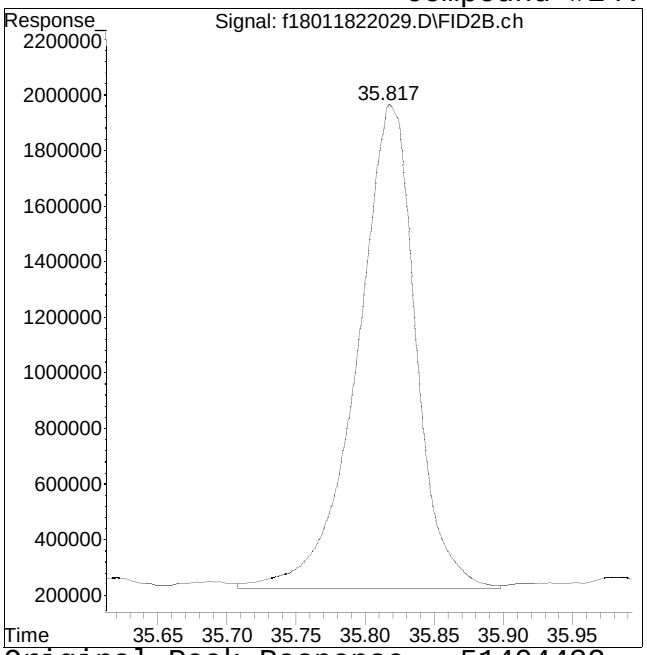
Original Peak Response = 20990209 Manual Peak Response = 21154650 M4
M4 = Poor automated baseline construction.

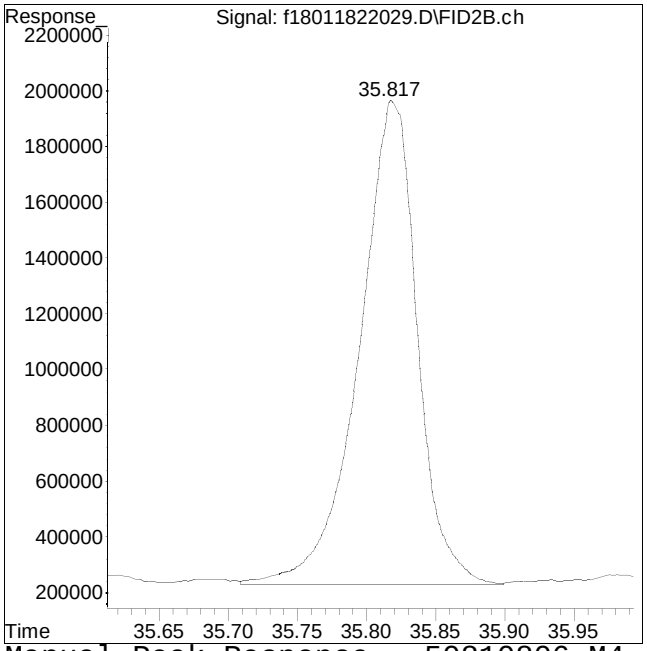
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #24: d50-Tetracosane





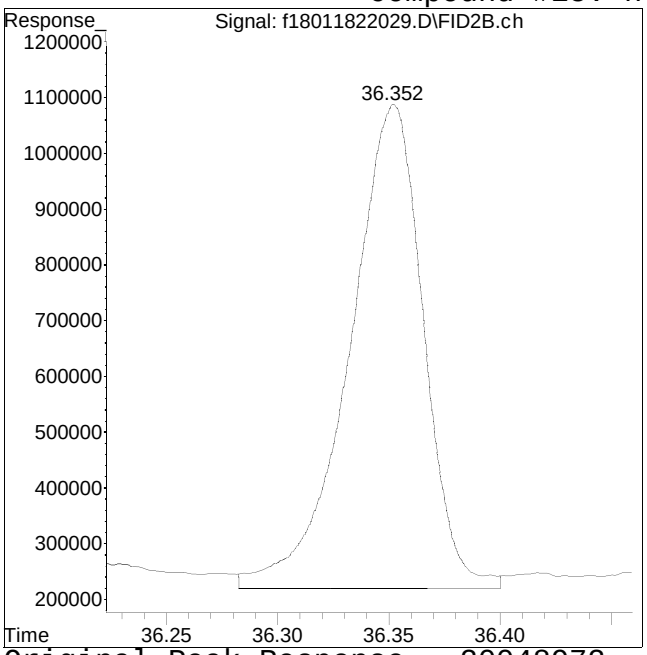
Original Peak Response = 51404432 Manual Peak Response = 50810806 M4
M4 = Poor automated baseline construction.

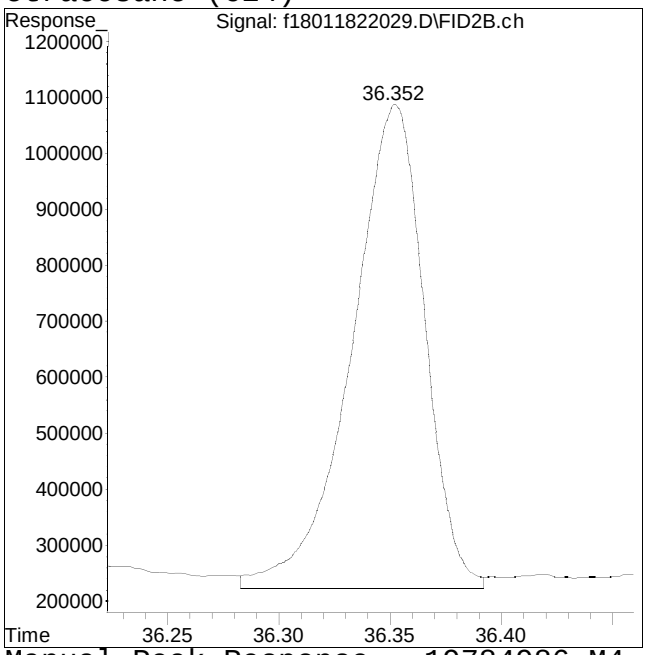
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #25: n-Tetracosane (C24)





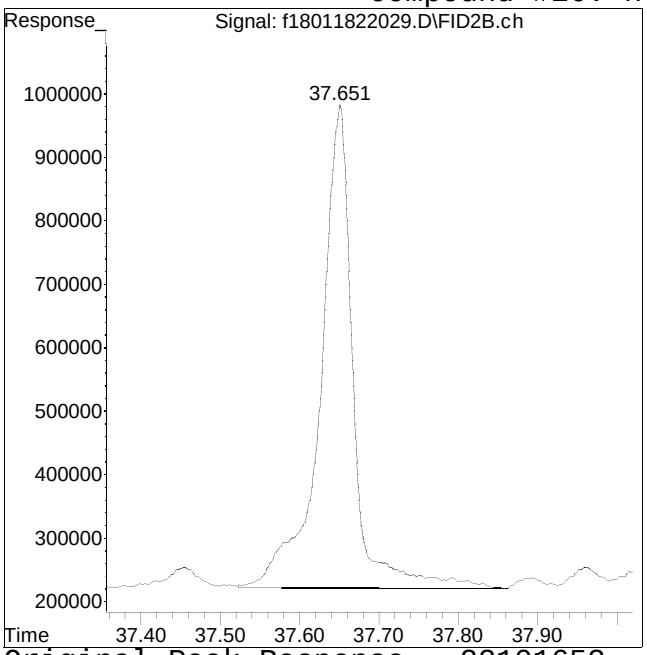
Original Peak Response = 20048972 Manual Peak Response = 19784986 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

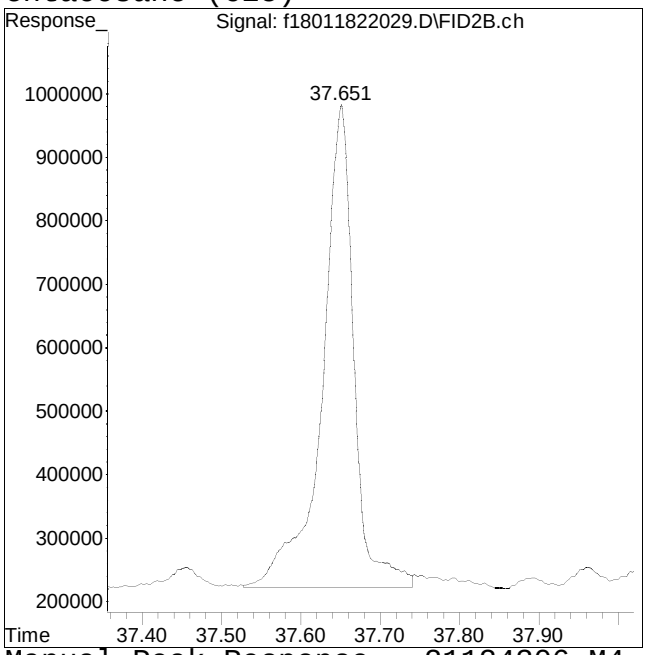
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #26: n-Pentacosane (C25)



Original Peak Response = 22101653



Manual Peak Response = 21124306 M4

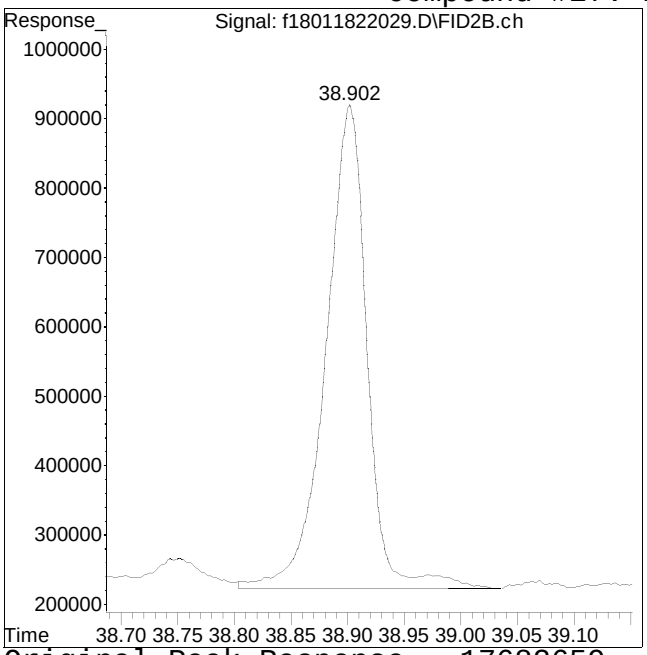
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

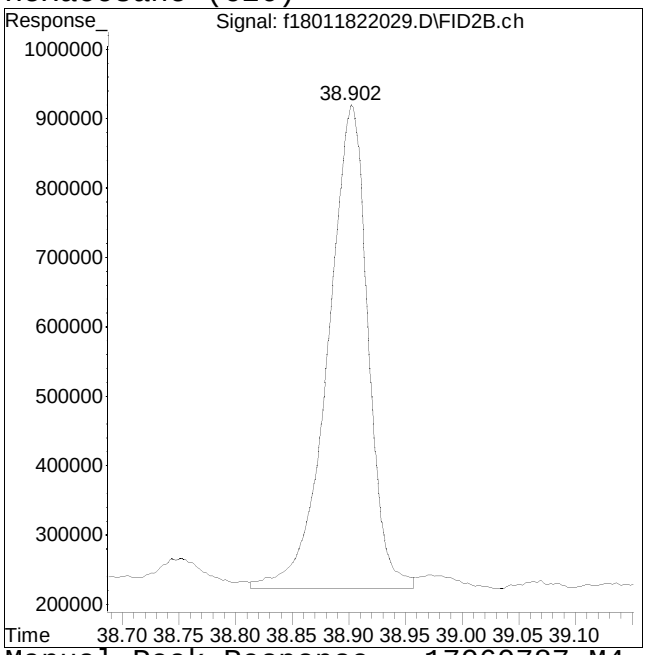
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #27: n-Hexacosane (C26)



Original Peak Response = 17682659



Manual Peak Response = 17060787 M4

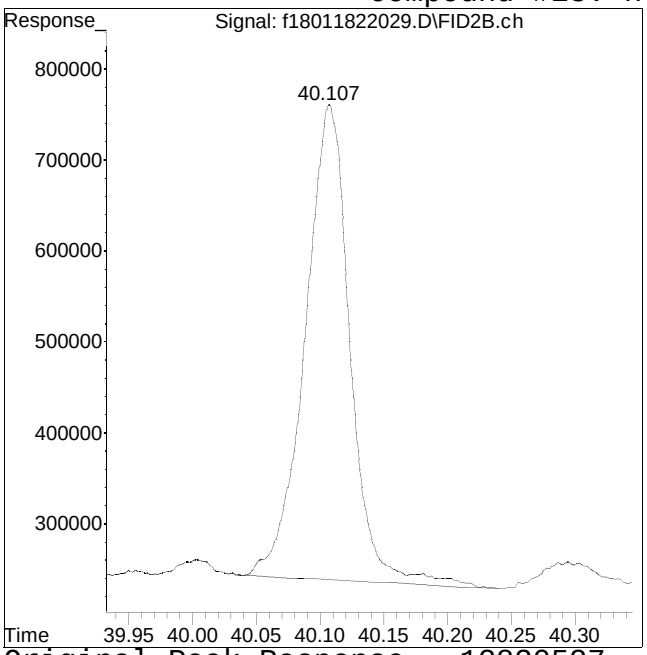
M4 = Poor automated baseline construction.

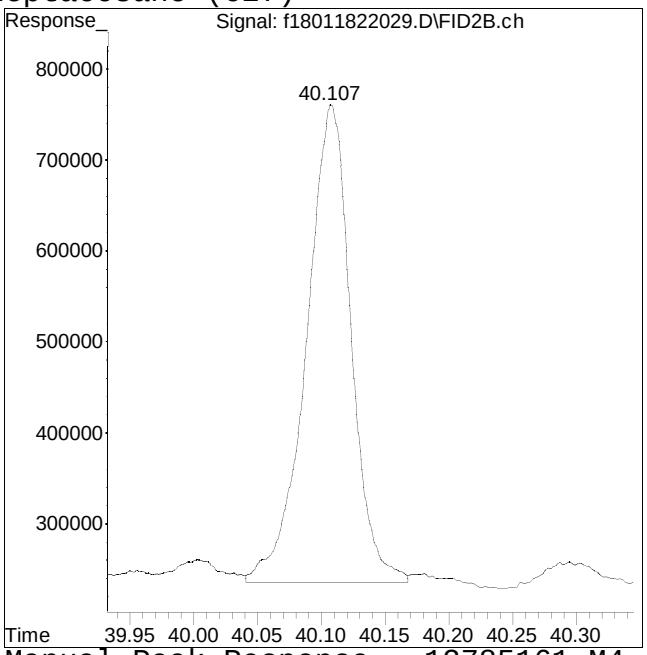
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #28: n-Heptacosane (C27)





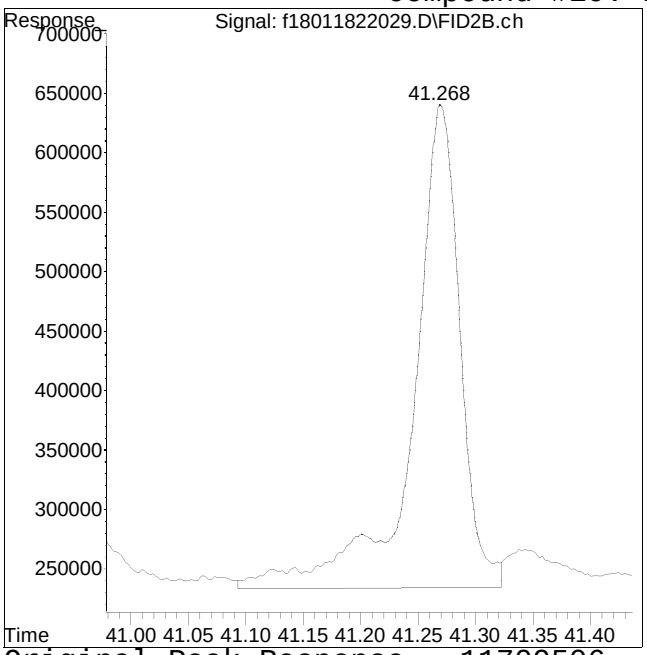
Original Peak Response = 12830527 Manual Peak Response = 12785161 M4
M4 = Poor automated baseline construction.

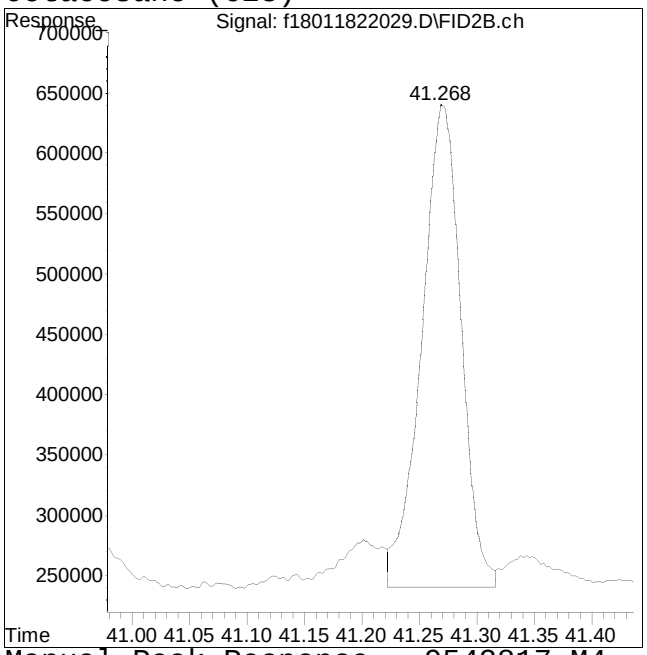
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #29: n-Octacosane (C28)





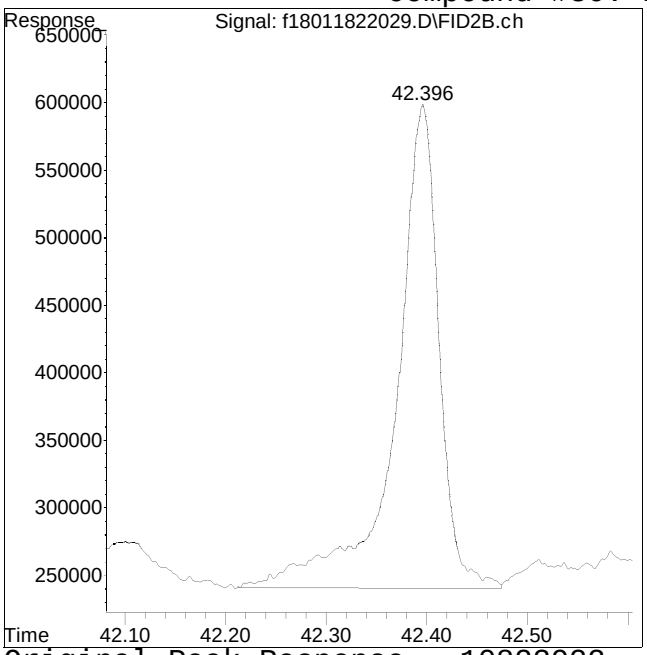
Original Peak Response = 11709506 Manual Peak Response = 9542817 M4
M4 = Poor automated baseline construction.

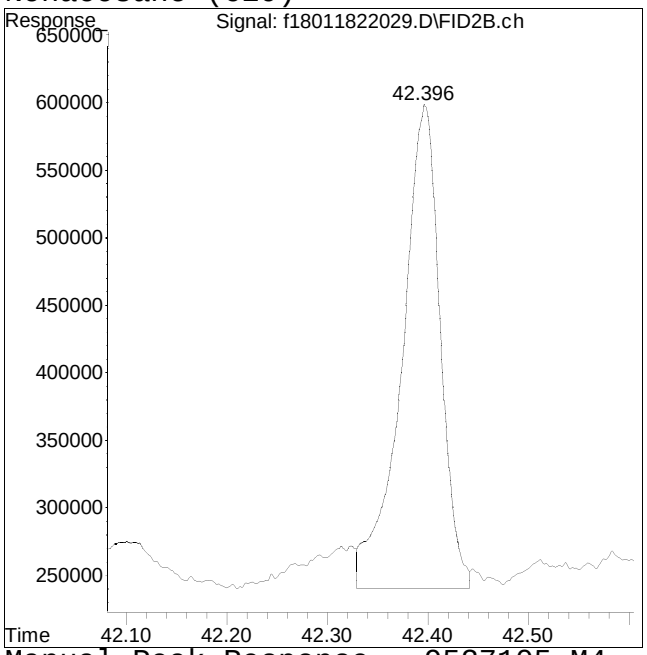
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #30: n-Nonacosane (C29)





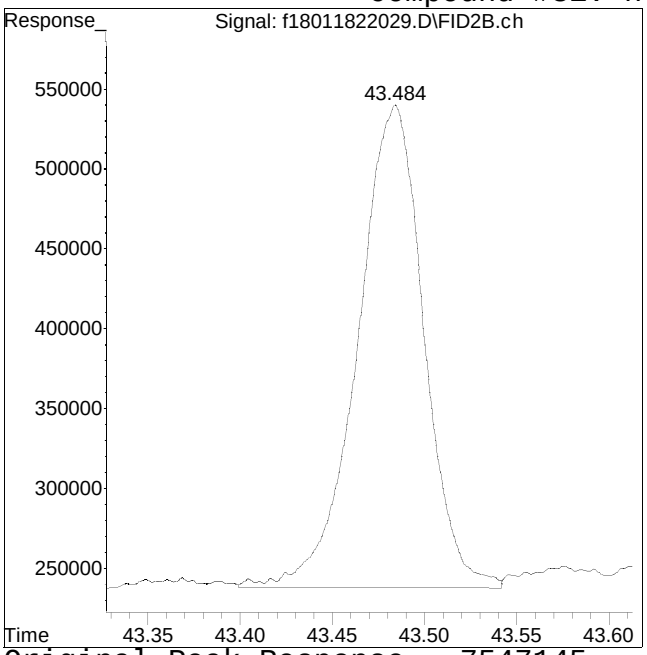
Original Peak Response = 10823922 Manual Peak Response = 9527105 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

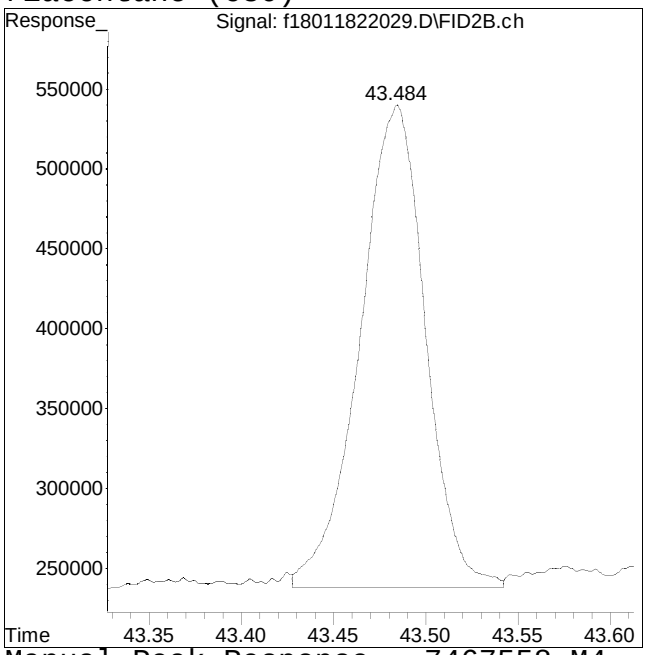
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #31: n-Triacontane (C30)



Original Peak Response = 7547145



Manual Peak Response = 7467558 M4

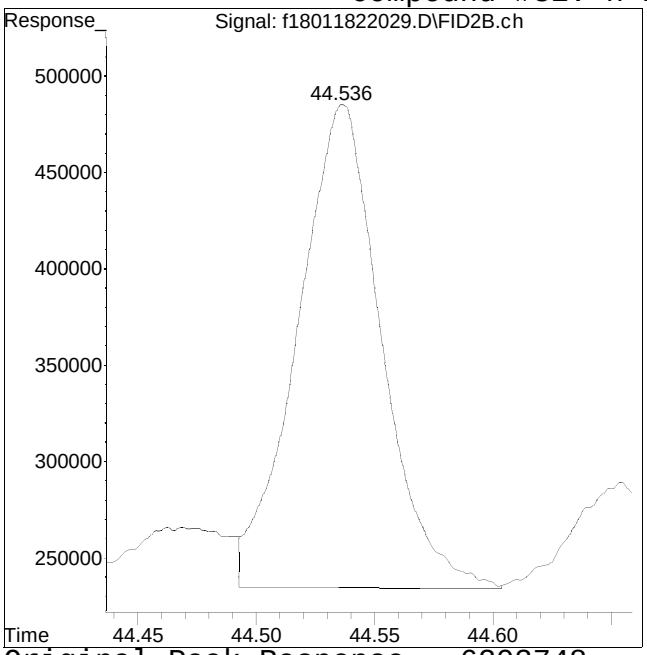
M4 = Poor automated baseline construction.

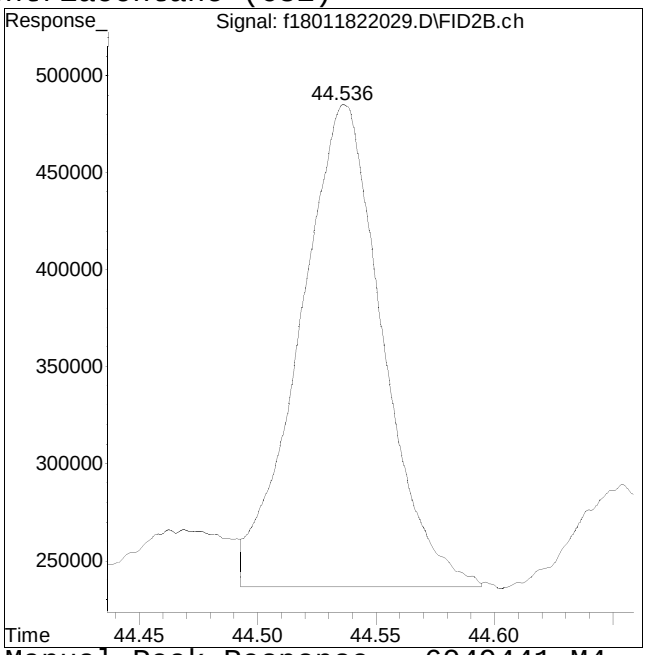
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #32: n-Hentriacontane (C31)





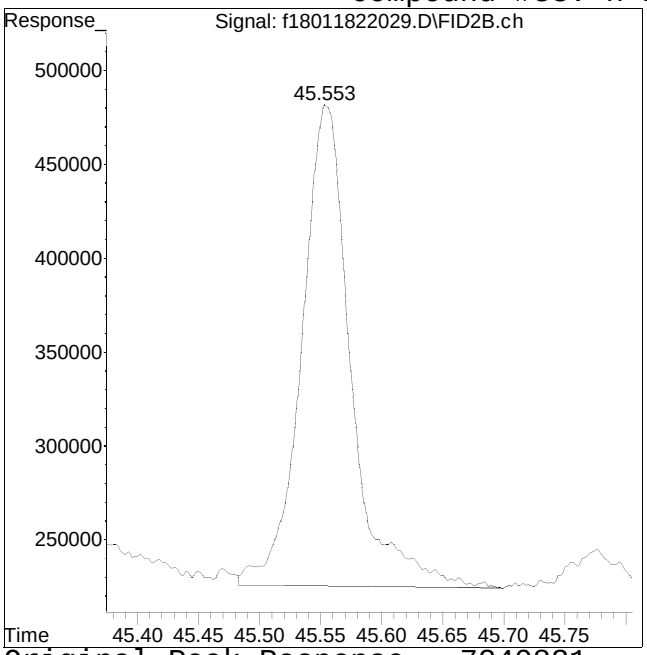
Original Peak Response = 6203748 Manual Peak Response = 6049441 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

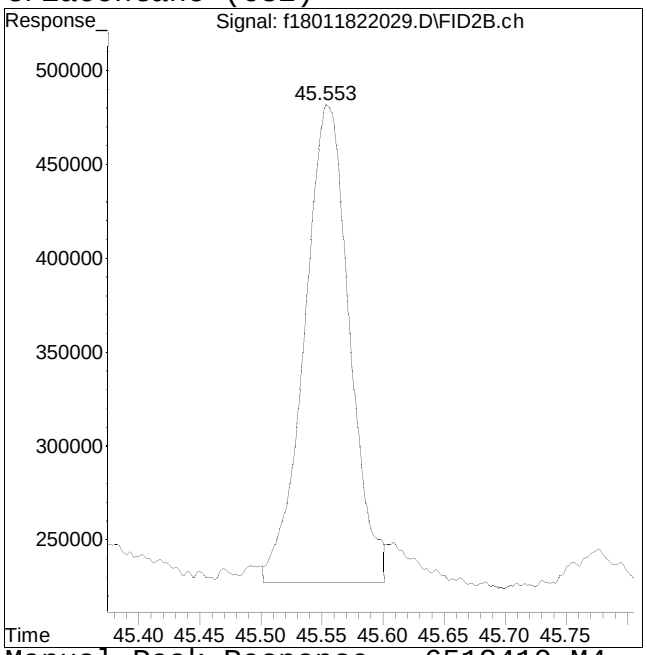
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #33: n-Dotriacontane (C32)



Original Peak Response = 7240831



Manual Peak Response = 6512410 M4

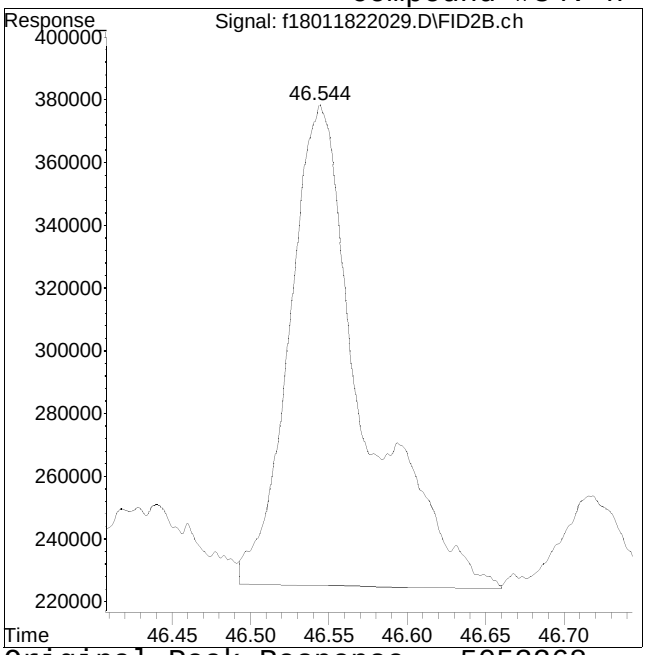
M4 = Poor automated baseline construction.

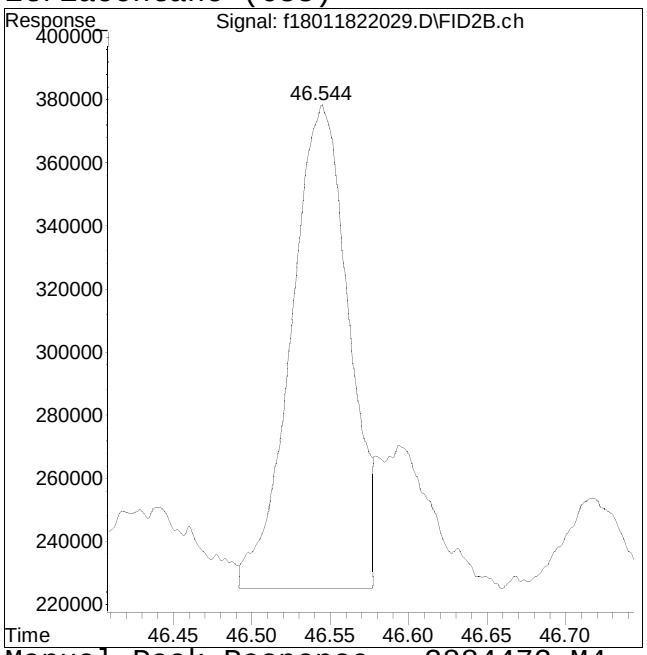
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #34: n-Tritriacontane (C33)





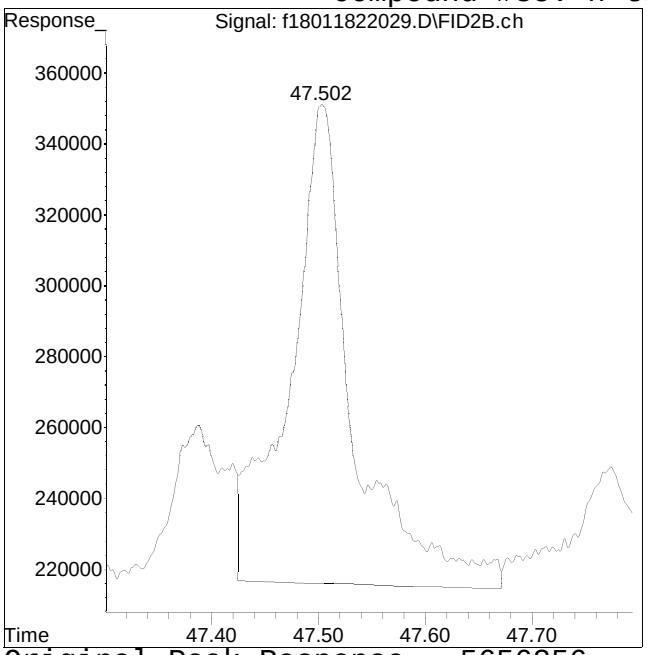
Original Peak Response = 5053268 Manual Peak Response = 3884472 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

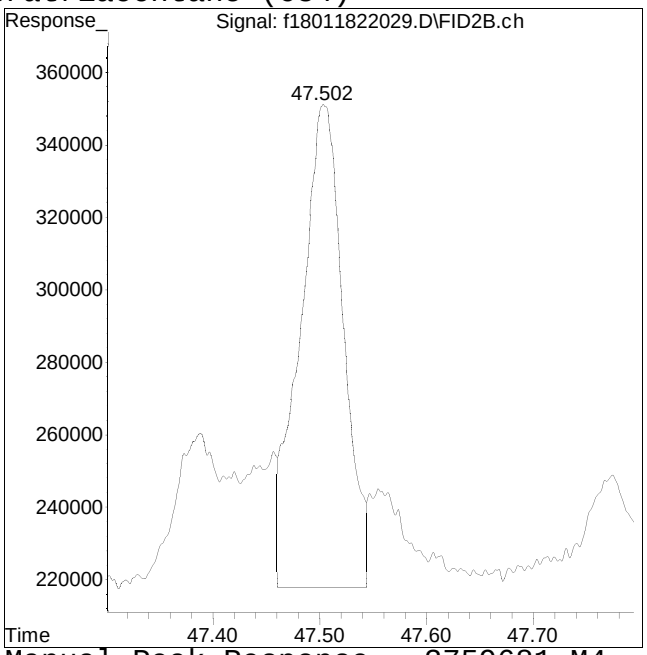
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #35: n-tetratriacontane (C34)



Original Peak Response = 5656356



Manual Peak Response = 3759681 M4

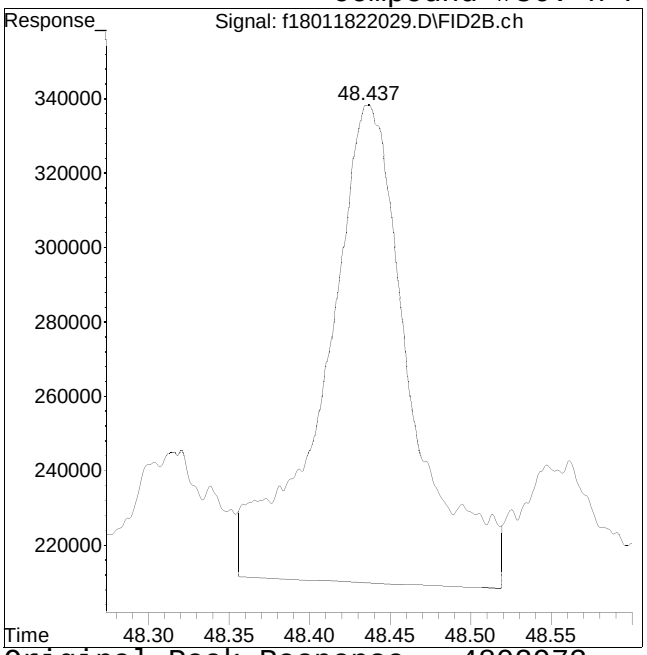
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

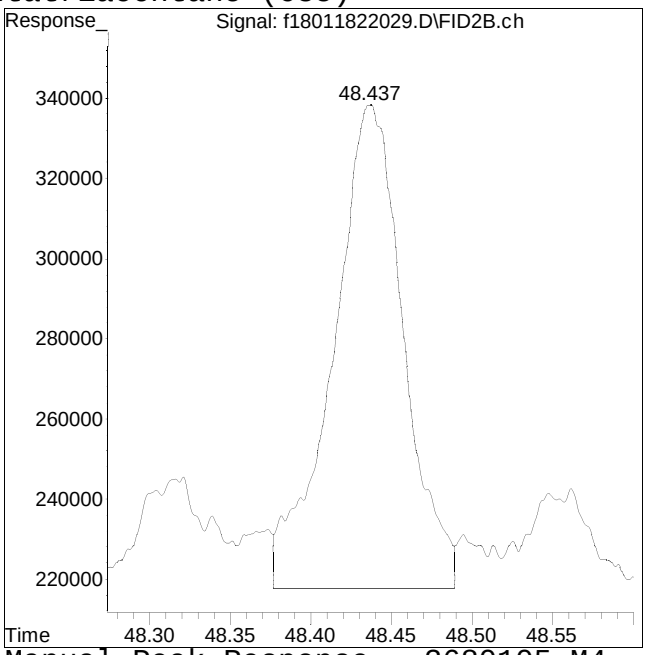
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #36: n-Pentatriacontane (C35)



Original Peak Response = 4802973



Manual Peak Response = 3680105 M4

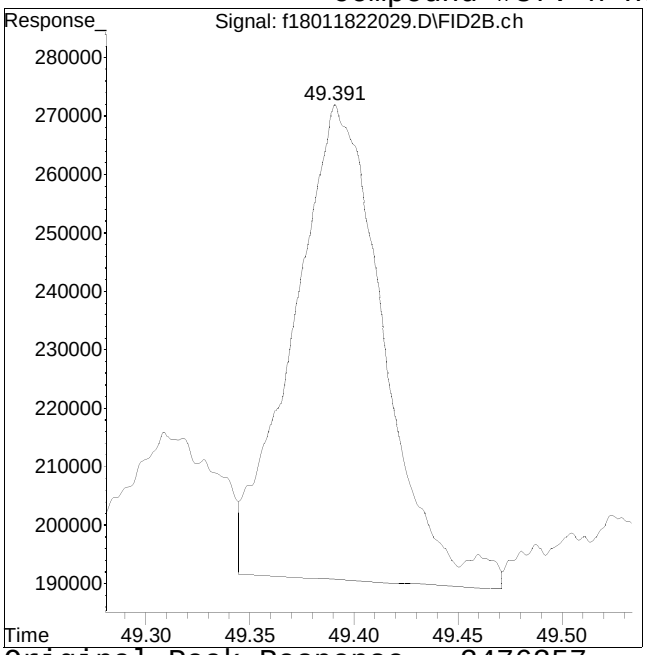
M4 = Poor automated baseline construction.

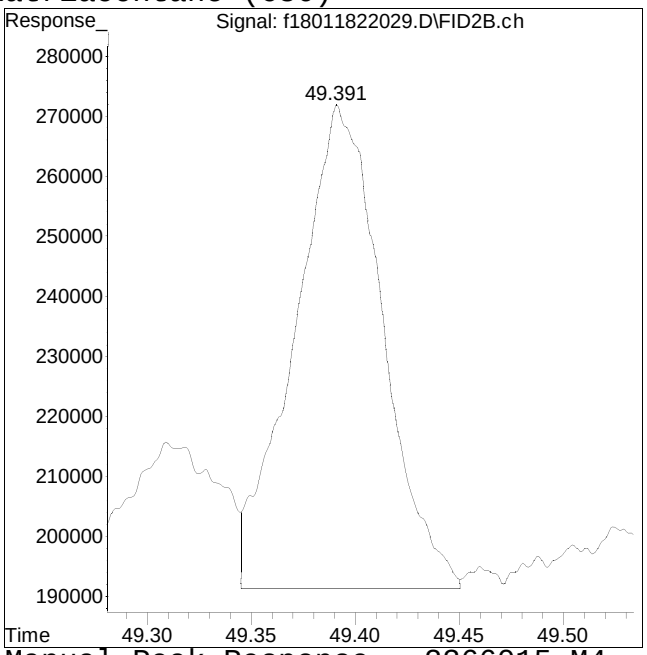
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #37: n-Hexatriacontane (C36)





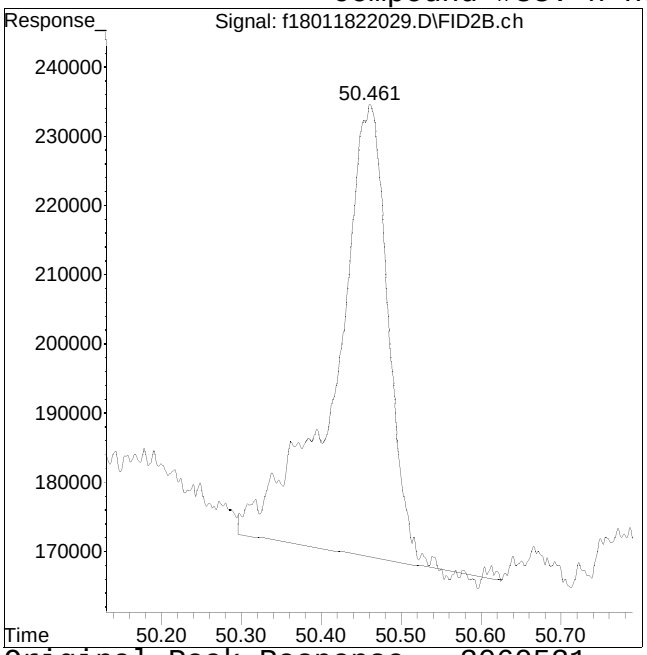
Original Peak Response = 2476357 Manual Peak Response = 2366015 M4
M4 = Poor automated baseline construction.

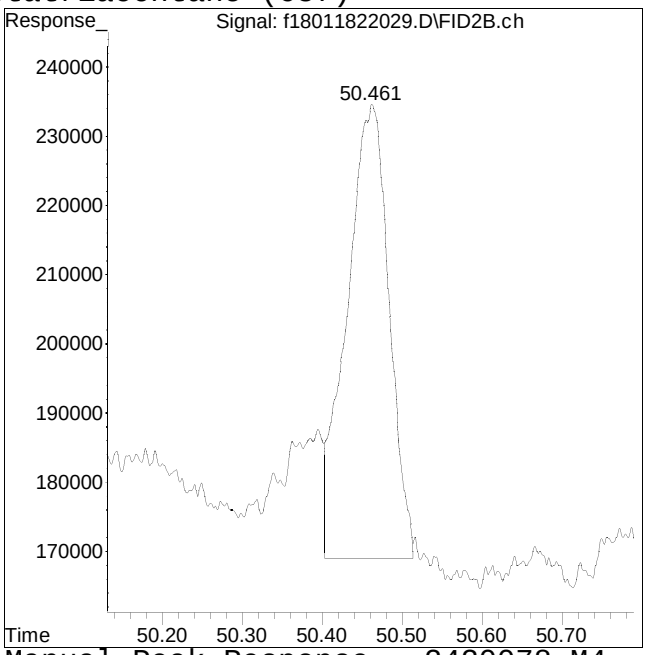
Manual Integration/Negative Proof Report

Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #38: n-Heptatriacontane (C37)





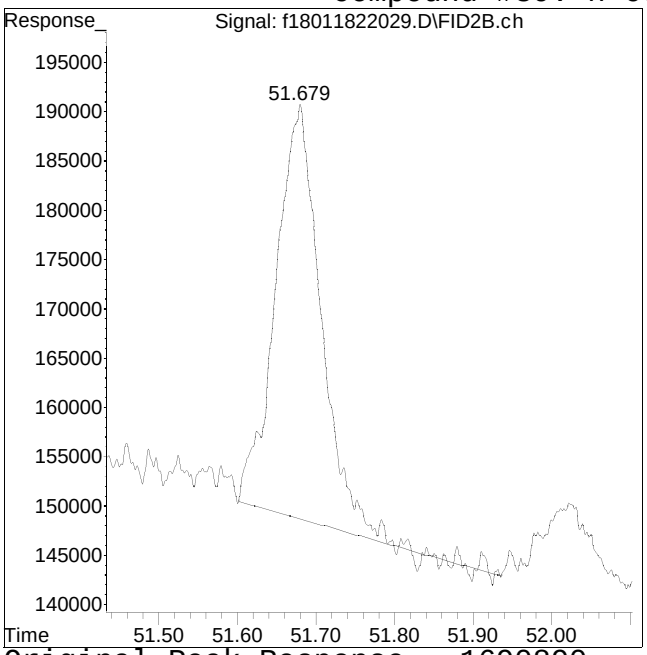
Original Peak Response = 3060531 Manual Peak Response = 2420078 M4
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

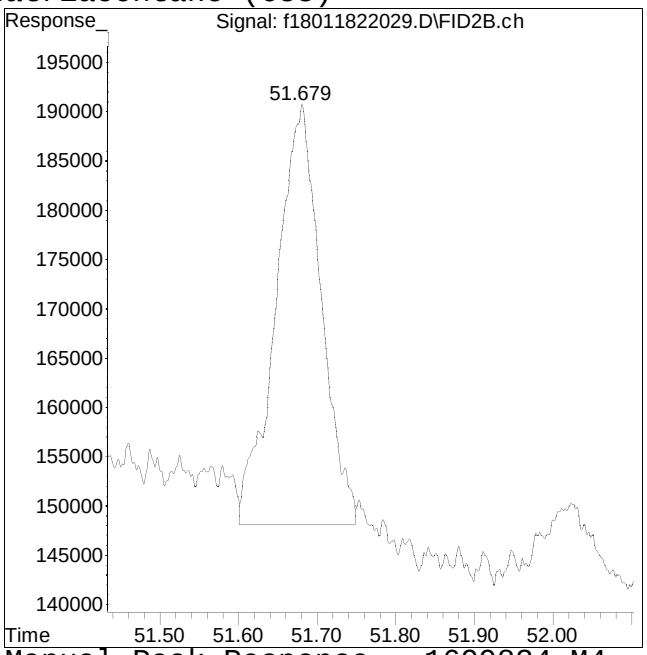
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #39: n-Octatriacontane (C38)



Original Peak Response = 1690890



Manual Peak Response = 1699834 M4

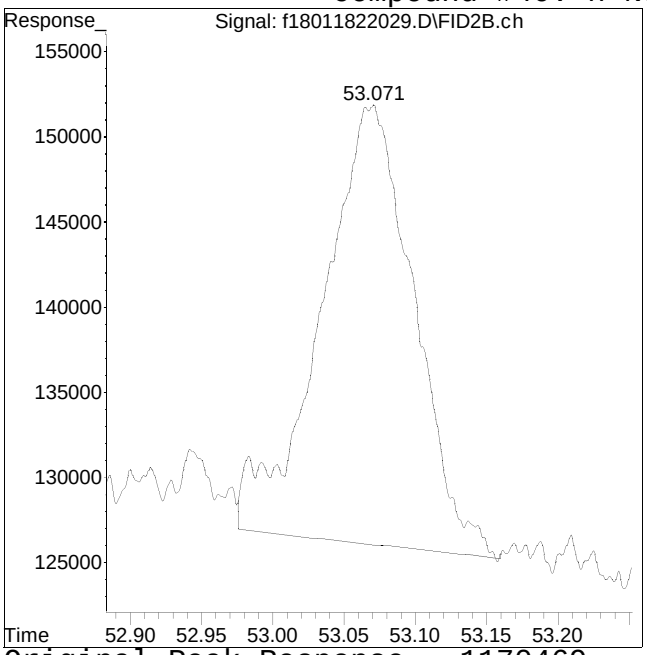
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

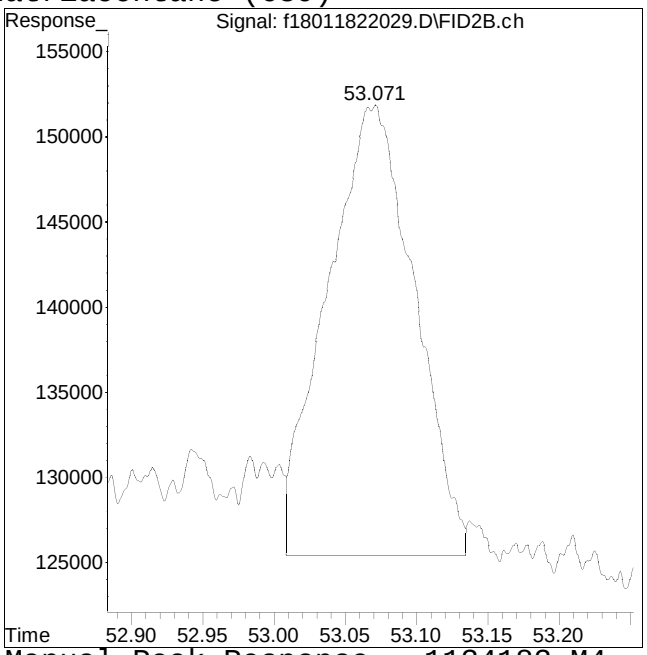
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #40: n-Nonatriacontane (C39)



Original Peak Response = 1170469



Manual Peak Response = 1134183 M4

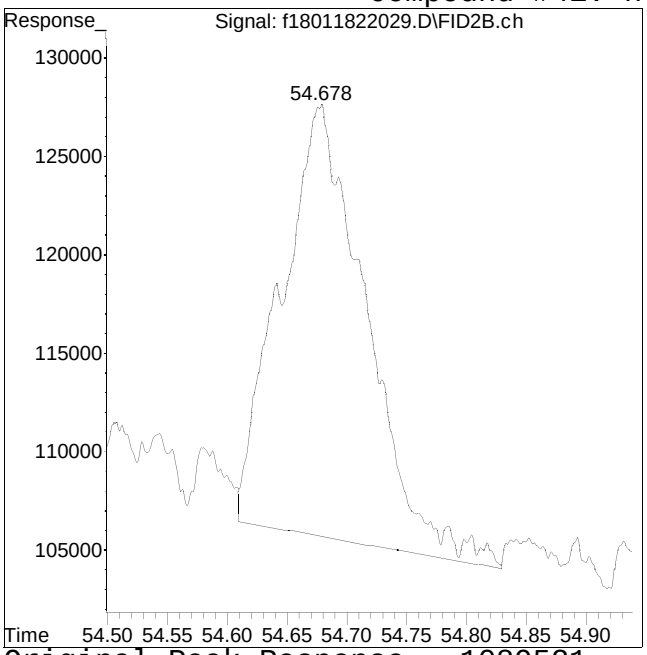
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

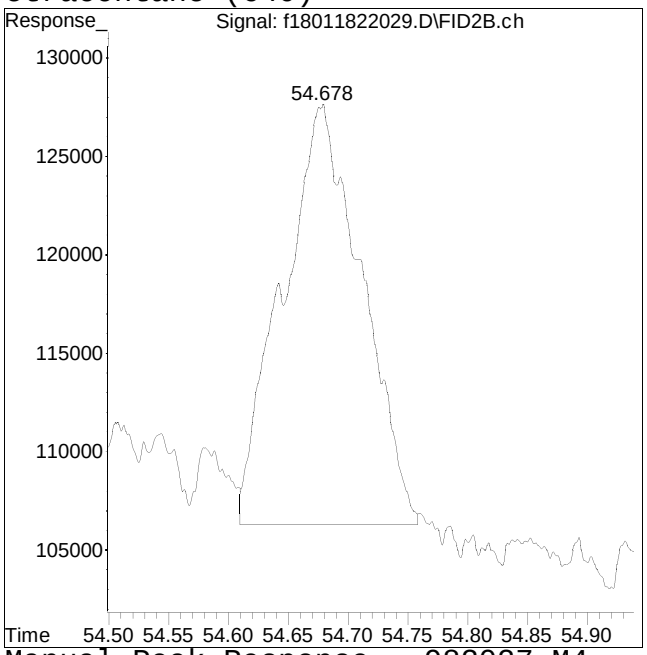
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #41: n-Tetracontane (C40)



Original Peak Response = 1089521



Manual Peak Response = 982027 M4

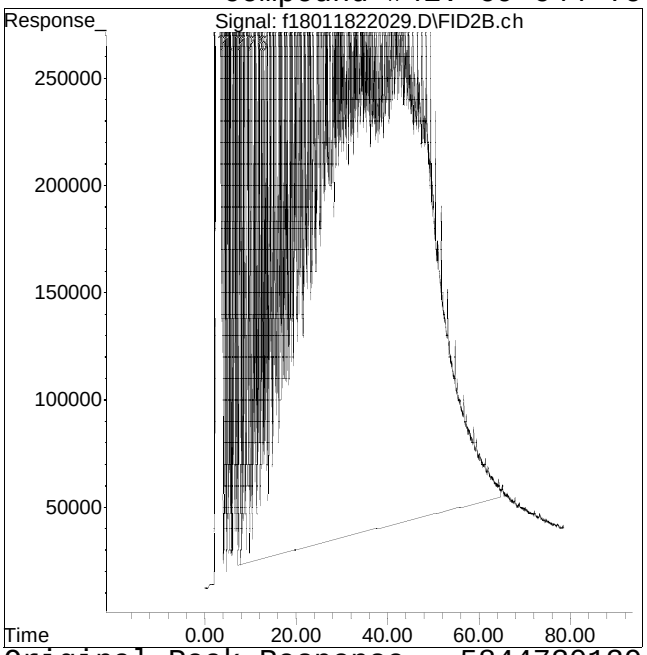
M4 = Poor automated baseline construction.

Manual Integration/Negative Proof Report

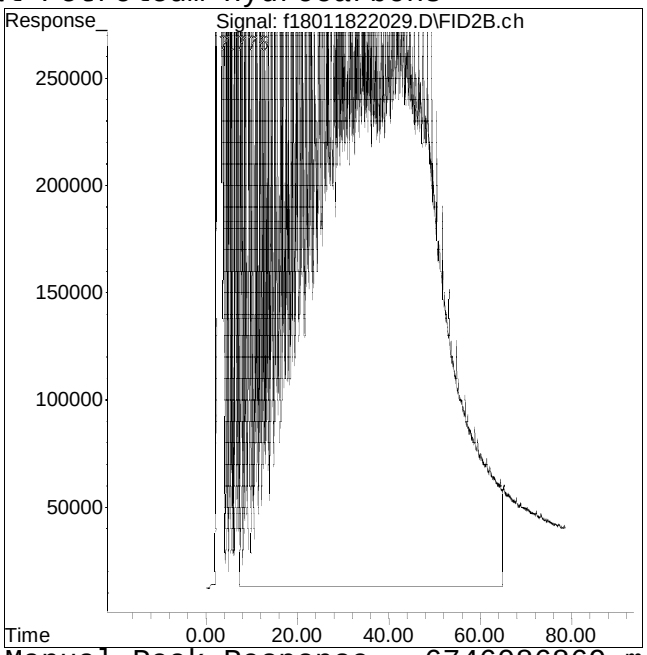
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #42: C9-C44 Total Petroleum Hydrocarbons



Original Peak Response = 5844730139



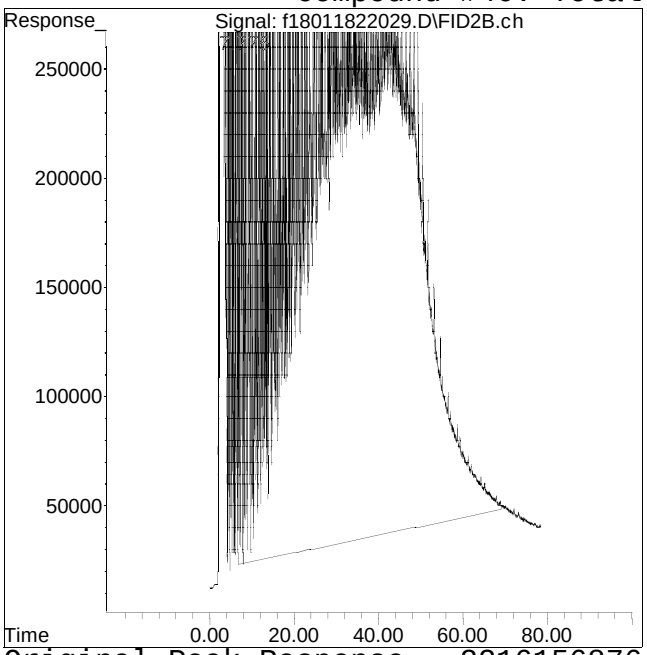
Manual Peak Response = 6746086869 m

Manual Integration/Negative Proof Report

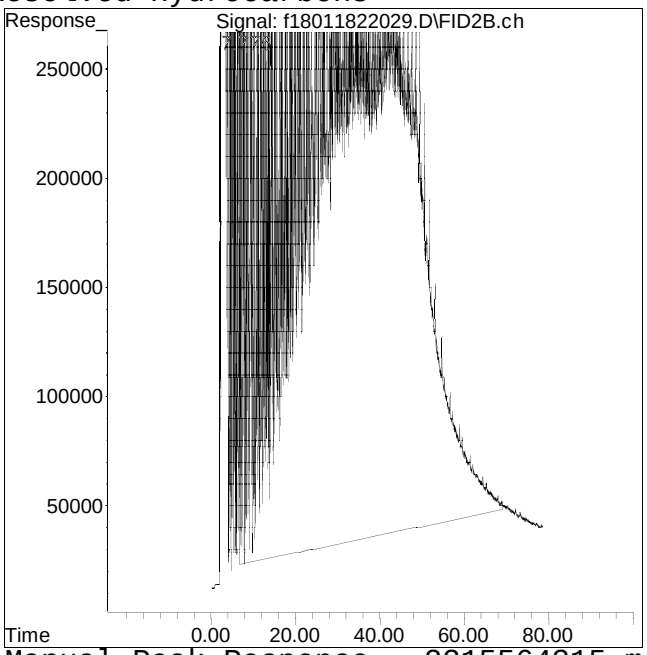
Data Path : O:\Forensics\Data\FID18\202Q
Data File : f18011822029.D
Date Inj'd : 1/19/2022 8:44 am
Sample : WG1596727-1,0.1028

Method : HC18011822R_DRO.M
Operator : FID18:WR
Instrument : FID 18
Quant Date : 1/21/2022 10:44 am

Compound #46: Total Resolved Hydrocarbons



Original Peak Response = 2216156876



Manual Peak Response = 2215564315 m

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\
Data File : f18011822027.D
Signal(s) : FID2B.ch
Acq On : 19 Jan 2022 07:18 am
Operator : FID18:WR
Sample : IB1801182201R
Misc :
ALS Vial : 64 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Jan 21 10:45:26 2022
Quant Method : O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Fri Jan 21 10:22:37 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : TPH - TPH

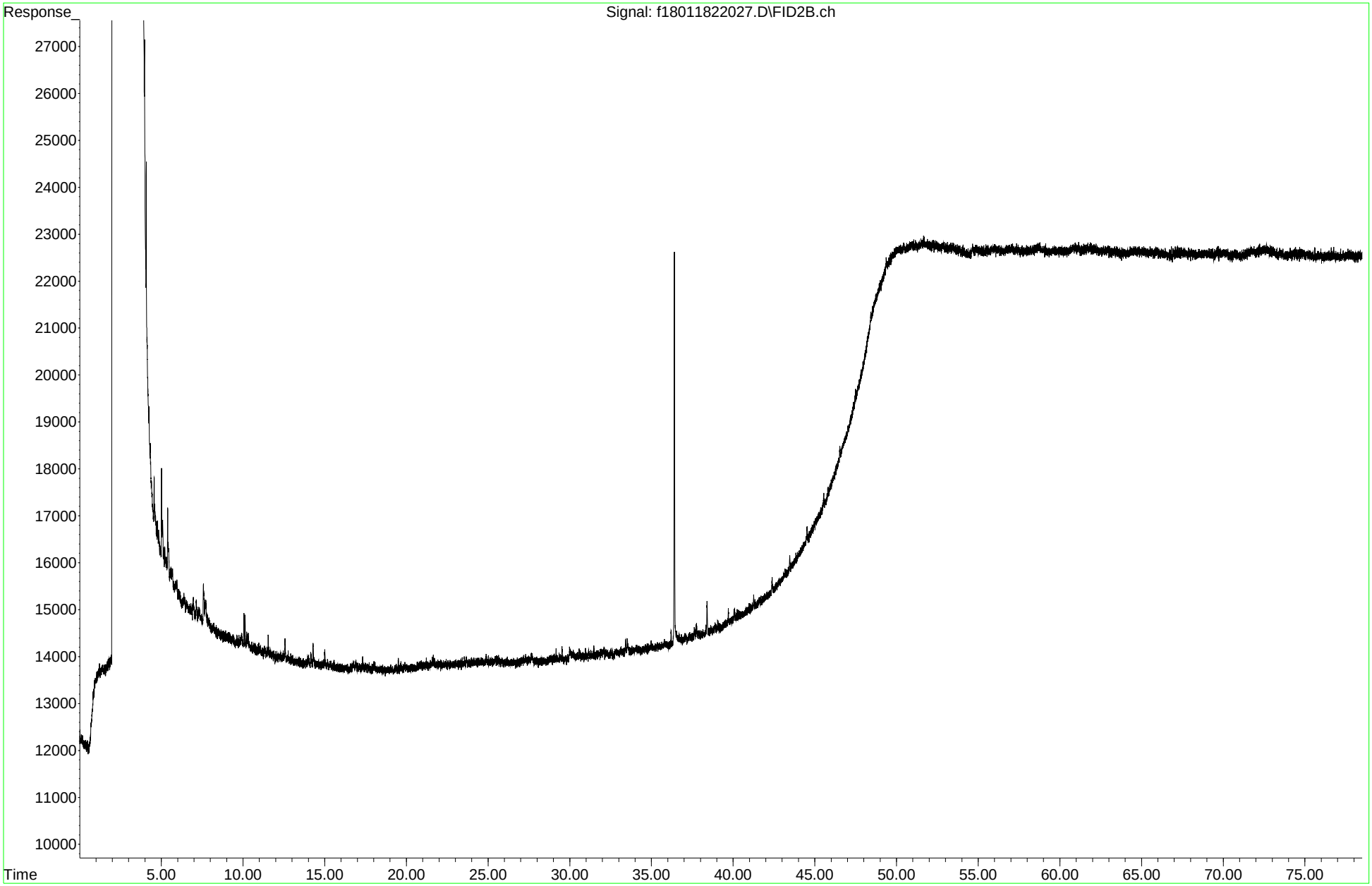
Compound	R.T.	Response	Conc	Units
Internal Standards				
1) I 5-alpha-androstane	31.156	6972	50.000	ug/mL M4
System Monitoring Compounds				
19) s ortho-terphenyl	0.000	0	N.D.	ug/mL
Spiked Amount 50.000	Range 50 - 130	Recovery	=	0.00%#
24) s d50-Tetracosane	0.000	0	N.D.	ug/mL
Spiked Amount 50.000	Range 50 - 130	Recovery	=	0.00%#
Target Compounds				
42) h C9-C44 Total Petroleu...	36.052	137587732	1025467.350	ug/mL M5
46) h Total Resolved Hydroc...	37.870	2591406	19314.242	ug/mL m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\f18011822027.D
Operator : FID18:WR
Acquired : 19 Jan 2022 07:18 am using AcqMethod FID18.M
Sample Name: IB1801182201R
Instrument: FID 18
Misc Info :
Vial Number: 64
CurrentMeth: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\HC18011822R_DRO.M



Work Group

ALPHA ANALYTICAL LABORATORIES, INC.

Alpha WORK GROUP REPORT (wk02)

Mar 23 2022, 04:28 pm

Work Group: WG1618210 for Department: 2 Organic Preparation

Created: 22-MAR-22 Due: Operator: ba

Sample	Client ID	C	Product	Matrix	Stat	UA	HOLD	DUE	PR	Location
L2213568-01	A3000-PRN01-220310	S	A2-SHC	WATER	DONE	U	0317	0323	2C	Glass-A.25
WG1618210-1	Laboratory Method Bl	S	A2-SHC	WATER	DONE	U				
WG1618210-2	Laboratory Control S	S	A2-SHC	WATER	DONE	U				
WG1618210-3	LCS Duplicate	S	A2-SHC	WATER	DONE	U				

Comments:

WG1618210-3 WG1618210-2

Sequence Logs

Analysis log File

Total Files Reported in Log : 16
Log Generated From Directory: O:\Forensics\Data\FID18\2022\JAN\JAN18.SEC\

No.	DATA FILE	INJ METH	SAMPLE NAME	MISC	DATE INJ'D
1	f18011822001.D		ll		1/18/2022 12:35 pm
2	f18011822003.D		ans		1/18/2022 2:02 pm
3	f18011822005.D		CCV		1/18/2022 3:28 pm
4	f18011822007.D		DCN		1/18/2022 4:55 pm
5	f18011822009.D		IB		1/18/2022 6:21 pm
6	f18011822011.D		I1801182201R	WG1596727,FRBE49,1ug/ml	1/18/2022 7:48 pm
7	f18011822013.D		I1801182202R	WG1596727,FRBE50,10ug/m..	1/18/2022 9:14 pm
8	f18011822015.D		I1801182203R	WG1596727,FRBE45,50ug/m..	1/18/2022 10:40 pm
9	f18011822017.D		I1801182204R	WG1596727,FRBE51,100ug/..	1/19/2022 12:06 am
10	f18011822019.D		I1801182205R	WG1596727,FRBE52,200ug/..	1/19/2022 1:33 am
11	f18011822021.D		I1801182206R	WG1596727,FRBE53,500ug/..	1/19/2022 2:59 am
12	f18011822023.D		DCM		1/19/2022 4:25 am
13	f18011822025.D		CQ1801182201R	WG1596727,FRBE54,50ug/m..	1/19/2022 5:51 am
14	f18011822027.D		IB1801182201R		1/19/2022 7:18 am
15	f18011822029.D		WG1596727-1,0.1028	WG1596727,FRBE48,10.28u..	1/19/2022 8:44 am
16	f18011822031.D		DCM		1/19/2022 10:10 am

SeqLog 1.0 - (c) 2009 Abacus Database Applications

Analysis log File

Total Files Reported in Log : 16
Log Generated From Directory: O:\Forensics\Data\FID18\2022\MAR22.SEC\

No.	DATA FILE	INJ METH	SAMPLE NAME	MISC	DATE INJ'D
1	f18032222001.D		11		3/22/2022 9:23 am
2	f18032222003.D		ans		3/22/2022 10:49 am
3	f18032222005.D		WG1618558-1	WG1618558,FRBE45,..	3/22/2022 12:16 pm
4	f18032222007.D		IB1803222201R		3/22/2022 1:42 pm
5	f18032222009.D		DCM		3/22/2022 3:09 pm
6	f18032222011.D		WG1618210-1	WG1618558,WG16182..	3/22/2022 4:43 pm
7	f18032222013.D		WG1618210-2,42,,	WG1618558,WG16182..	3/22/2022 6:09 pm
8	f18032222015.D		WG1618210-3,42,,	WG1618558,WG16182..	3/22/2022 7:36 pm
9	f18032222017.D		dcm		3/22/2022 9:02 pm
10	f18032222019.D		L2213568-01,42,,,R2C	WG1618558,WG16182..	3/22/2022 10:28 pm
11	f18032222021.D		WG1618558-2	WG1618558,FRBE45,..	3/22/2022 11:54 pm
12	f18032222023.D		dcm		3/23/2022 1:20 am
13	f18032222025.D		IB1803222202R		3/23/2022 2:47 am
14	f18032222027.D		DCM		3/23/2022 11:23 am
15	f18032222029.D		12213568-01d,42,20	WG1618558,WG16182..	3/23/2022 12:49 pm
16	f18032222031.D		WG1618558-3	WG1618558,FRBE45,..	3/23/2022 2:16 pm

Analytical Event

Continuing Calibration

Evaluate Continuing Calibration Report

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222005.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 12:16 pm
Operator : FID18:WR
Sample : WG1618558-1
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 53 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 09:54:29 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Min. RRF : 0.050 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 25% Max. Rel. Area : 200%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1	I	5-alpha-androstane	1.000	1.000	0.0	96	0.00
2	t	n-Octane (C8)	0.807	0.858	-6.3	96	0.00
3	t	n-Nonane (C9)	0.836	0.900	-7.7	97	0.00
4	t	n-Decane (C10)	0.869	0.934	-7.5	97	0.00
5	t	n-Undecane (C11)	0.873	0.951	-8.9	97	0.00
6	t	n-Dodecane (C12)	0.884	0.948	-7.2	97	0.00
7	t	n-Tridecane (C13)	0.890	0.953	-7.1	96	0.00
9	t	n-Tetradecane (C14)	0.916	0.967	-5.6	96	0.00
11	t	n-Pentadecane (C15)	0.924	0.960	-3.9	96	0.00
12	t	n-Hexadecane (C16)	0.925	0.974	-5.3	95	0.00
14	t	n-Heptadecane (C17)	0.942	0.981	-4.1	94	0.00
15	t	Pristane	0.955	1.003	-5.0	96	0.00
16	t	n-Octadecane (C18)	0.953	0.987	-3.6	94	0.00
17	t	Phytane	0.881	0.926	-5.1	96	0.00
18	t	n-Nonadecane (C19)	0.957	0.983	-2.7	95	0.00
19	s	ortho-terphenyl	1.038	1.077	-3.8	96	0.00
20	t	n-Eicosane (C20)	0.965	0.998	-3.4	95	0.00
21	t	n-Heneicosane (C21)	0.972	0.993	-2.2	95	0.00
22	t	n-Docosane (C22)	0.977	1.008	-3.2	95	0.00
23	t	n-Tricosane (C23)	0.974	1.012	-3.9	95	0.00
24	s	d50-Tetracosane	0.844	0.860	-1.9	94	0.00
25	t	n-Tetracosane (C24)	0.965	0.958	0.7	94	0.00
26	t	n-Pentacosane (C25)	0.958	0.994	-3.8	94	0.00
27	t	n-Hexacosane (C26)	0.985	1.023	-3.9	94	0.00
28	t	n-Heptacosane (C27)	0.983	0.988	-0.5	94	0.00
29	t	n-Octacosane (C28)	1.005	1.031	-2.6	94	0.00
30	t	n-Nonacosane (C29)	1.002	1.025	-2.3	93	0.00
31	t	n-Triacontane (C30)	1.007	1.029	-2.2	93	0.00
32	t	n-Hentriacontane (C31)	0.978	1.000	-2.2	93	0.00
33	t	n-Dotriacontane (C32)	1.025	1.051	-2.5	93	0.00
34	t	n-Tritriacontane (C33)	0.996	1.012	-1.6	92	0.00
35	t	n-tetratriacontane (C34)	0.993	1.008	-1.5	92	0.00

Evaluate Continuing Calibration Report

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222005.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 12:16 pm
Operator : FID18:WR
Sample : WG1618558-1
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 53 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 09:54:29 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Min. RRF : 0.050 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 25% Max. Rel. Area : 200%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
36 t	n-Pentatriacontane (C35)	0.948	1.019	-7.5	91	0.00
37 t	n-Hexatriacontane (C36)	1.118	1.093	2.2	91	0.00
38 t	n-Heptatriacontane (C37)	1.022	1.006	1.6	91	0.00
39 t	n-Octatriacontane (C38)	1.040	1.039	0.1	90	0.00
41 t	n-Tetracontane (C40)	1.034	1.032	0.2	89	0.00

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Mass Discrimination (Response)	Ratio	Range Limits
n-Hexatriacontane (C36) to n-Eicosane (C20)	1.09	0.85 - 1.15

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222005.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 12:16 pm
Operator : FID18:WR
Sample : WG1618558-1
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 53 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 09:54:29 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

	Compound	R.T.	Response	Conc Units
Internal Standards				
1) I	5-alpha-androstane	30.881	54828827	50.000 ug/mL M4
System Monitoring Compounds				
19) s	ortho-terphenyl	28.886	59074279	51.916 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery =	103.83%
24) s	d50-Tetracosane	35.527	47153652	50.966 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery =	101.93%
Target Compounds				
2) t	n-Octane (C8)	5.369	47017196	53.129 ug/mL M4
3) t	n-Nonane (C9)	7.551	49351981	53.849 ug/mL M4
4) t	n-Decane (C10)	10.017	51207483	53.765 ug/mL M4
5) t	n-Undecane (C11)	12.518	52134362	54.465 ug/mL M4
6) t	n-Dodecane (C12)	14.936	51959172	53.598 ug/mL M4
7) t	n-Tridecane (C13)	17.237	52234361	53.507 ug/mL M4
9) t	n-Tetradecane (C14)	19.414	53032011	52.776 ug/mL M4
11) t	n-Pentadecane (C15)	21.474	52616809	51.928 ug/mL M4
12) t	n-Hexadecane (C16)	23.424	53377601	52.603 ug/mL M4
14) t	n-Heptadecane (C17)	25.277	53781485	52.059 ug/mL M4
15) t	Pristane	25.386	55003906	52.496 ug/mL M4
16) t	n-Octadecane (C18)	27.039	54121476	51.813 ug/mL M4
17) t	Phytane	27.198	50766748	52.536 ug/mL M4
18) t	n-Nonadecane (C19)	28.718	53897915	51.369 ug/mL M4
20) t	n-Eicosane (C20)	30.318	54745185	51.748 ug/mL M4
21) t	n-Heneicosane (C21)	31.848	54470401	51.108 ug/mL M4
22) t	n-Docosane (C22)	33.315	55267625	51.604 ug/mL M4
23) t	n-Tricosane (C23)	34.723	55487109	51.925 ug/mL M4
25) t	n-Tetracosane (C24)	36.075	52528806	49.656 ug/mL M4
26) t	n-Pentacosane (C25)	37.376	54489763	51.858 ug/mL M4
27) t	n-Hexacosane (C26)	38.627	56101121	51.937 ug/mL M4
28) t	n-Heptacosane (C27)	39.831	54184546	50.289 ug/mL M4
29) t	n-Octacosane (C28)	40.996	56503650	51.281 ug/mL M4
30) t	n-Nonacosane (C29)	42.122	56205728	51.147 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222005.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 12:16 pm
Operator : FID18:WR
Sample : WG1618558-1
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 53 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 09:54:29 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

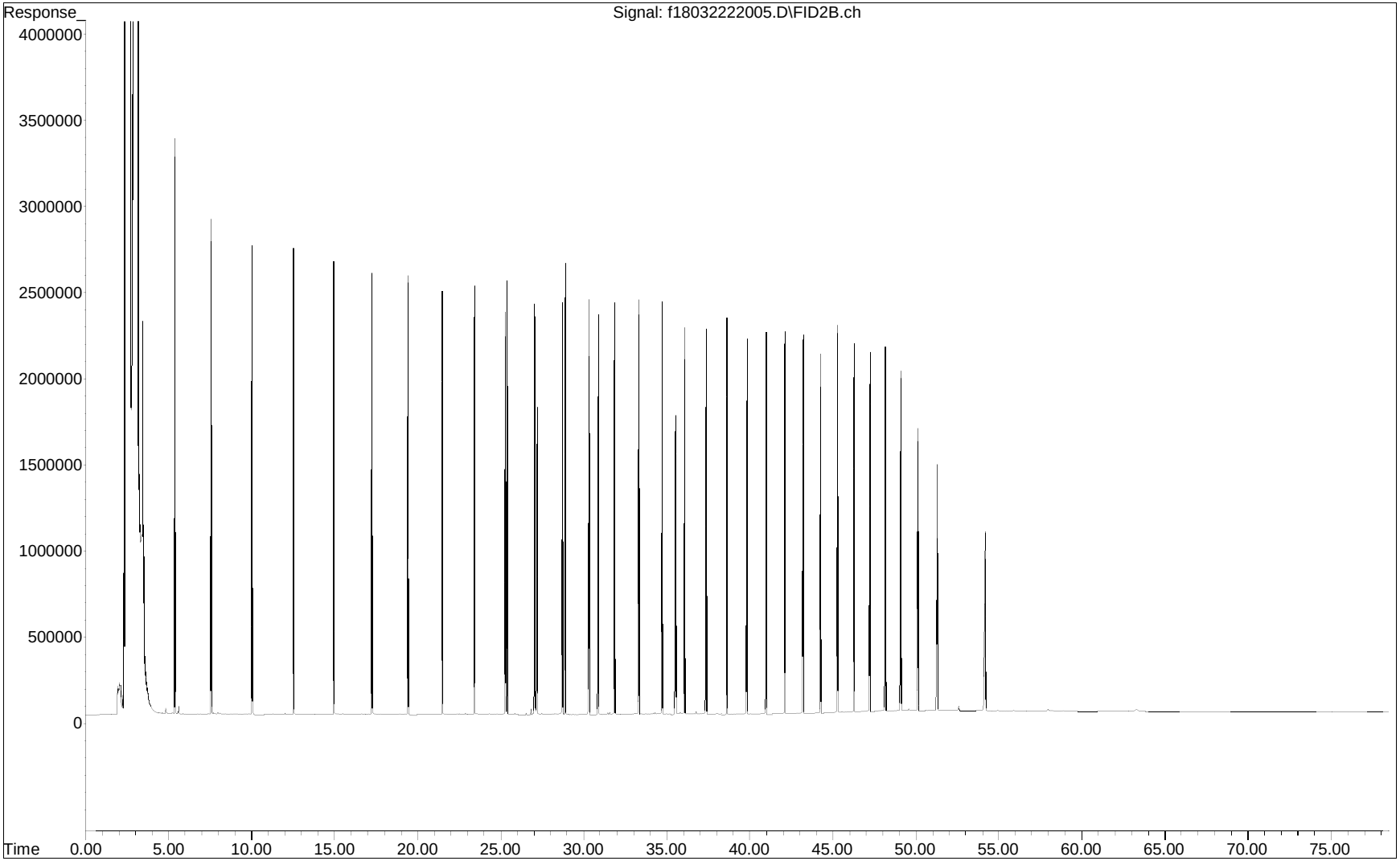
	Compound	R.T.	Response	Conc Units
31) t	n-Triacontane (C30)	43.211	56422188	51.090 ug/mL M4
32) t	n-Hentriacontane (C31)	44.262	54806837	51.102 ug/mL M4
33) t	n-Dotriacontane (C32)	45.286	57645488	51.308 ug/mL M4
34) t	n-Tritriacontane (C33)	46.276	55500492	50.826 ug/mL M4
35) t	n-tetratriacontane (C34)	47.233	55263837	50.747 ug/mL M4
36) t	n-Pentatriacontane (C35)	48.167	55849149	53.728 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.100	59935508	48.880 ug/mL M4
38) t	n-Heptatriacontane (C37)	50.124	55148413	49.216 ug/mL M4
39) t	n-Octatriacontane (C38)	51.291	56964328	49.960 ug/mL M4
41) t	n-Tetracontane (C40)	54.160	56579196	49.907 ug/mL M4

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222005.D
Operator : FID18:WR
Acquired : 22 Mar 2022 12:16 pm using AcqMethod FID18.M
Sample Name: WG1618558-1
Instrument: FID 18
Misc Info : WG1618558,FRBE45,ICAL18676
Vial Number: 53
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Sample Raw Data

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222019.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 10:28 pm
Operator : FID18:WR
Sample : L2213568-01,42,,,R2C
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 60 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 12:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

	Compound	R.T.	Response	Conc	Units	
	Internal Standards					
1) I	5-alpha-androstane	30.881	54723123	50.000	ug/mL	M4
	System Monitoring Compounds					
19) s	ortho-terphenyl	28.943	305984432	269.426	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	538.85%#
24) s	d50-Tetracosane	35.576	245518221	265.880	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	531.76%#
	Target Compounds					
2) t	n-Octane (C8)	0.000	0	N.D.	ug/mL	d
3) t	n-Nonane (C9)	7.529	778273	0.851	ug/mL	M4
4) t	n-Decane (C10)	10.017	54374551	57.200	ug/mL	M4
5) t	n-Undecane (C11)	12.595	434391544	454.690	ug/mL	M4
6) t	n-Dodecane (C12)	15.062f	708145884	731.890	ug/mL	M4
7) t	n-Tridecane (C13)	17.374f	683138568	701.132	ug/mL	M4
8) t	1380	18.993	148440109	148.010	ug/mL	M4
9) t	n-Tetradecane (C14)	19.529f	419776072	418.559	ug/mL	M4
10) t	1470	20.751	109294236	108.071	ug/mL	M4
11) t	n-Pentadecane (C15)	21.527	163490824	161.661	ug/mL	M4
12) t	n-Hexadecane (C16)	23.426	30896263	30.507	ug/mL	M4
13) t	1650	24.322	9212448	8.935	ug/mL	M4
14) t	n-Heptadecane (C17)	25.263	7134056	6.919	ug/mL	M4
15) t	Pristane	25.361	10695163	10.227	ug/mL	M4
16) t	n-Octadecane (C18)	27.017	2707523	2.597	ug/mL	M4
17) t	Phytane	27.179	4470790	4.636	ug/mL	M4
18) t	n-Nonadecane (C19)	28.702	888827	0.849	ug/mL	M4
20) t	n-Eicosane (C20)	30.295	594114	0.563	ug/mL	M4
21) t	n-Heneicosane (C21)	31.821	260006	0.244	ug/mL	M4
22) t	n-Docosane (C22)	33.290	111888	0.105	ug/mL	M4
23) t	n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222019.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 10:28 pm
Operator : FID18:WR
Sample : L2213568-01,42,,,R2C
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 60 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 12:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

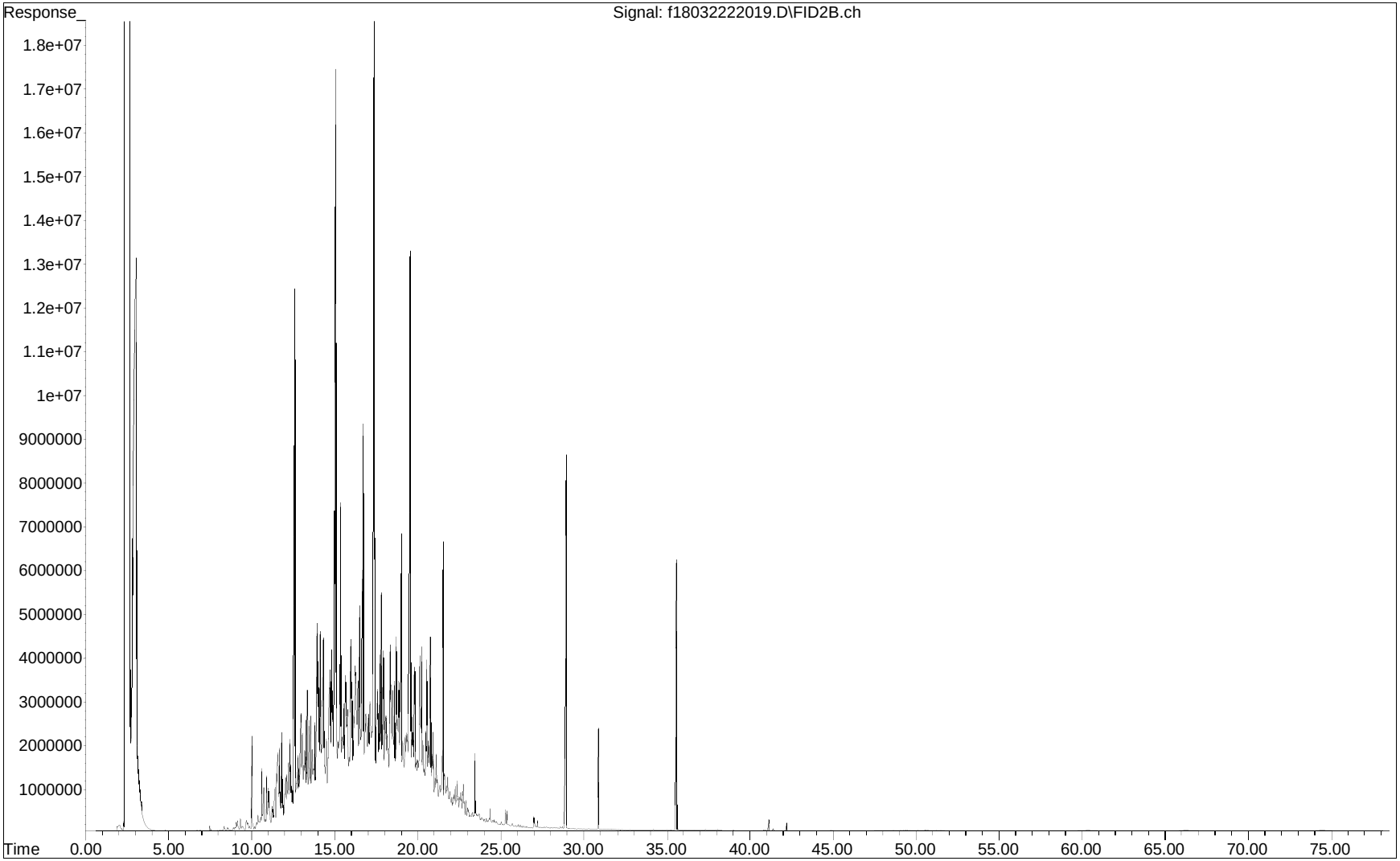
	Compound	R.T.	Response	Conc	Units	
25) t	n-Tetracosane (C24)	0.000	0	N.D.	ug/mL	d
26) t	n-Pentacosane (C25)	0.000	0	N.D.	ug/mL	d
27) t	n-Hexacosane (C26)	38.593	129376	0.120	ug/mL	M4
28) t	n-Heptacosane (C27)	39.805	164966	0.153	ug/mL	M4
29) t	n-Octacosane (C28)	40.967	154111	0.140	ug/mL	M4
30) t	n-Nonacosane (C29)	42.090	118681	0.108	ug/mL	M4
31) t	n-Triacontane (C30)	43.180	118231	0.107	ug/mL	M4
32) t	n-Hentriacontane (C31)	44.226	110925	0.104	ug/mL	M4
33) t	n-Dotriacontane (C32)	45.250	105556	0.094	ug/mL	M4
34) t	n-Tritriacontane (C33)	46.241	70678	0.065	ug/mL	M4
35) t	n-tetratriacontane (C34)	47.199	61959	0.057	ug/mL	M4
36) t	n-Pentatriacontane (C35)	48.134	55991	0.054	ug/mL	M4
37) t	n-Hexatriacontane (C36)	49.063	46807	0.038	ug/mL	M4
38) t	n-Heptatriacontane (C37)	50.086	36674	0.033	ug/mL	M4
39) t	n-Octatriacontane (C38)	51.245	23231	0.020	ug/mL	M4
40) t	n-Nonatriacontane (C39)	0.000	0	N.D.	ug/mL	
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL	
42) h	C9-C44 Total Petroleu...	35.451	17400771744	16524.367	ug/mL	m
42) h	C9-C44 Total Petroleu BS	35.451	17204088188	16337.590	ug/mL	m
43) h	C9-C40 Total Petroleu...	0.000	0	N.D.	ug/ml	d
44) h	C10-C28 DRO	25.502	17173074061	16640.141	ug/mL	m
44) h	C10-C28 DRO BS	25.502	17147050936	16614.926	ug/mL	m
45) h	C28-C40 ORO	47.557	102111105	93.392	ug/mL	m
45) h	C28-C40 ORO BS	47.557	16865606	15.425	ug/mL	m
46) h	Total Resolved Hydroc...	37.870	9656555327	9170.195	ug/mL	m

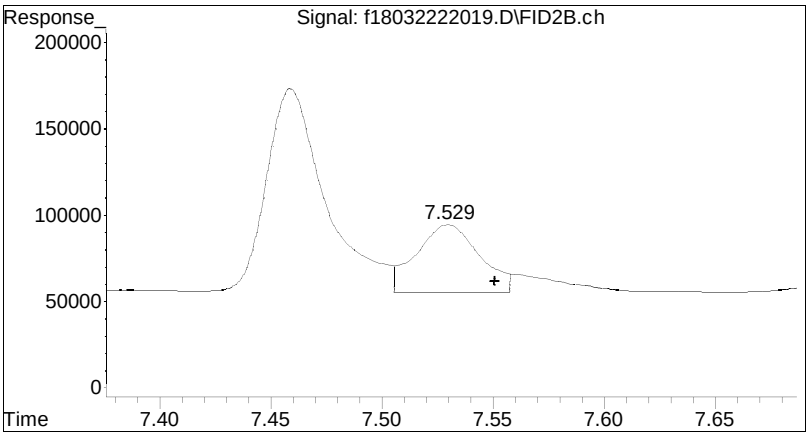
SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

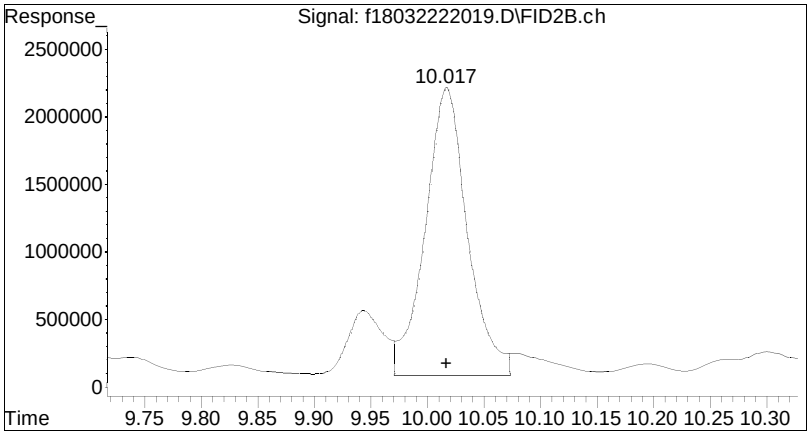
File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222019.D
Operator : FID18:WR
Acquired : 22 Mar 2022 10:28 pm using AcqMethod FID18.M
Sample Name: L2213568-01,42,,,R2C
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 60
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M





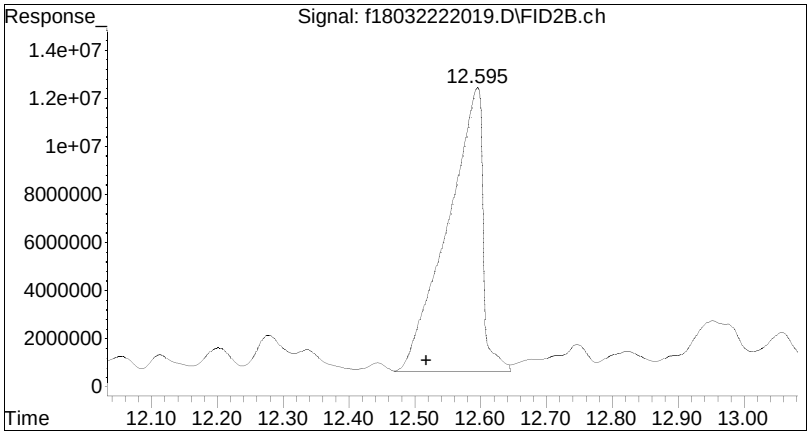
#3 n-Nonane (C9)

R.T.: 7.529 min
Delta R.T.: -0.021 min
Response: 778273
Conc: 0.85 ug/mL M4



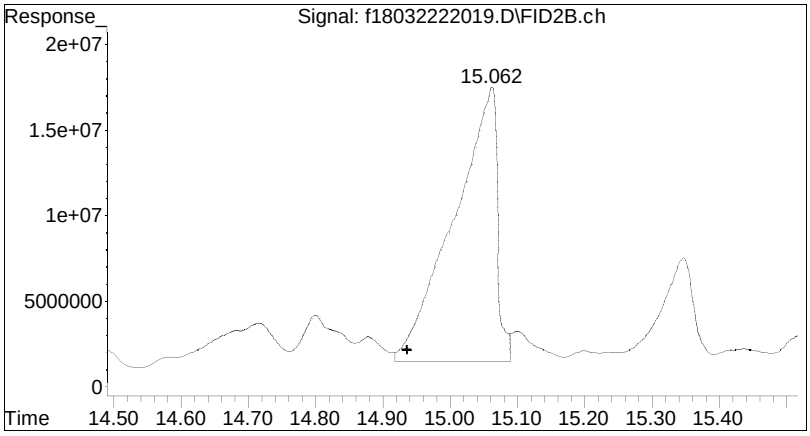
#4 n-Decane (C10)

R.T.: 10.017 min
Delta R.T.: 0.000 min
Response: 54374551
Conc: 57.20 ug/mL M4



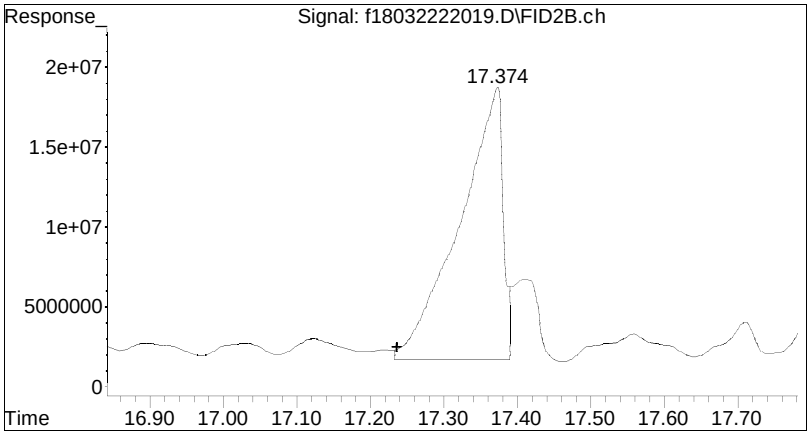
#5 n-Undecane (C11)

R.T.: 12.595 min
Delta R.T.: 0.078 min
Response: 434391544
Conc: 454.69 ug/mL M4



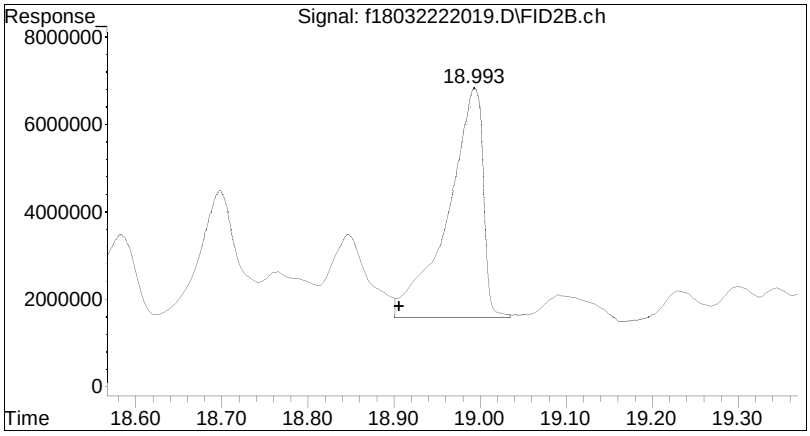
#6 n-Dodecane (C12)

R.T.: 15.062 min
Delta R.T.: 0.126 min
Response: 708145884
Conc: 731.89 ug/mL M4



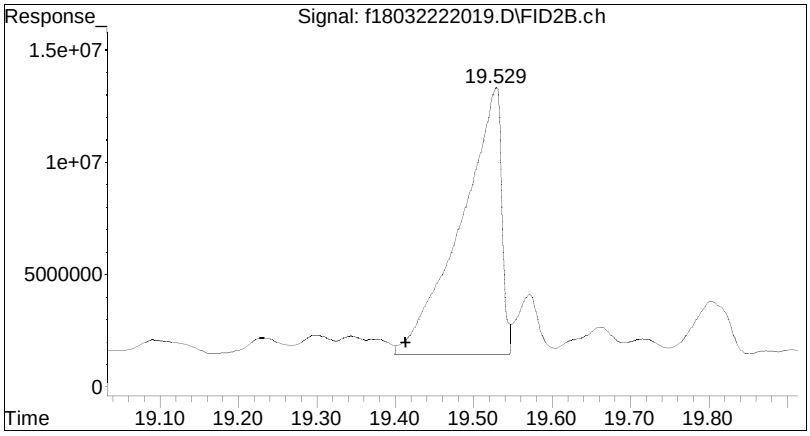
#7 n-Tridecane (C13)

R.T.: 17.374 min
Delta R.T.: 0.137 min
Response: 683138568
Conc: 701.13 ug/mL M4



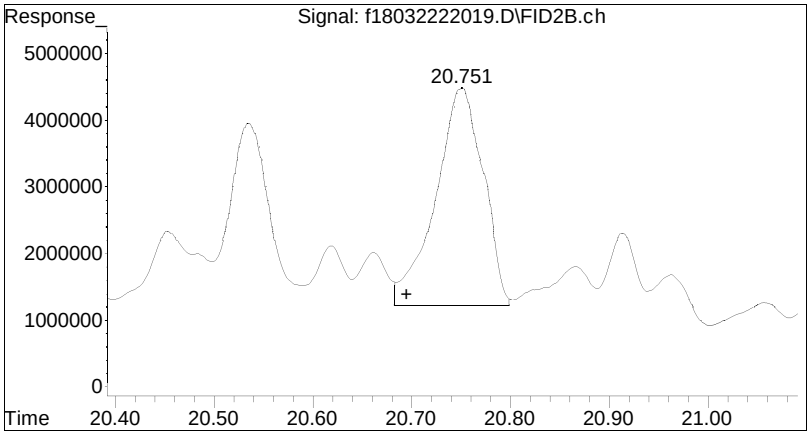
#8 1380

R.T.: 18.993 min
Delta R.T.: 0.087 min
Response: 148440109
Conc: 148.01 ug/mL M4



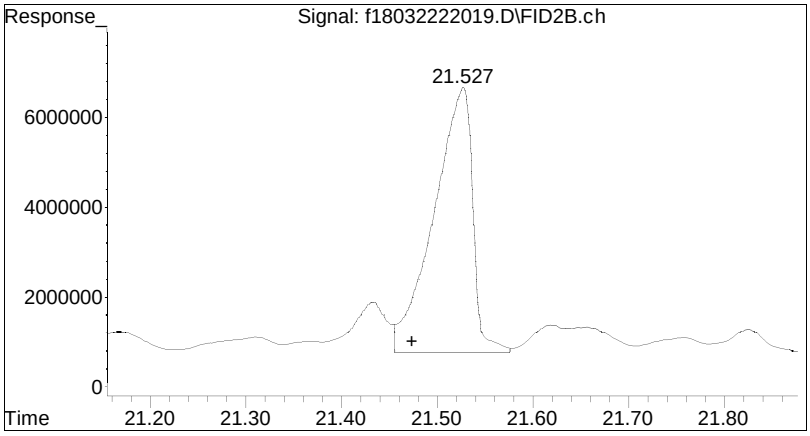
#9 n-Tetradecane (C14)

R.T.: 19.529 min
Delta R.T.: 0.115 min
Response: 419776072
Conc: 418.56 ug/mL M4



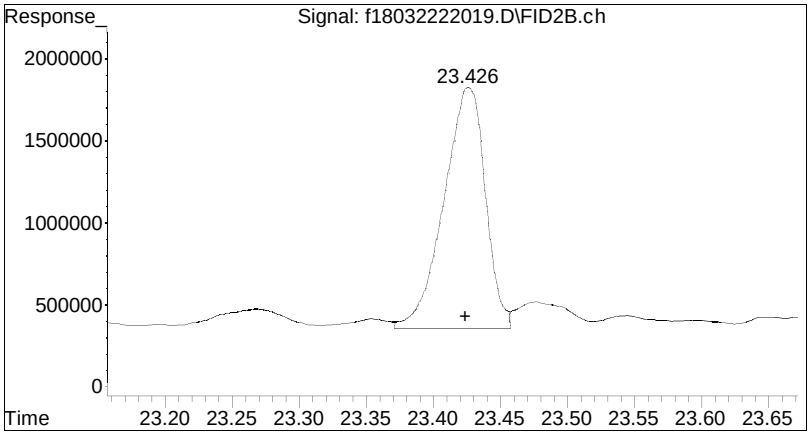
#10 1470

R.T.: 20.751 min
Delta R.T.: 0.056 min
Response: 109294236
Conc: 108.07 ug/mL M4



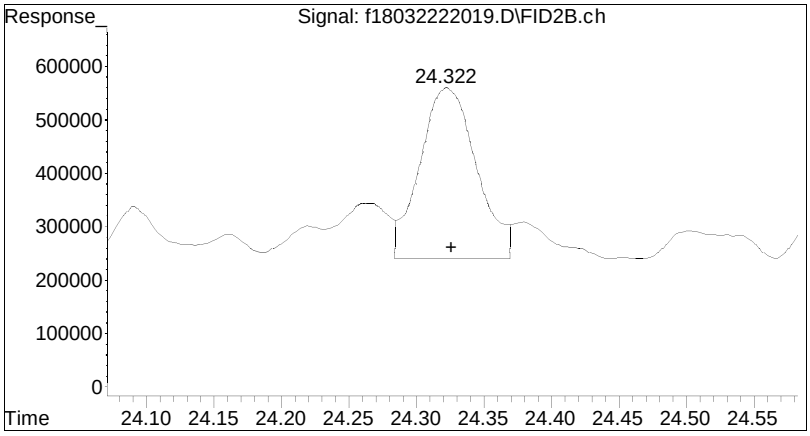
#11 n-Pentadecane (C15)

R.T.: 21.527 min
Delta R.T.: 0.053 min
Response: 163490824
Conc: 161.66 ug/mL M4



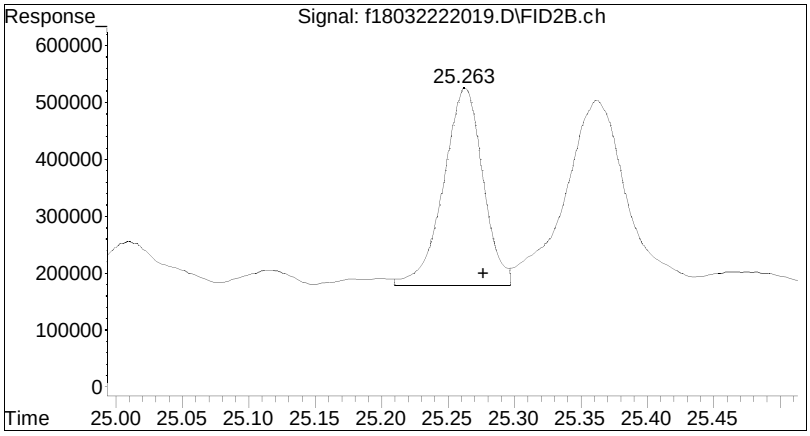
#12 n-Hexadecane (C16)

R.T.: 23.426 min
Delta R.T.: 0.002 min
Response: 30896263
Conc: 30.51 ug/mL M4



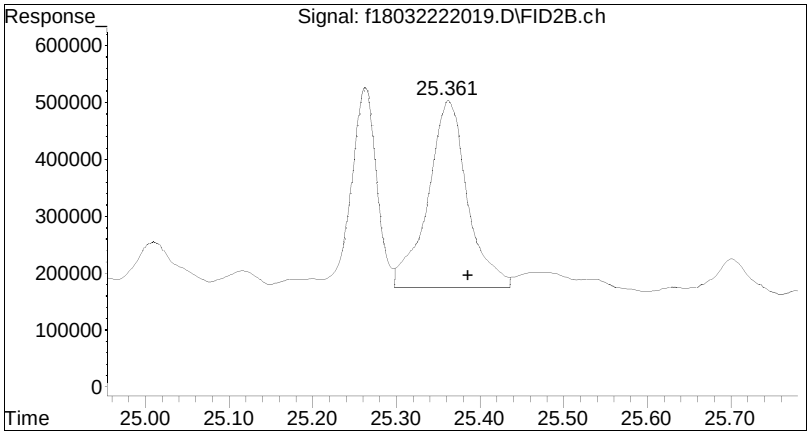
#13 1650

R.T.: 24.322 min
Delta R.T.: -0.004 min
Response: 9212448
Conc: 8.93 ug/mL M4



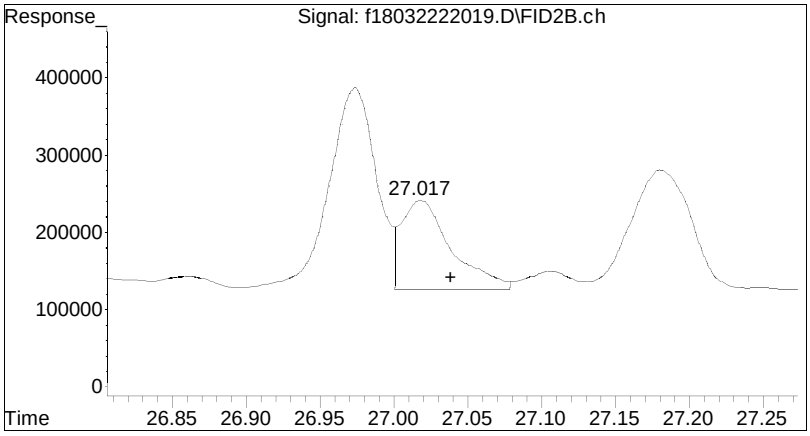
#14 n-Heptadecane (C17)

R.T.:	25.263 min
Delta R.T.:	-0.014 min
Response:	7134056
Conc:	6.92 ug/mL M4



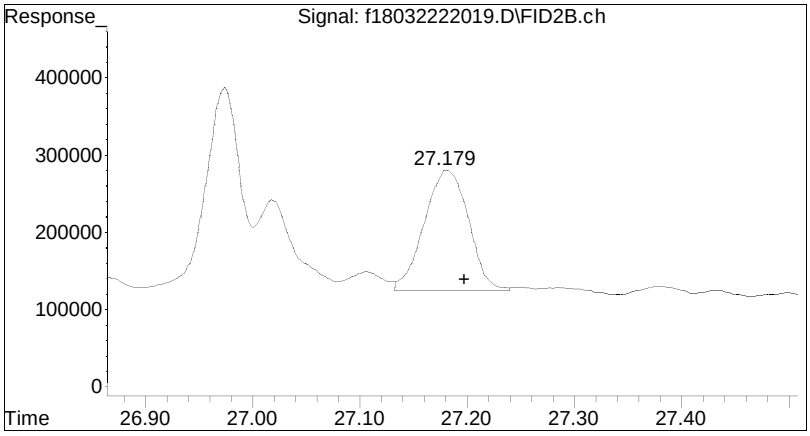
#15 Pristane

R.T.: 25.361 min
Delta R.T.: -0.025 min
Response: 10695163
Conc: 10.23 ug/mL M4



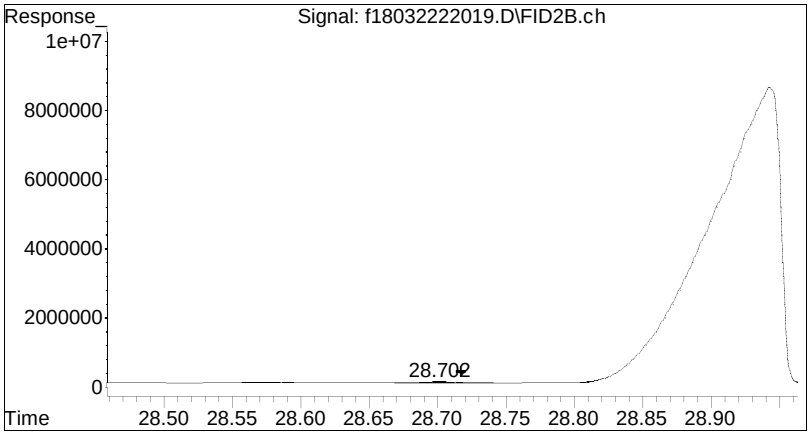
#16 n-Octadecane (C18)

R.T.: 27.017 min
Delta R.T.: -0.021 min
Response: 2707523
Conc: 2.60 ug/mL M4



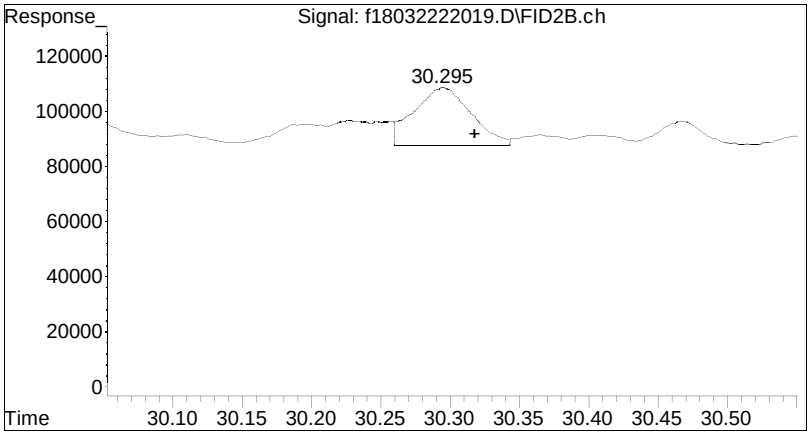
#17 Phytane

R.T.: 27.179 min
Delta R.T.: -0.018 min
Response: 4470790
Conc: 4.64 ug/mL M4



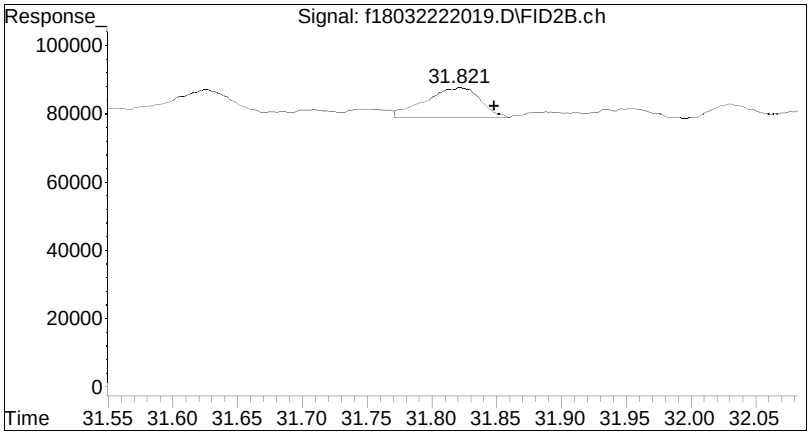
#18 n-Nonadecane (C19)

R.T.:	28.702 min
Delta R.T.:	-0.016 min
Response:	888827
Conc:	0.85 ug/mL M4



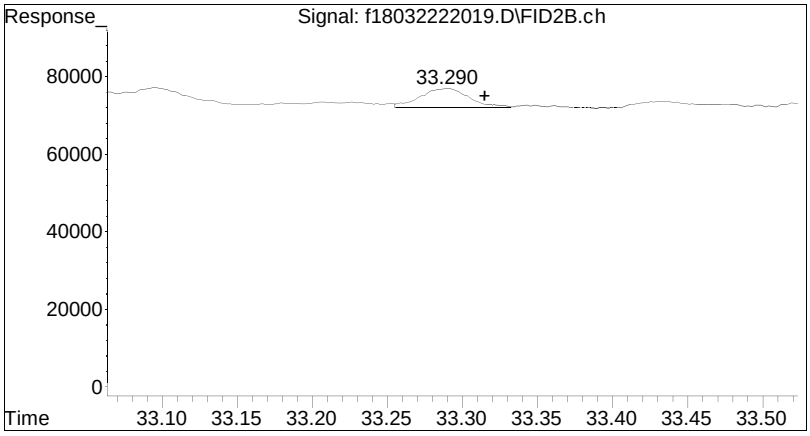
#20 n-Eicosane (C20)

R.T.: 30.295 min
Delta R.T.: -0.023 min
Response: 594114
Conc: 0.56 ug/mL M4



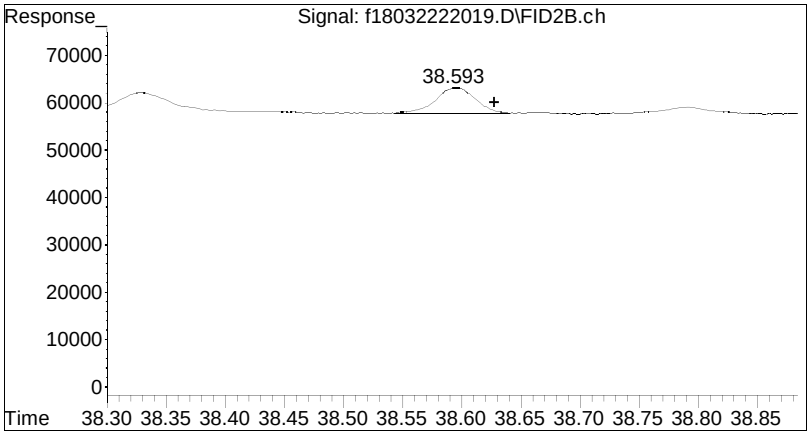
#21 n-Heneicosane (C21)

R.T.: 31.821 min
Delta R.T.: -0.027 min
Response: 260006
Conc: 0.24 ug/mL M4



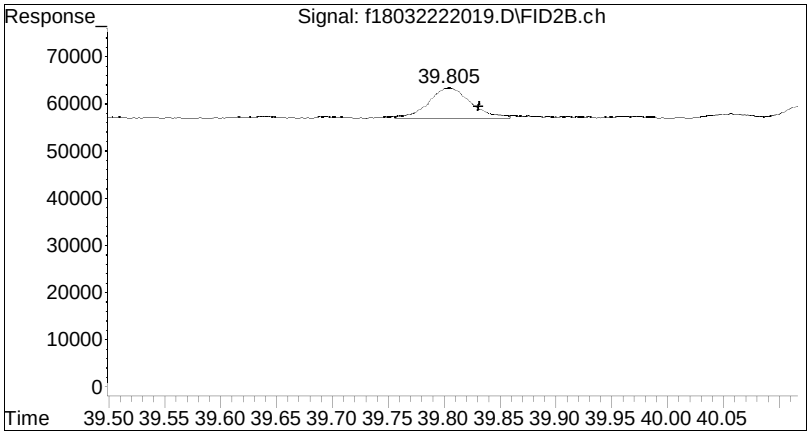
#22 n-Docosane (C22)

R.T.: 33.290 min
Delta R.T.: -0.025 min
Response: 111888
Conc: 0.10 ug/mL M4



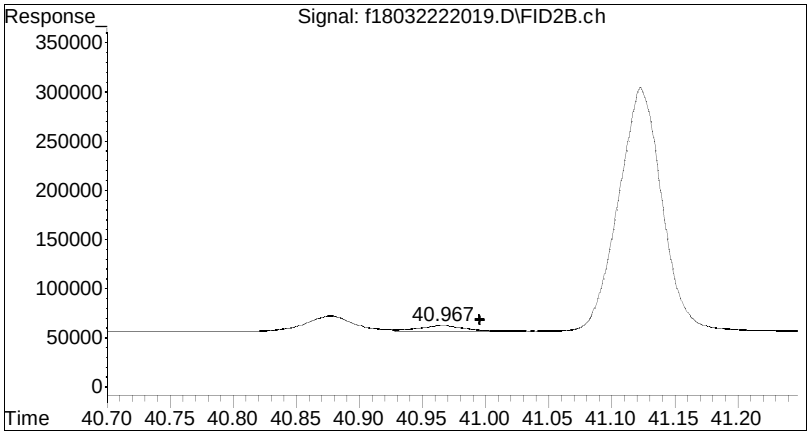
#27 n-Hexacosane (C26)

R.T.: 38.593 min
Delta R.T.: -0.034 min
Response: 129376
Conc: 0.12 ug/mL M4



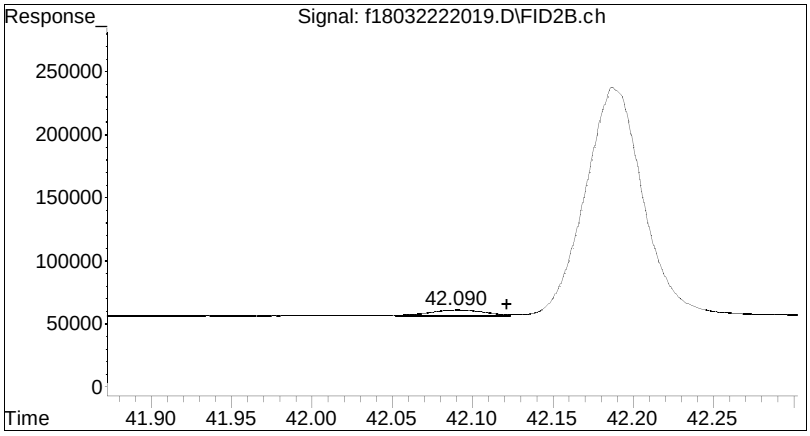
#28 n-Heptacosane (C27)

R.T.: 39.805 min
Delta R.T.: -0.026 min
Response: 164966
Conc: 0.15 ug/mL M4



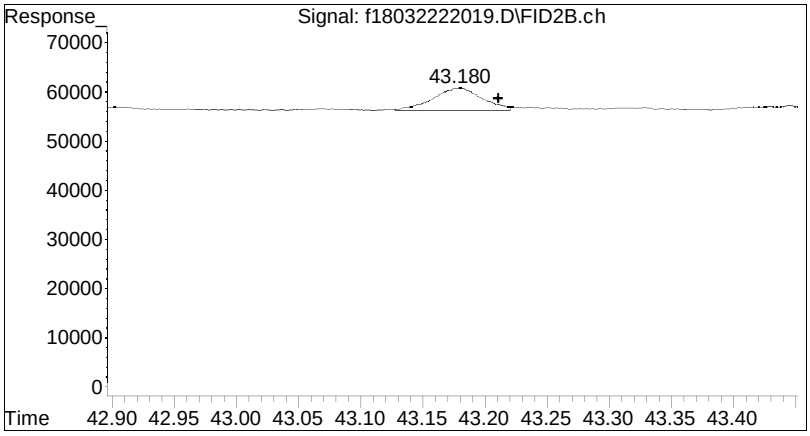
#29 n-Octacosane (C28)

R.T.: 40.967 min
Delta R.T.: -0.029 min
Response: 154111
Conc: 0.14 ug/mL M4



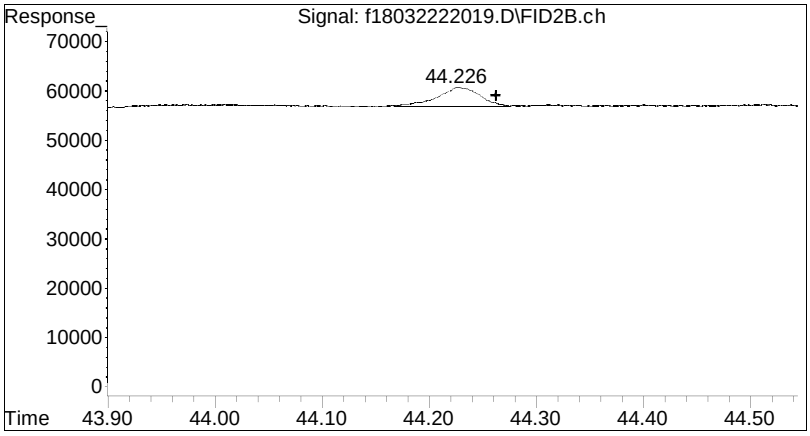
#30 n-Nonacosane (C29)

R.T.: 42.090 min
Delta R.T.: -0.032 min
Response: 118681
Conc: 0.11 ug/mL M4



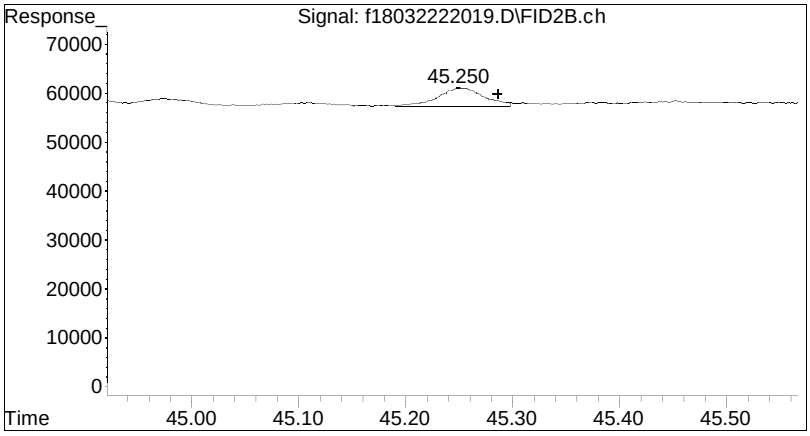
#31 n-Triacontane (C30)

R.T.: 43.180 min
Delta R.T.: -0.031 min
Response: 118231
Conc: 0.11 ug/mL M4



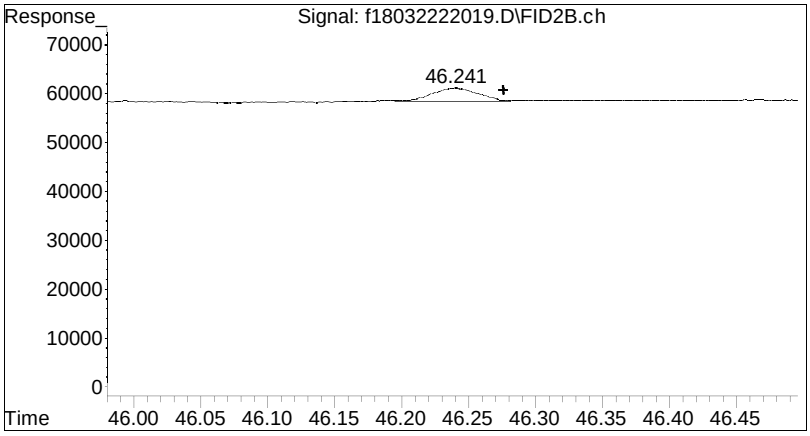
#32 n-Hentriacontane (C31)

R.T.: 44.226 min
Delta R.T.: -0.036 min
Response: 110925
Conc: 0.10 ug/mL M4



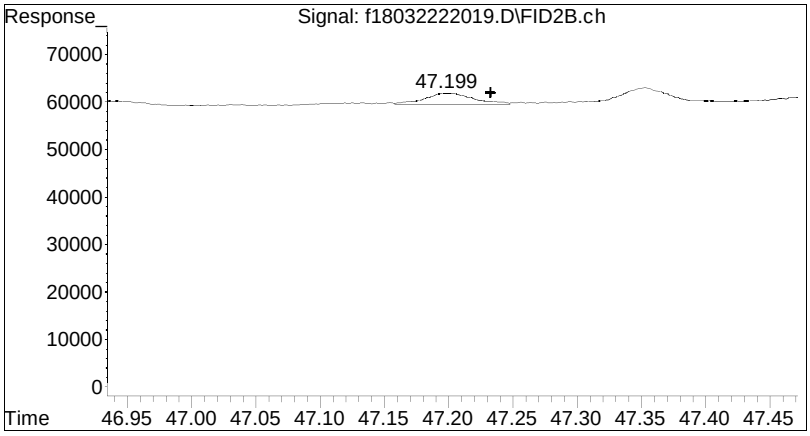
#33 n-Dotriacontane (C32)

R.T.: 45.250 min
Delta R.T.: -0.036 min
Response: 105556
Conc: 0.09 ug/mL M4



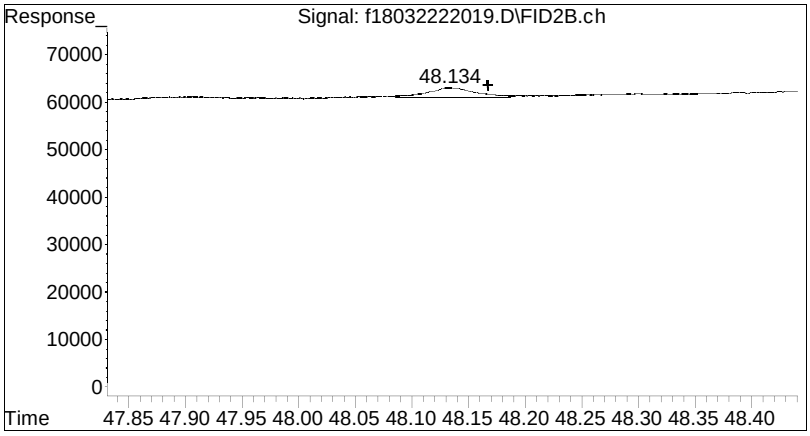
#34 n-Tritriacontane (C33)

R.T.:	46.241 min
Delta R.T.:	-0.035 min
Response:	70678
Conc:	0.06 ug/mL M4



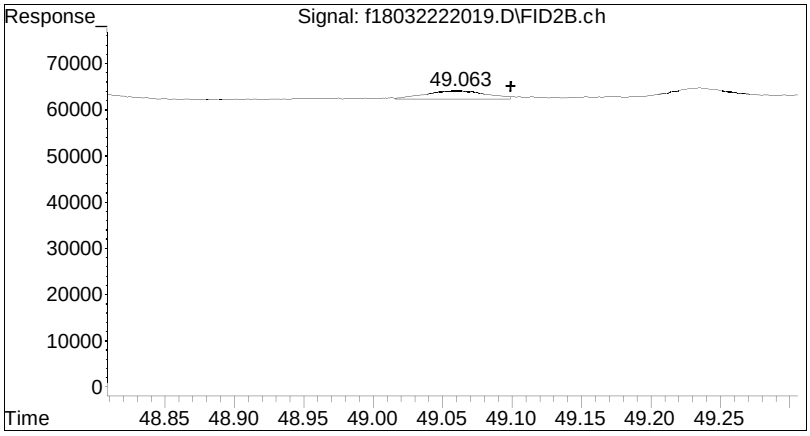
#35 n-tetratriacontane (C34)

R.T.: 47.199 min
Delta R.T.: -0.035 min
Response: 61959
Conc: 0.06 ug/mL M4



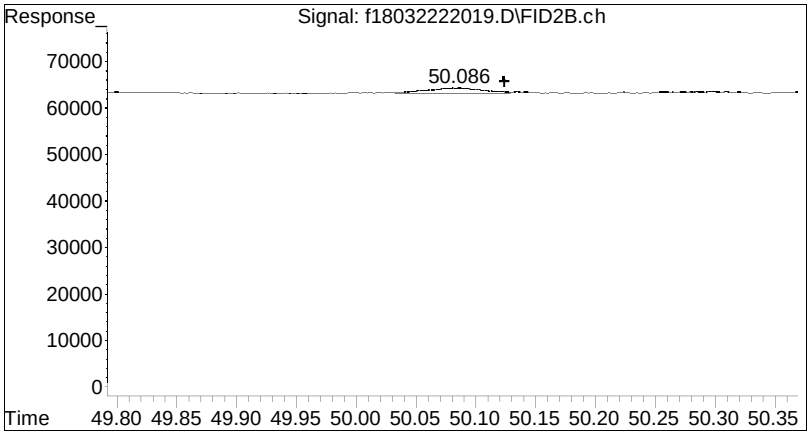
#36 n-Pentatriacontane (C35)

R.T.: 48.134 min
Delta R.T.: -0.033 min
Response: 55991
Conc: 0.05 ug/mL M4



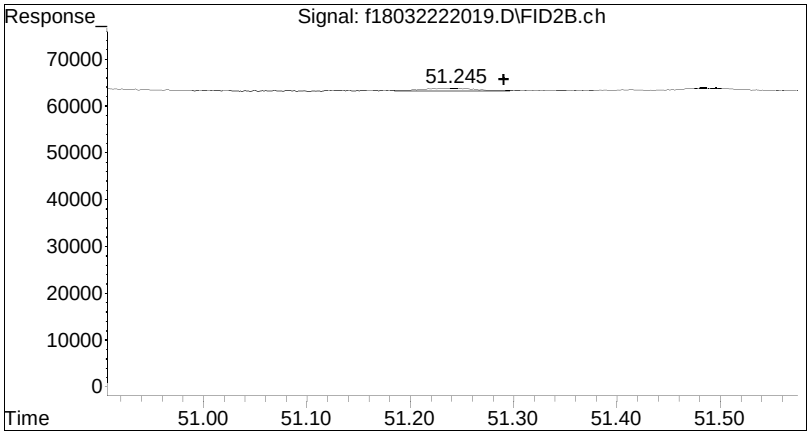
#37 n-Hexatriacontane (C36)

R.T.: 49.063 min
Delta R.T.: -0.036 min
Response: 46807
Conc: 0.04 ug/mL M4



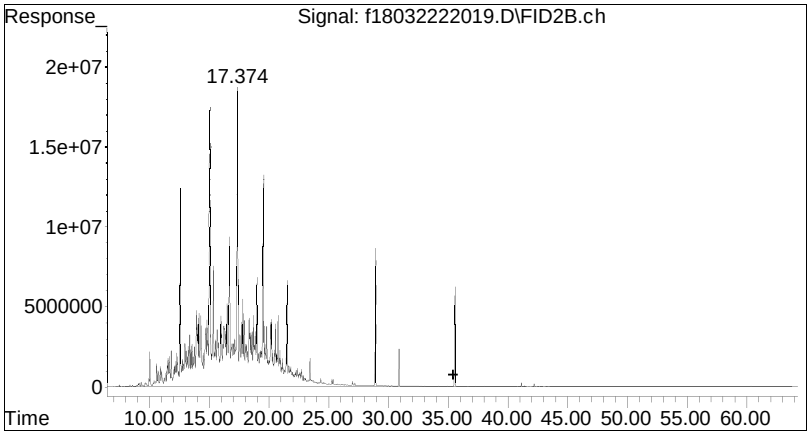
#38 n-Heptatriacontane (C37)

R.T.: 50.086 min
Delta R.T.: -0.038 min
Response: 36674
Conc: 0.03 ug/mL M4



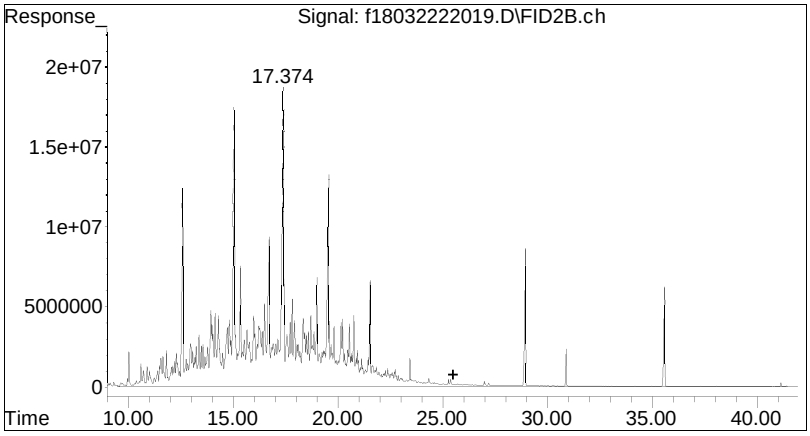
#39 n-Octatriacontane (C38)

R.T.: 51.245 min
Delta R.T.: -0.046 min
Response: 23231
Conc: 0.02 ug/mL M4



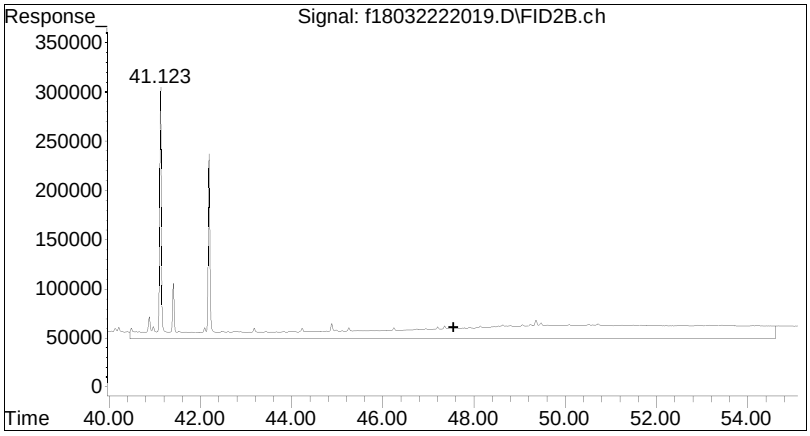
#42 C9-C44 Total Petroleum Hy

R.T.: 35.451 min
Delta R.T.: 0.000 min
Response: 17400771744
Conc: 16524.37 ug/mL m



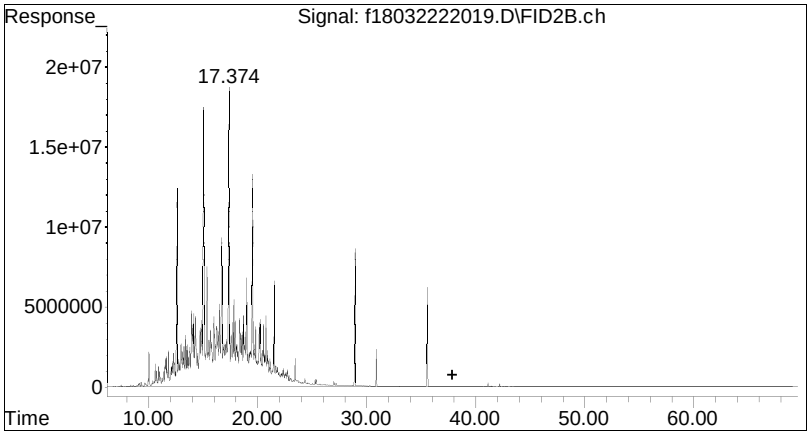
#44 C10-C28 DRO

R.T.: 25.502 min
Delta R.T.: 0.000 min
Response: 17173074061
Conc: 16640.14 ug/mL m



#45 C28-C40 ORO

R.T.: 47.557 min
Delta R.T.: 0.000 min
Response: 102111105
Conc: 93.39 ug/mL m



#46 Total Resolved Hydrocarbo

R.T.: 37.870 min
Delta R.T.: 0.000 min
Response: 9656555327
Conc: 9170.19 ug/mL m

Analytical Event

Continuing Calibration

Evaluate Continuing Calibration Report

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222021.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 11:54 pm
Operator : FID18:WR
Sample : WG1618558-2
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 61 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 11:44:45 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Min. RRF : 0.050 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 25% Max. Rel. Area : 200%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1	I	5-alpha-androstane	1.000	1.000	0.0	92	0.00
2	t	n-Octane (C8)	0.807	0.829	-2.7	90	0.00
3	t	n-Nonane (C9)	0.836	0.879	-5.1	91	0.00
4	t	n-Decane (C10)	0.869	0.917	-5.5	92	0.00
5	t	n-Undecane (C11)	0.873	0.931	-6.6	92	0.00
6	t	n-Dodecane (C12)	0.884	0.939	-6.2	92	0.00
7	t	n-Tridecane (C13)	0.890	0.945	-6.2	92	0.00
9	t	n-Tetradecane (C14)	0.916	0.962	-5.0	92	0.00
11	t	n-Pentadecane (C15)	0.924	0.956	-3.5	92	0.00
12	t	n-Hexadecane (C16)	0.925	0.972	-5.1	92	0.00
14	t	n-Heptadecane (C17)	0.942	0.981	-4.1	91	0.00
15	t	Pristane	0.955	1.005	-5.2	93	0.00
16	t	n-Octadecane (C18)	0.953	0.987	-3.6	91	0.00
17	t	Phytane	0.881	0.933	-5.9	93	0.00
18	t	n-Nonadecane (C19)	0.957	0.987	-3.1	92	0.00
19	s	ortho-terphenyl	1.038	1.075	-3.6	93	0.00
20	t	n-Eicosane (C20)	0.965	1.008	-4.5	93	0.00
21	t	n-Heneicosane (C21)	0.972	0.999	-2.8	92	0.00
22	t	n-Docosane (C22)	0.977	1.018	-4.2	92	0.00
23	t	n-Tricosane (C23)	0.974	1.023	-5.0	92	0.00
24	s	d50-Tetracosane	0.844	0.870	-3.1	92	0.00
25	t	n-Tetracosane (C24)	0.965	0.969	-0.4	92	0.00
26	t	n-Pentacosane (C25)	0.958	1.007	-5.1	92	0.00
27	t	n-Hexacosane (C26)	0.985	1.038	-5.4	92	0.00
28	t	n-Heptacosane (C27)	0.983	1.004	-2.1	92	0.00
29	t	n-Octacosane (C28)	1.005	1.048	-4.3	92	0.00
30	t	n-Nonacosane (C29)	1.002	1.045	-4.3	91	0.00
31	t	n-Triacontane (C30)	1.007	1.051	-4.4	91	0.00
32	t	n-Hentriacontane (C31)	0.978	1.024	-4.7	91	0.00
33	t	n-Dotriacontane (C32)	1.025	1.079	-5.3	92	0.00
34	t	n-Tritriacontane (C33)	0.996	1.045	-4.9	92	0.00
35	t	n-tetratriacontane (C34)	0.993	1.045	-5.2	92	0.00

Evaluate Continuing Calibration Report

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222021.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 11:54 pm
Operator : FID18:WR
Sample : WG1618558-2
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 61 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 11:44:45 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Min. RRF : 0.050 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 25% Max. Rel. Area : 200%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
36 t	n-Pentatriacontane (C35)	0.948	1.060	-11.8	92	0.00
37 t	n-Hexatriacontane (C36)	1.118	1.141	-2.1	91	0.00
38 t	n-Heptatriacontane (C37)	1.022	1.051	-2.8	91	0.00
39 t	n-Octatriacontane (C38)	1.040	1.094	-5.2	92	0.00
41 t	n-Tetracontane (C40)	1.034	1.079	-4.4	90	0.00

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Mass Discrimination (Response)	Ratio	Range Limits
n-Hexatriacontane (C36) to n-Eicosane (C20)	1.13	0.85 - 1.15

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222021.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 11:54 pm
Operator : FID18:WR
Sample : WG1618558-2
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 61 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 11:44:45 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

	Compound	R.T.	Response	Conc Units
Internal Standards				
1) I	5-alpha-androstane	30.879	52812404	50.000 ug/mL M4
System Monitoring Compounds				
19) s	ortho-terphenyl	28.884	56757544	51.784 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery =	103.57%
24) s	d50-Tetracosane	35.525	45972257	51.586 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery =	103.17%
Target Compounds				
2) t	n-Octane (C8)	5.364	43787461	51.369 ug/mL M4
3) t	n-Nonane (C9)	7.549	46425611	52.590 ug/mL M4
4) t	n-Decane (C10)	10.016	48416382	52.775 ug/mL M4
5) t	n-Undecane (C11)	12.517	49191840	53.353 ug/mL M4
6) t	n-Dodecane (C12)	14.935	49581244	53.098 ug/mL M4
7) t	n-Tridecane (C13)	17.236	49885051	53.051 ug/mL M4
9) t	n-Tetradecane (C14)	19.411	50810798	52.496 ug/mL M4
11) t	n-Pentadecane (C15)	21.471	50467899	51.709 ug/mL M4
12) t	n-Hexadecane (C16)	23.422	51325007	52.511 ug/mL M4
14) t	n-Heptadecane (C17)	25.275	51790419	52.045 ug/mL M4
15) t	Pristane	25.385	53058889	52.574 ug/mL M4
16) t	n-Octadecane (C18)	27.037	52139322	51.821 ug/mL M4
17) t	Phytane	27.196	49284017	52.949 ug/mL M4
18) t	n-Nonadecane (C19)	28.714	52149655	51.601 ug/mL M4
20) t	n-Eicosane (C20)	30.315	53236742	52.243 ug/mL M4
21) t	n-Heneicosane (C21)	31.846	52779856	51.412 ug/mL M4
22) t	n-Docosane (C22)	33.312	53775532	52.128 ug/mL M4
23) t	n-Tricosane (C23)	34.719	54021901	52.485 ug/mL M4
25) t	n-Tetracosane (C24)	36.070	51178655	50.227 ug/mL M4
26) t	n-Pentacosane (C25)	37.368	53179840	52.544 ug/mL M4
27) t	n-Hexacosane (C26)	38.622	54828743	52.697 ug/mL M4
28) t	n-Heptacosane (C27)	39.828	53023931	51.091 ug/mL M4
29) t	n-Octacosane (C28)	40.993	55349391	52.152 ug/mL M4
30) t	n-Nonacosane (C29)	42.116	55190658	52.141 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222021.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 11:54 pm
Operator : FID18:WR
Sample : WG1618558-2
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 61 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 11:44:45 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

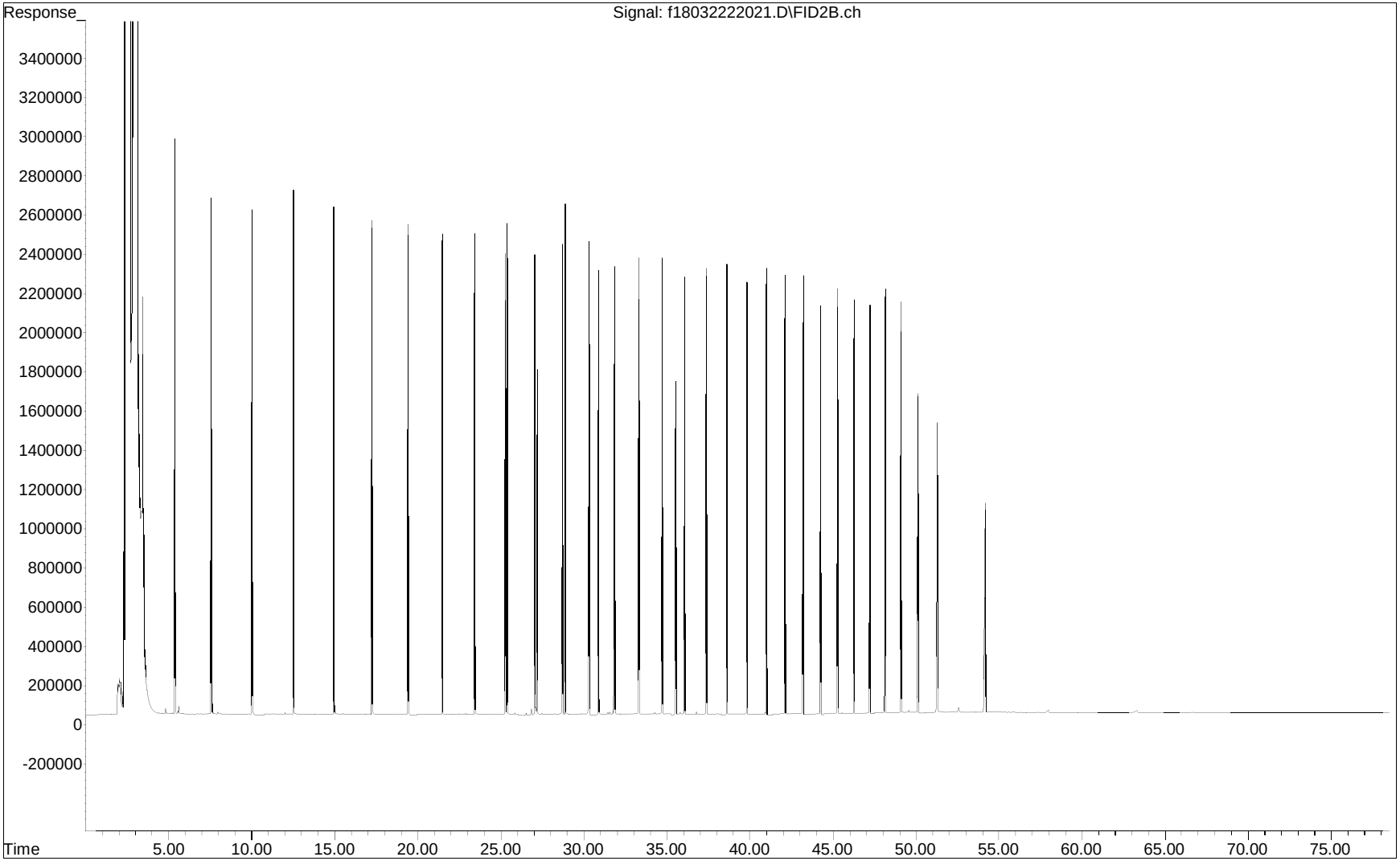
	Compound	R.T.	Response	Conc Units
31) t	n-Triacontane (C30)	43.204	55528044	52.200 ug/mL M4
32) t	n-Hentriacontane (C31)	44.258	54103620	52.372 ug/mL M4
33) t	n-Dotriacontane (C32)	45.282	56990934	52.662 ug/mL M4
34) t	n-Tritriacontane (C33)	46.271	55173075	52.455 ug/mL M4
35) t	n-tetratriacontane (C34)	47.230	55179804	52.604 ug/mL M4
36) t	n-Pentatriacontane (C35)	48.163	55955246	55.885 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.095	60283290	51.041 ug/mL M4
38) t	n-Heptatriacontane (C37)	50.117	55532018	51.450 ug/mL M4
39) t	n-Octatriacontane (C38)	51.282	57793474	52.623 ug/mL M4
41) t	n-Tetracontane (C40)	54.157	57006832	52.204 ug/mL M4

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222021.D
Operator : FID18:WR
Acquired : 22 Mar 2022 11:54 pm using AcqMethod FID18.M
Sample Name: WG1618558-2
Instrument: FID 18
Misc Info : WG1618558,FRBE45,ICAL18676
Vial Number: 61
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Evaluate Continuing Calibration Report

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222031.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 02:16 pm
Operator : FID18:WR
Sample : WG1618558-3
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 66 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 14:41:17 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Min. RRF : 0.050 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 25% Max. Rel. Area : 200%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1	I	5-alpha-androstane	1.000	1.000	0.0	91	0.00
2	t	n-Octane (C8)	0.807	0.839	-4.0	90	0.00
3	t	n-Nonane (C9)	0.836	0.876	-4.8	90	0.00
4	t	n-Decane (C10)	0.869	0.907	-4.4	90	0.00
5	t	n-Undecane (C11)	0.873	0.927	-6.2	91	0.00
6	t	n-Dodecane (C12)	0.884	0.928	-5.0	91	0.00
7	t	n-Tridecane (C13)	0.890	0.935	-5.1	90	0.00
9	t	n-Tetradecane (C14)	0.916	0.953	-4.0	90	0.00
11	t	n-Pentadecane (C15)	0.924	0.948	-2.6	91	0.00
12	t	n-Hexadecane (C16)	0.925	0.965	-4.3	90	0.00
14	t	n-Heptadecane (C17)	0.942	0.973	-3.3	90	0.00
15	t	Pristane	0.955	0.999	-4.6	92	0.00
16	t	n-Octadecane (C18)	0.953	0.982	-3.0	90	0.00
17	t	Phytane	0.881	0.929	-5.4	92	0.00
18	t	n-Nonadecane (C19)	0.957	0.981	-2.5	91	0.00
19	s	ortho-terphenyl	1.038	1.073	-3.4	92	0.00
20	t	n-Eicosane (C20)	0.965	1.003	-3.9	91	0.00
21	t	n-Heneicosane (C21)	0.972	0.999	-2.8	91	0.00
22	t	n-Docosane (C22)	0.977	1.016	-4.0	91	0.00
23	t	n-Tricosane (C23)	0.974	1.021	-4.8	91	0.00
24	s	d50-Tetracosane	0.844	0.869	-3.0	91	0.00
25	t	n-Tetracosane (C24)	0.965	0.968	-0.3	91	0.00
26	t	n-Pentacosane (C25)	0.958	1.004	-4.8	91	0.00
27	t	n-Hexacosane (C26)	0.985	1.036	-5.2	91	0.00
28	t	n-Heptacosane (C27)	0.983	1.000	-1.7	91	0.00
29	t	n-Octacosane (C28)	1.005	1.043	-3.8	91	0.00
30	t	n-Nonacosane (C29)	1.002	1.038	-3.6	90	0.00
31	t	n-Triacontane (C30)	1.007	1.041	-3.4	90	0.00
32	t	n-Hentriacontane (C31)	0.978	1.010	-3.3	89	0.00
33	t	n-Dotriacontane (C32)	1.025	1.060	-3.4	89	0.00
34	t	n-Tritriacontane (C33)	0.996	1.023	-2.7	89	0.00
35	t	n-tetratriacontane (C34)	0.993	1.019	-2.6	89	0.00

Evaluate Continuing Calibration Report

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222031.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 02:16 pm
Operator : FID18:WR
Sample : WG1618558-3
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 66 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 14:41:17 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Min. RRF : 0.050 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 25% Max. Rel. Area : 200%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
36 t	n-Pentatriacontane (C35)	0.948	1.030	-8.6	88	0.00
37 t	n-Hexatriacontane (C36)	1.118	1.107	1.0	88	0.00
38 t	n-Heptatriacontane (C37)	1.022	1.018	0.4	88	0.00
39 t	n-Octatriacontane (C38)	1.040	1.050	-1.0	87	0.00
41 t	n-Tetracontane (C40)	1.034	1.045	-1.1	86	0.00

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Mass Discrimination (Response)	Ratio	Range Limits
n-Hexatriacontane (C36) to n-Eicosane (C20)	1.10	0.85 - 1.15

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222031.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 02:16 pm
Operator : FID18:WR
Sample : WG1618558-3
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 66 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 14:41:17 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

	Compound	R.T.	Response	Conc Units
Internal Standards				
1) I	5-alpha-androstane	30.877	52374968	50.000 ug/mL M4
System Monitoring Compounds				
19) s	ortho-terphenyl	28.882	56223533	51.726 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery =	103.45%
24) s	d50-Tetracosane	35.524	45527915	51.514 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery =	103.03%
Target Compounds				
2) t	n-Octane (C8)	5.362	43961187	52.003 ug/mL M4
3) t	n-Nonane (C9)	7.547	45894912	52.423 ug/mL M4
4) t	n-Decane (C10)	10.016	47527777	52.239 ug/mL M4
5) t	n-Undecane (C11)	12.516	48544100	53.091 ug/mL M4
6) t	n-Dodecane (C12)	14.935	48596436	52.478 ug/mL M4
7) t	n-Tridecane (C13)	17.235	48973508	52.517 ug/mL M4
9) t	n-Tetradecane (C14)	19.411	49900139	51.986 ug/mL M4
11) t	n-Pentadecane (C15)	21.469	49670762	51.317 ug/mL M4
12) t	n-Hexadecane (C16)	23.422	50522072	52.121 ug/mL M4
14) t	n-Heptadecane (C17)	25.275	50986154	51.665 ug/mL M4
15) t	Pristane	25.383	52305638	52.260 ug/mL M4
16) t	n-Octadecane (C18)	27.034	51435763	51.549 ug/mL M4
17) t	Phytane	27.195	48644980	52.699 ug/mL M4
18) t	n-Nonadecane (C19)	28.713	51397680	51.281 ug/mL M4
20) t	n-Eicosane (C20)	30.313	52532615	51.983 ug/mL M4
21) t	n-Heneicosane (C21)	31.845	52308886	51.379 ug/mL M4
22) t	n-Docosane (C22)	33.312	53219955	52.021 ug/mL M4
23) t	n-Tricosane (C23)	34.717	53498073	52.410 ug/mL M4
25) t	n-Tetracosane (C24)	36.070	50684572	50.157 ug/mL M4
26) t	n-Pentacosane (C25)	37.366	52594613	52.400 ug/mL M4
27) t	n-Hexacosane (C26)	38.620	54243144	52.570 ug/mL M4
28) t	n-Heptacosane (C27)	39.827	52370443	50.883 ug/mL M4
29) t	n-Octacosane (C28)	40.992	54611203	51.886 ug/mL M4
30) t	n-Nonacosane (C29)	42.119	54361274	51.786 ug/mL M4

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222031.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 02:16 pm
Operator : FID18:WR
Sample : WG1618558-3
Misc : WG1618558,FRBE45,ICAL18676
ALS Vial : 66 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 14:41:17 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : CCAL - CCAL

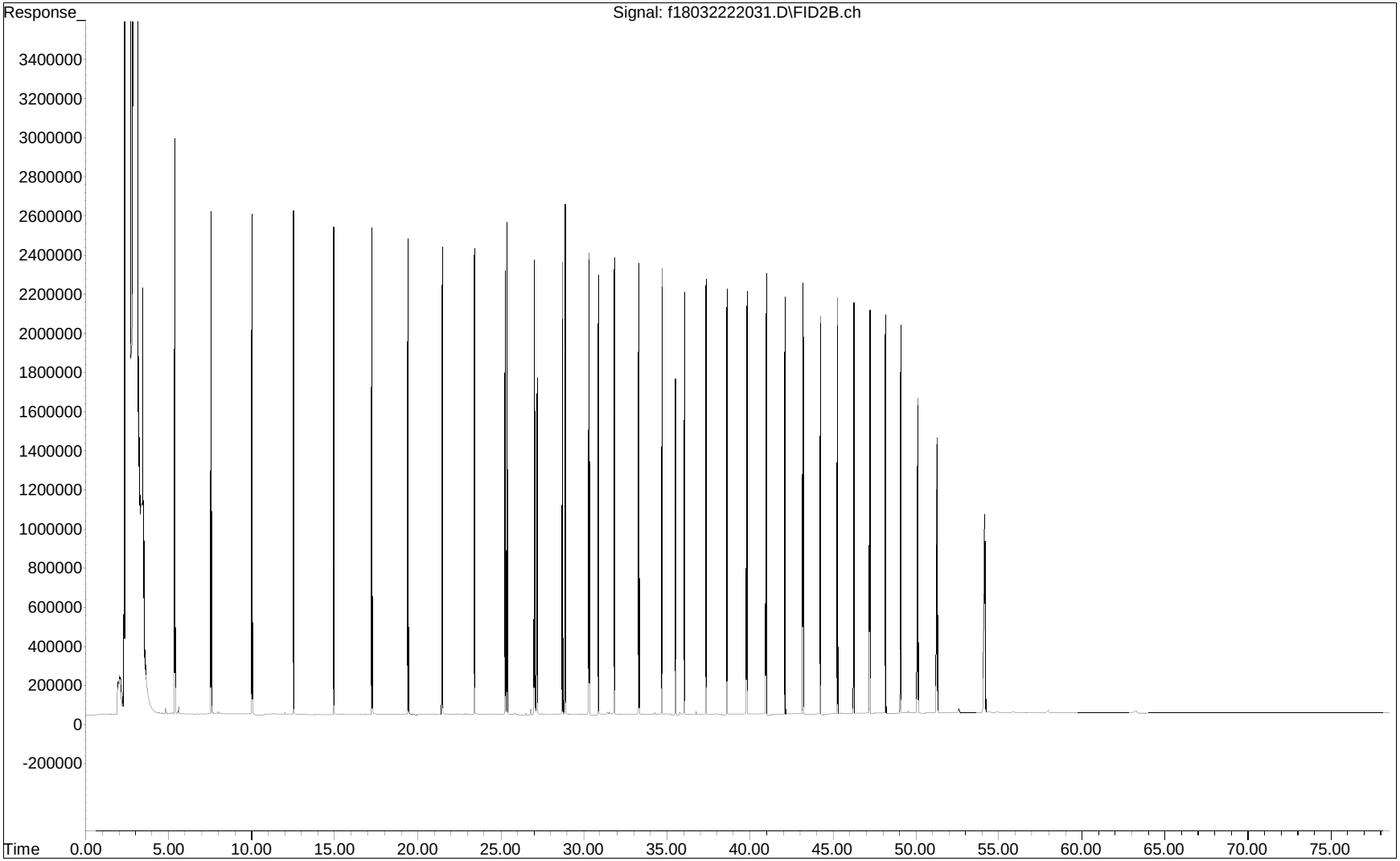
	Compound	R.T.	Response	Conc Units
31) t	n-Triacontane (C30)	43.204	54535204	51.695 ug/mL M4
32) t	n-Hentriacontane (C31)	44.258	52901082	51.636 ug/mL M4
33) t	n-Dotriacontane (C32)	45.279	55536472	51.746 ug/mL M4
34) t	n-Tritriacontane (C33)	46.268	53569495	51.356 ug/mL M4
35) t	n-tetratriacontane (C34)	47.229	53387863	51.321 ug/mL M4
36) t	n-Pentatriacontane (C35)	48.161	53955502	54.338 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.095	57961696	49.485 ug/mL M4
38) t	n-Heptatriacontane (C37)	50.118	53337057	49.829 ug/mL M4
39) t	n-Octatriacontane (C38)	51.284	55003456	50.501 ug/mL M4
41) t	n-Tetracontane (C40)	54.151	54744219	50.550 ug/mL M4

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222031.D
Operator : FID18:WR
Acquired : 23 Mar 2022 02:16 pm using AcqMethod FID18.M
Sample Name: WG1618558-3
Instrument: FID 18
Misc Info : WG1618558,FRBE45,ICAL18676
Vial Number: 66
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Sample Raw Data

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222029.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 12:49 pm
Operator : FID18:WR
Sample : l2213568-01d,42,20
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 65 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:19:49 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222202R
Blank File : f18032222025.D

Sub List : Default - All compounds listed

	Compound	R.T.	Response	Conc	Units	
	Internal Standards					
1) I	5-alpha-androstane	30.872	48454780	50.000	ug/mL	M4
	System Monitoring Compounds					
19) s	ortho-terphenyl	28.861	13184900	13.111	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	26.22%#
24) s	d50-Tetracosane	35.505	10567047	12.924	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	25.85%#
	Target Compounds					
2) t	n-Octane (C8)	0.000	0	N.D.	ug/mL	
3) t	n-Nonane (C9)	0.000	0	N.D.	ug/mL	d
4) t	n-Decane (C10)	0.000	0	N.D.	ug/mL	d
5) t	n-Undecane (C11)	12.507	18724495	22.135	ug/mL	M4
6) t	n-Dodecane (C12)	14.931	30069697	35.098	ug/mL	M4
7) t	n-Tridecane (C13)	17.229	25848589	29.961	ug/mL	M4
8) t	1380	0.000	0	N.D.	ug/mL	d
9) t	n-Tetradecane (C14)	19.402	16917955	19.051	ug/mL	M4
10) t	1470	0.000	0	N.D.	ug/mL	d
11) t	n-Pentadecane (C15)	0.000	0	N.D.	ug/mL	d
12) t	n-Hexadecane (C16)	0.000	0	N.D.	ug/mL	d
13) t	1650	0.000	0	N.D.	ug/mL	d
14) t	n-Heptadecane (C17)	0.000	0	N.D.	ug/mL	d
15) t	Pristane	0.000	0	N.D.	ug/mL	d
16) t	n-Octadecane (C18)	0.000	0	N.D.	ug/mL	d
17) t	Phytane	0.000	0	N.D.	ug/mL	d
18) t	n-Nonadecane (C19)	0.000	0	N.D.	ug/mL	d
20) t	n-Eicosane (C20)	0.000	0	N.D.	ug/mL	d
21) t	n-Heneicosane (C21)	0.000	0	N.D.	ug/mL	d
22) t	n-Docosane (C22)	0.000	0	N.D.	ug/mL	d
23) t	n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222029.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 12:49 pm
Operator : FID18:WR
Sample : l2213568-01d,42,20
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 65 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:19:49 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222202R
Blank File : f18032222025.D

Sub List : Default - All compounds listed

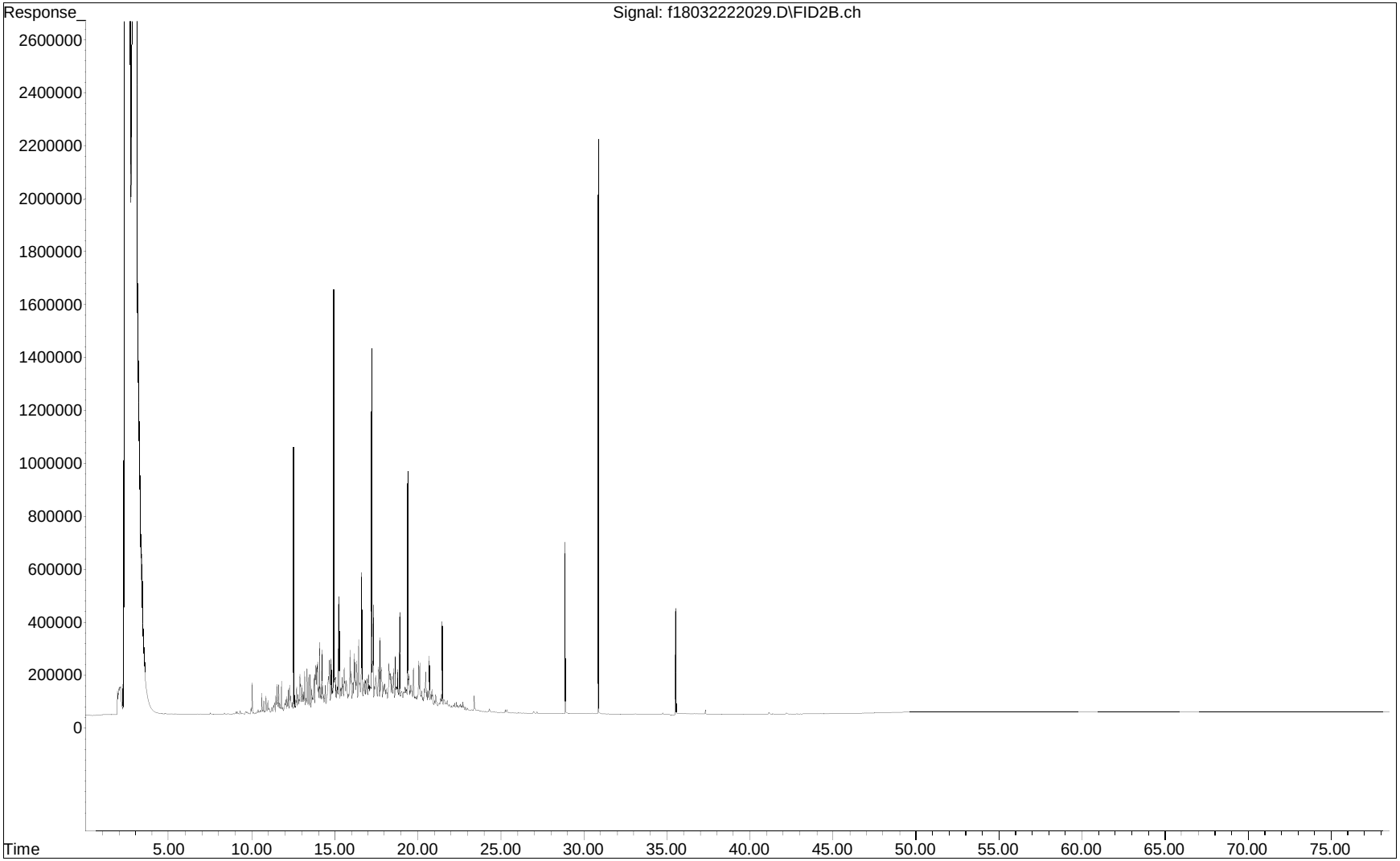
	Compound	R.T.	Response	Conc	Units
25) t	n-Tetracosane (C24)	0.000	0	N.D.	ug/mL d
26) t	n-Pentacosane (C25)	0.000	0	N.D.	ug/mL d
27) t	n-Hexacosane (C26)	0.000	0	N.D.	ug/mL d
28) t	n-Heptacosane (C27)	0.000	0	N.D.	ug/mL d
29) t	n-Octacosane (C28)	0.000	0	N.D.	ug/mL d
30) t	n-Nonacosane (C29)	0.000	0	N.D.	ug/mL d
31) t	n-Triacontane (C30)	0.000	0	N.D.	ug/mL
32) t	n-Hentriacontane (C31)	0.000	0	N.D.	ug/mL
33) t	n-Dotriacontane (C32)	0.000	0	N.D.	ug/mL
34) t	n-Tritriacontane (C33)	0.000	0	N.D.	ug/mL
35) t	n-tetratriacontane (C34)	0.000	0	N.D.	ug/mL
36) t	n-Pentatriacontane (C35)	0.000	0	N.D.	ug/mL
37) t	n-Hexatriacontane (C36)	0.000	0	N.D.	ug/mL
38) t	n-Heptatriacontane (C37)	0.000	0	N.D.	ug/mL
39) t	n-Octatriacontane (C38)	0.000	0	N.D.	ug/mL
40) t	n-Nonatriacontane (C39)	0.000	0	N.D.	ug/mL
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL
42) h	C9-C44 Total Petroleu...	35.451	899042042	964.208	ug/mL m
42) h	C9-C44 Total Petroleu BS	35.451	752747758	807.309	ug/mLm
43) h	C9-C40 Total Petroleu...	0.000	0	N.D.	ug/ml d
44) h	C10-C28 DRO	25.502	779652031	853.187	ug/mL m
44) h	C10-C28 DRO BS	25.502	747174476	817.646	ug/mLm
45) h	C28-C40 ORO	47.557	55585714	57.416	ug/mL m
45) h	C28-C40 ORO BS	47.557	1125726	1.163	ug/mLm
46) h	Total Resolved Hydroc...	37.870	473710064	508.046	ug/mL m

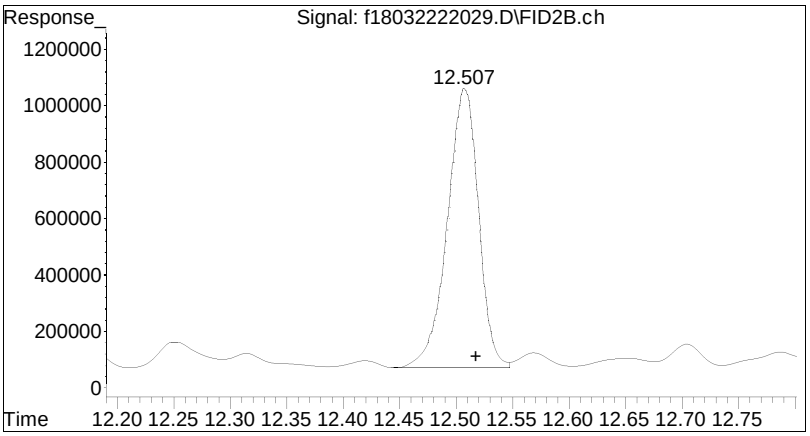
SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

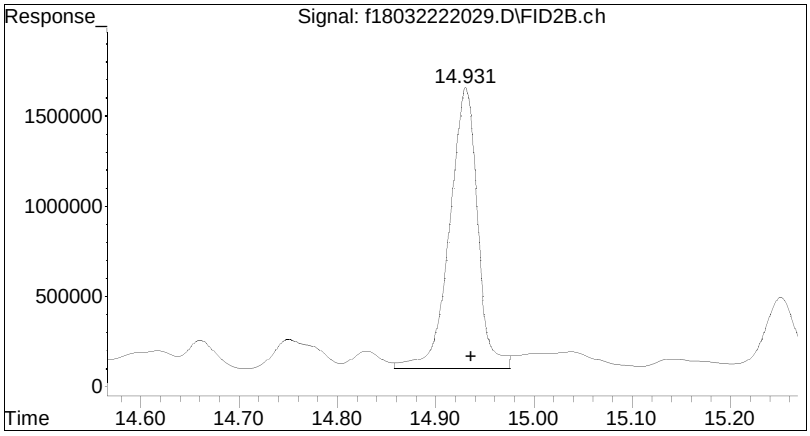
File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222029.D
Operator : FID18:WR
Acquired : 23 Mar 2022 12:49 pm using AcqMethod FID18.M
Sample Name: l2213568-01d,42,20
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 65
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M





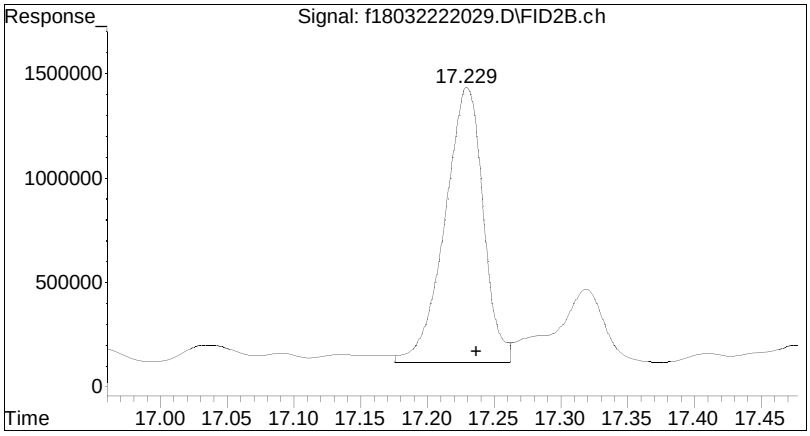
#5 n-Undecane (C11)

R.T.: 12.507 min
Delta R.T.: -0.010 min
Response: 18724495
Conc: 22.13 ug/mL M4



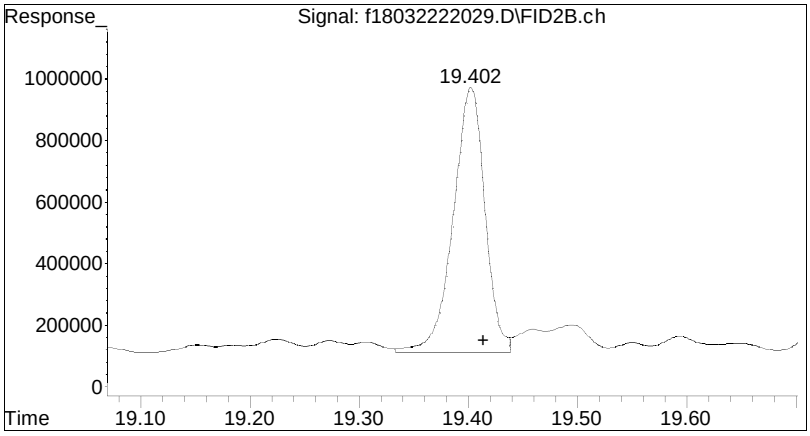
#6 n-Dodecane (C12)

R.T.: 14.931 min
Delta R.T.: -0.005 min
Response: 30069697
Conc: 35.10 ug/mL M4



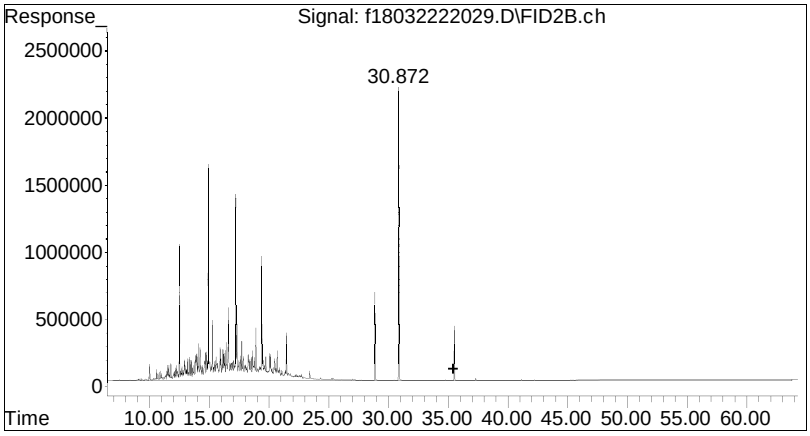
#7 n-Tridecane (C13)

R.T.: 17.229 min
Delta R.T.: -0.007 min
Response: 25848589
Conc: 29.96 ug/mL M4



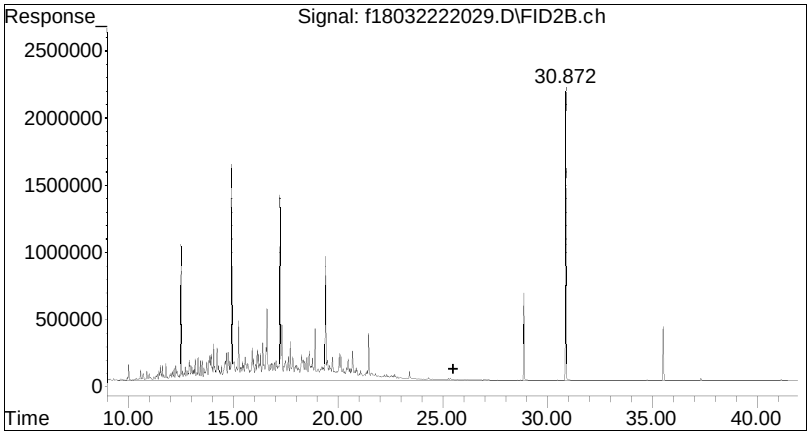
#9 n-Tetradecane (C14)

R.T.: 19.402 min
Delta R.T.: -0.011 min
Response: 16917955
Conc: 19.05 ug/mL M4



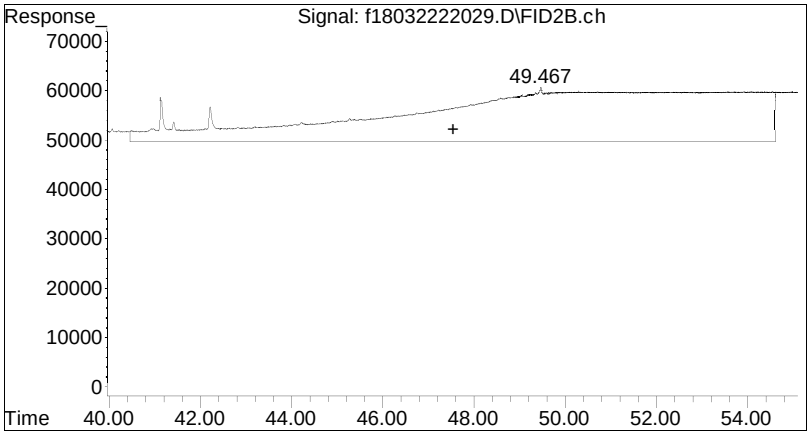
#42 C9-C44 Total Petroleum Hy

R.T.: 35.451 min
Delta R.T.: 0.000 min
Response: 899042042
Conc: 964.21 ug/mL m



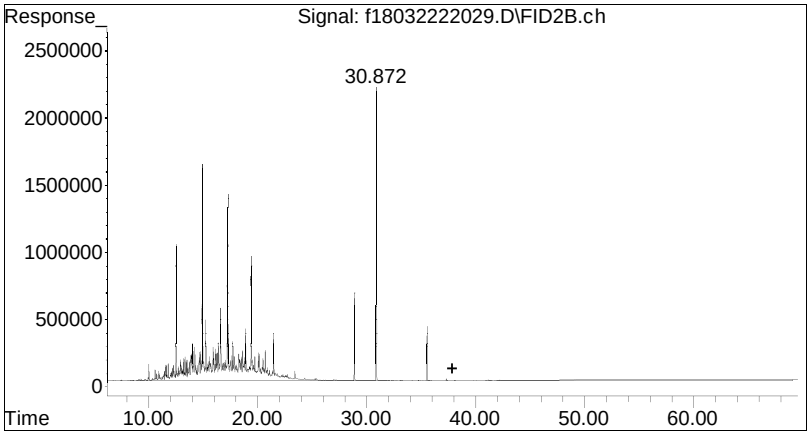
#44 C10-C28 DRO

R.T.: 25.502 min
Delta R.T.: 0.000 min
Response: 779652031
Conc: 853.19 ug/mL m



#45 C28-C40 ORO

R.T.: 47.557 min
Delta R.T.: 0.000 min
Response: 55585714
Conc: 57.42 ug/mL m



#46 Total Resolved Hydrocarbo

R.T.: 37.870 min
Delta R.T.: 0.000 min
Response: 473710064
Conc: 508.05 ug/mL m

Batch Quality Control

Method Blank
Raw Data

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222011.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 04:43 pm
Operator : FID18:WR
Sample : WG1618210-1
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 56 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 12:12:34 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

Compound	R.T.	Response	Conc	Units	
Internal Standards					
1) I 5-alpha-androstane	30.868	50483982	50.000	ug/mL	M4
System Monitoring Compounds					
19) s ortho-terphenyl	28.875	57421538	54.807	ug/mL	M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 109.61%			
24) s d50-Tetracosane	35.518	45953855	53.944	ug/mL	M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 107.89%			
Target Compounds					
2) t n-Octane (C8)	0.000	0	N.D.	ug/mL	d
3) t n-Nonane (C9)	0.000	0	N.D.	ug/mL	
4) t n-Decane (C10)	0.000	0	N.D.	ug/mL	
5) t n-Undecane (C11)	0.000	0	N.D.	ug/mL	
6) t n-Dodecane (C12)	0.000	0	N.D.	ug/mL	
7) t n-Tridecane (C13)	0.000	0	N.D.	ug/mL	
8) t 1380	0.000	0	N.D.	ug/mL	
9) t n-Tetradecane (C14)	0.000	0	N.D.	ug/mL	
10) t 1470	0.000	0	N.D.	ug/mL	
11) t n-Pentadecane (C15)	0.000	0	N.D.	ug/mL	
12) t n-Hexadecane (C16)	0.000	0	N.D.	ug/mL	
13) t 1650	0.000	0	N.D.	ug/mL	
14) t n-Heptadecane (C17)	0.000	0	N.D.	ug/mL	
15) t Pristane	0.000	0	N.D.	ug/mL	
16) t n-Octadecane (C18)	0.000	0	N.D.	ug/mL	d
17) t Phytane	0.000	0	N.D.	ug/mL	
18) t n-Nonadecane (C19)	0.000	0	N.D.	ug/mL	
20) t n-Eicosane (C20)	0.000	0	N.D.	ug/mL	
21) t n-Heneicosane (C21)	0.000	0	N.D.	ug/mL	
22) t n-Docosane (C22)	0.000	0	N.D.	ug/mL	
23) t n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222011.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 04:43 pm
Operator : FID18:WR
Sample : WG1618210-1
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 56 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 12:12:34 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

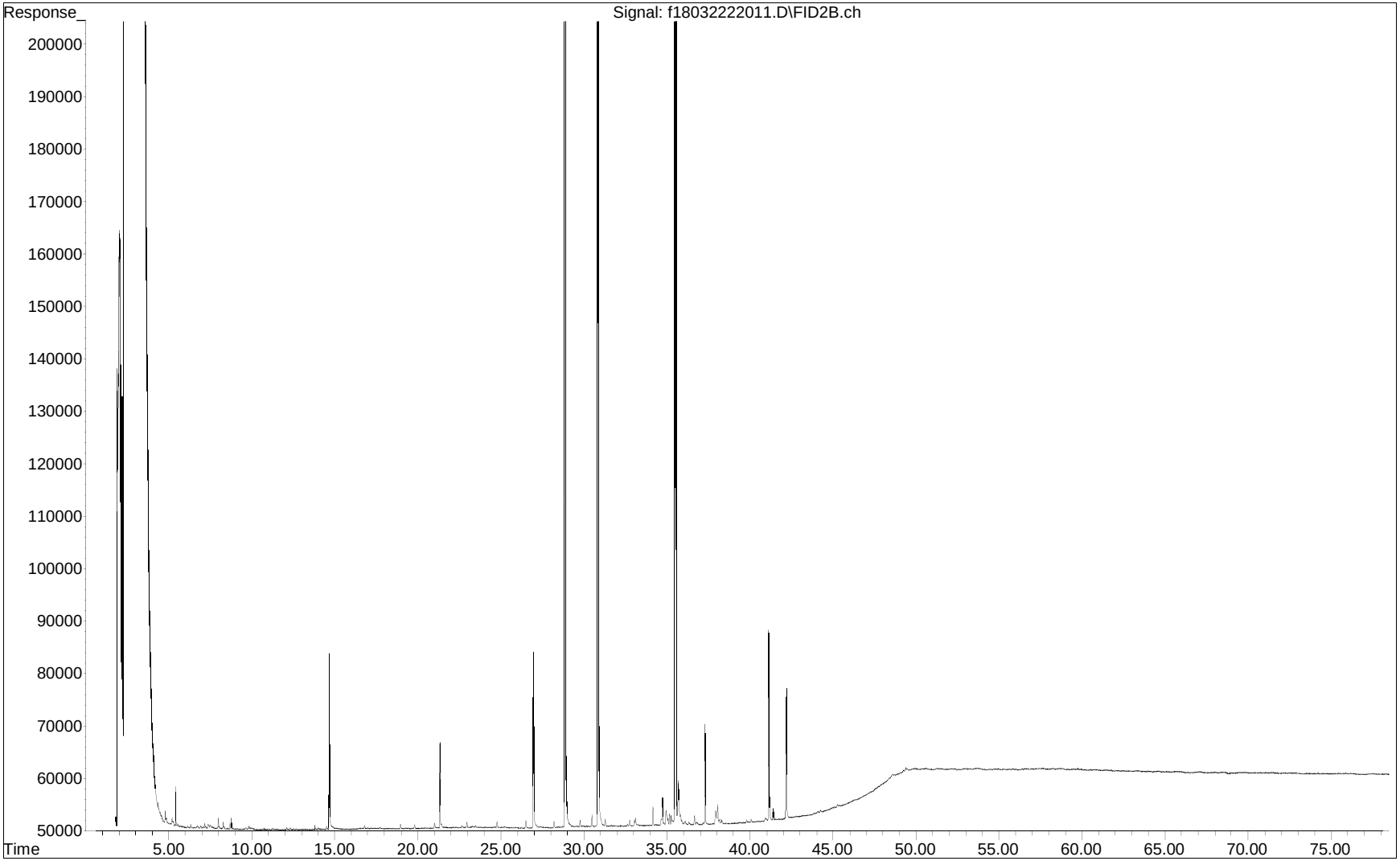
	Compound	R.T.	Response	Conc	Units	
25) t	n-Tetracosane (C24)	0.000	0	N.D.	ug/mL	
26) t	n-Pentacosane (C25)	0.000	0	N.D.	ug/mL	d
27) t	n-Hexacosane (C26)	0.000	0	N.D.	ug/mL	
28) t	n-Heptacosane (C27)	0.000	0	N.D.	ug/mL	
29) t	n-Octacosane (C28)	0.000	0	N.D.	ug/mL	d
30) t	n-Nonacosane (C29)	0.000	0	N.D.	ug/mL	d
31) t	n-Triacontane (C30)	0.000	0	N.D.	ug/mL	
32) t	n-Hentriacontane (C31)	0.000	0	N.D.	ug/mL	
33) t	n-Dotriacontane (C32)	0.000	0	N.D.	ug/mL	
34) t	n-Tritriacontane (C33)	0.000	0	N.D.	ug/mL	
35) t	n-tetratriacontane (C34)	0.000	0	N.D.	ug/mL	
36) t	n-Pentatriacontane (C35)	0.000	0	N.D.	ug/mL	
37) t	n-Hexatriacontane (C36)	0.000	0	N.D.	ug/mL	
38) t	n-Heptatriacontane (C37)	0.000	0	N.D.	ug/mL	
39) t	n-Octatriacontane (C38)	0.000	0	N.D.	ug/mL	
40) t	n-Nonatriacontane (C39)	0.000	0	N.D.	ug/mL	
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL	
42) h	C9-C44 Total Petroleu...	35.451	175432930	180.586	ug/mL	m
42) h	C9-C44 Total Petroleu BS	35.451	-21250626	N.D.	ug/mLm	
43) h	C9-C40 Total Petroleu...	0.000	0	N.D.	ug/ml	d
44) h	C10-C28 DRO	25.502	37483589	39.370	ug/mL	m
44) h	C10-C28 DRO BS	25.502	11460464	12.037	ug/mLm	
45) h	C28-C40 ORO	47.557	67950383	67.367	ug/mL	m
45) h	C28-C40 ORO BS	47.557	-17295116	N.D.	ug/mLm	
46) h	Total Resolved Hydroc...	37.870	11300121	11.632	ug/mL	m

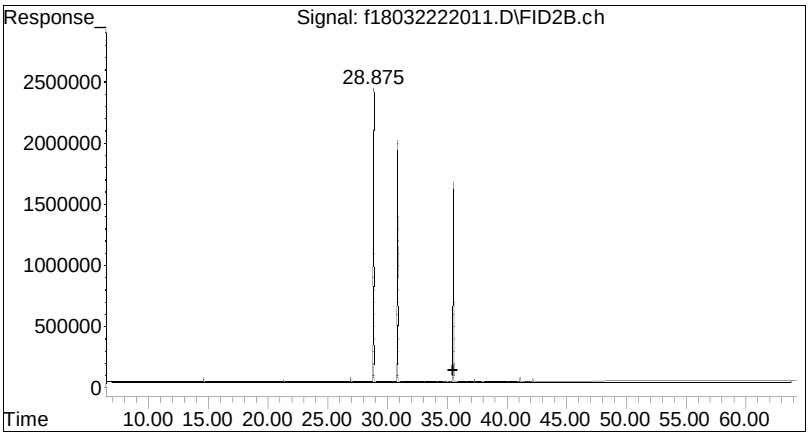
SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

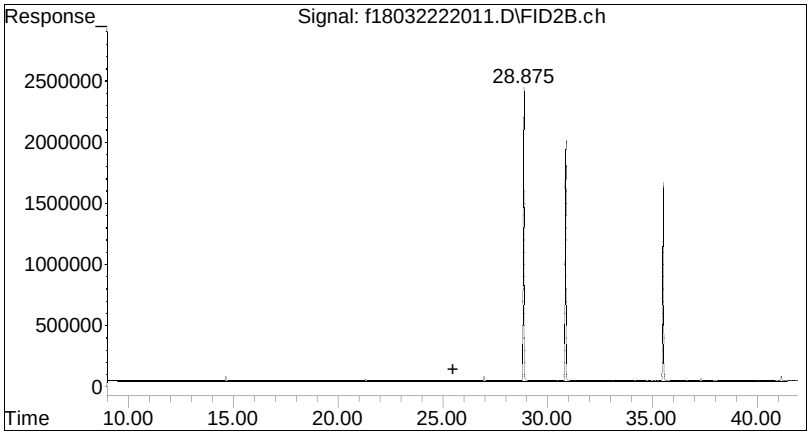
File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222011.D
Operator : FID18:WR
Acquired : 22 Mar 2022 04:43 pm using AcqMethod FID18.M
Sample Name: WG1618210-1
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 56
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M





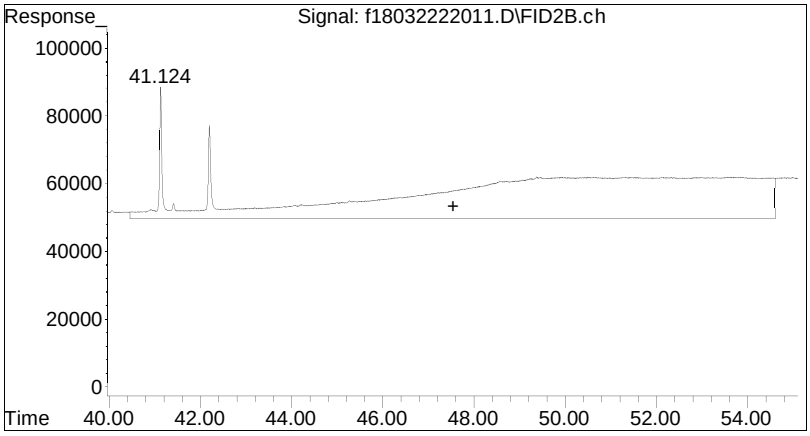
#42 C9-C44 Total Petroleum Hy

R.T.: 35.451 min
Delta R.T.: 0.000 min
Response: 175432930
Conc: 180.59 ug/mL m



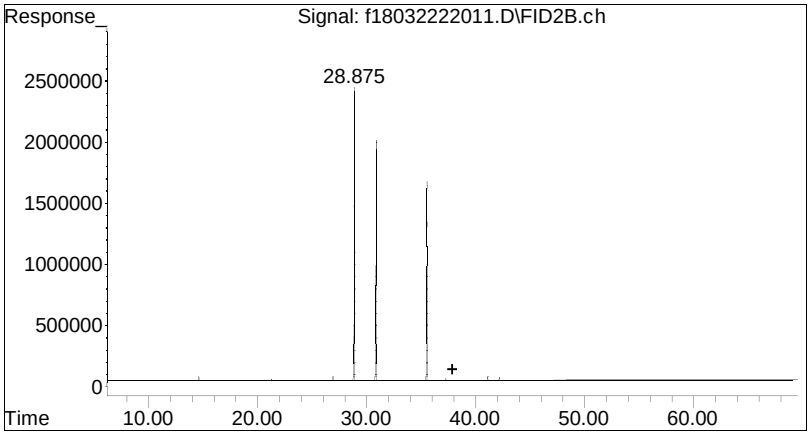
#44 C10-C28 DRO

R.T.: 25.502 min
Delta R.T.: 0.000 min
Response: 37483589
Conc: 39.37 ug/mL m



#45 C28-C40 ORO

R.T.: 47.557 min
Delta R.T.: 0.000 min
Response: 67950383
Conc: 67.37 ug/mL m



#46 Total Resolved Hydrocarbo

R.T.: 37.870 min
Delta R.T.: 0.000 min
Response: 11300121
Conc: 11.63 ug/mL m

LCS Raw Data

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222013.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 06:09 pm
Operator : FID18:WR
Sample : WG1618210-2,42,,
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 57 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 12:12:35 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : SHC_QC_Samples - SHC_QC_Samples

Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	30.877	52029457	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	28.882	55885531	51.756 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 103.51%	
24) s d50-Tetracosane	35.526	45301463	51.598 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 103.20%	
Target Compounds			
3) t n-Nonane (C9)	7.528	14657467	16.854 ug/mL M4
4) t n-Decane (C10)	10.003	16054725	17.763 ug/mL M4
6) t n-Dodecane (C12)	14.925	16834167	18.299 ug/mL M4
9) t n-Tetradecane (C14)	19.401	18077201	18.958 ug/mL M4
12) t n-Hexadecane (C16)	23.411	19899046	20.665 ug/mL M4
16) t n-Octadecane (C18)	27.023	22105365	22.301 ug/mL M4
18) t n-Nonadecane (C19)	28.703	20447630	20.537 ug/mL M4
20) t n-Eicosane (C20)	30.303	20392307	20.313 ug/mL M4
22) t n-Docosane (C22)	33.299	20565456	20.236 ug/mL M4
25) t n-Tetracosane (C24)	36.057	21090469	21.010 ug/mL M4
27) t n-Hexacosane (C26)	38.606	21271120	20.752 ug/mL M4
29) t n-Octacosane (C28)	40.979	21462311	20.527 ug/mL M4
31) t n-Triacontane (C30)	43.188	21558343	20.571 ug/mL M4
37) t n-Hexatriacontane (C36)	49.074	20881086	17.946 ug/mL M4
42) h C9-C44 Total Petroleu...	35.451	476735217	476.162 ug/mL m
42) h C9-C44 Total Petroleu BS	35.451	280051661	279.715 ug/mLm
46) h Total Resolved Hydroc...	37.870	300840580	300.479 ug/mL m

SemiQuant Compounds - Not Calibrated on this Instrument

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222013.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 06:09 pm
Operator : FID18:WR
Sample : WG1618210-2,42,,
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 57 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 12:12:35 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

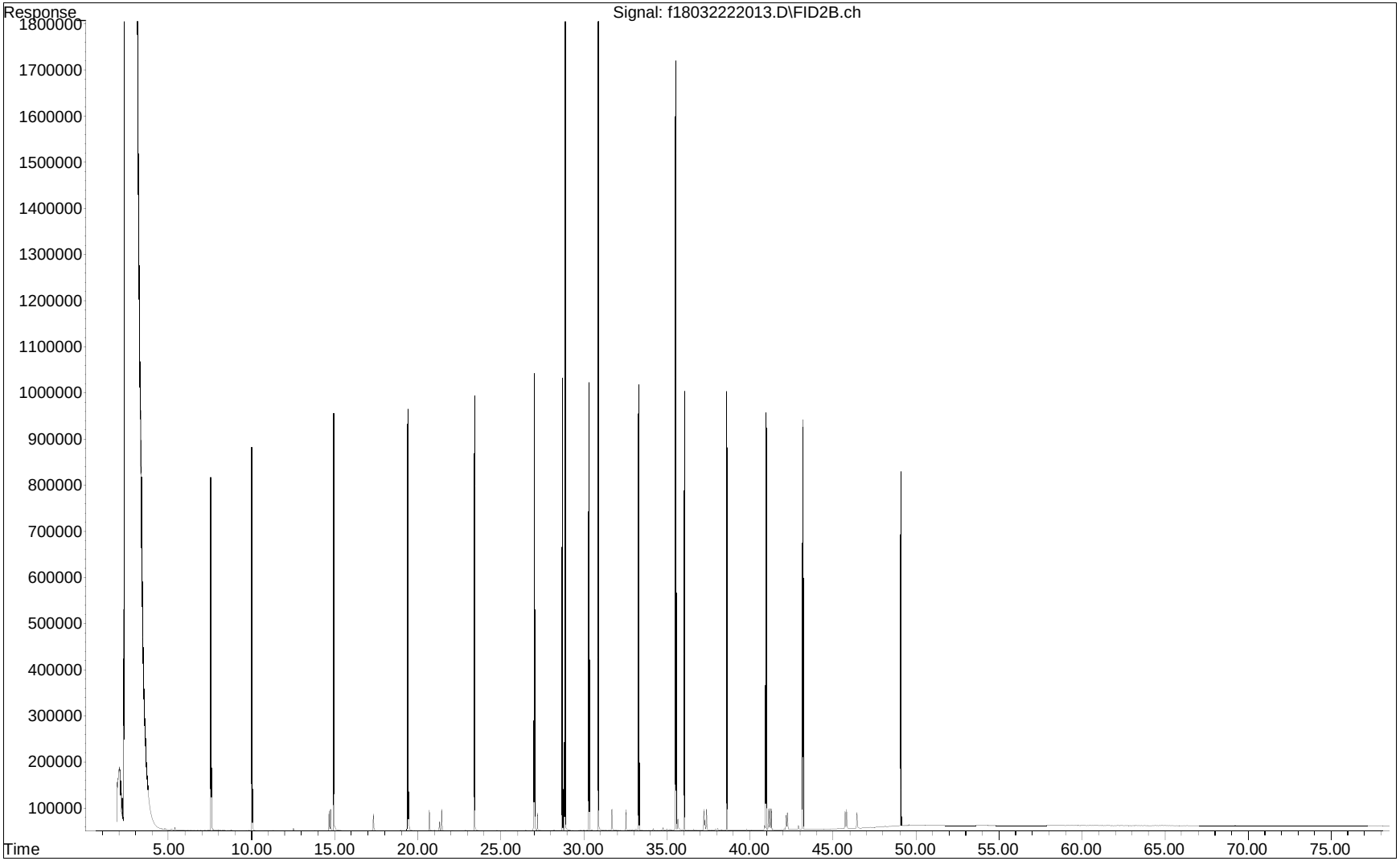
Sub List : SHC_QC_Samples - SHC_QC_Samples

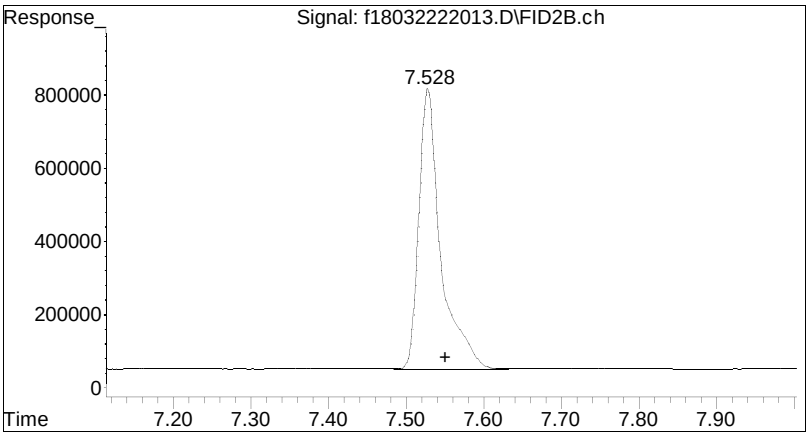
Compound	R.T.	Response	Conc Units

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

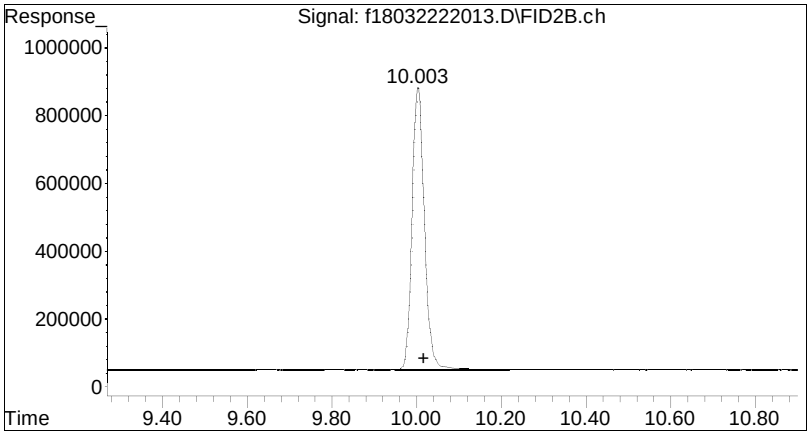
File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222013.D
Operator : FID18:WR
Acquired : 22 Mar 2022 06:09 pm using AcqMethod FID18.M
Sample Name: WG1618210-2,42,,
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 57
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M





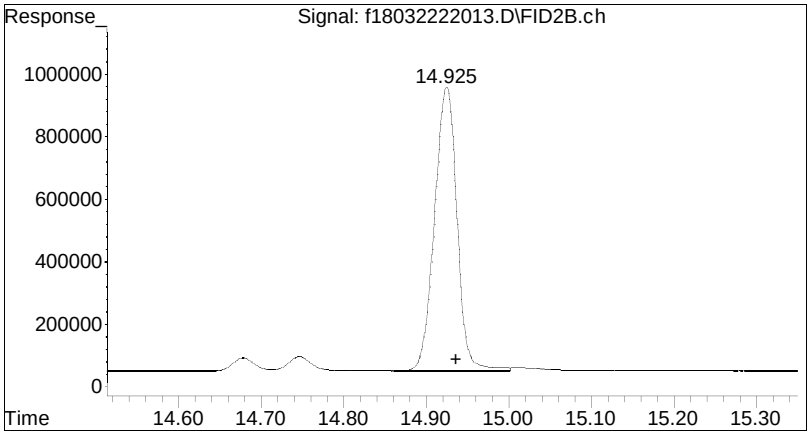
#3 n-Nonane (C9)

R.T.: 7.528 min
Delta R.T.: -0.023 min
Response: 14657467
Conc: 16.85 ug/mL M4



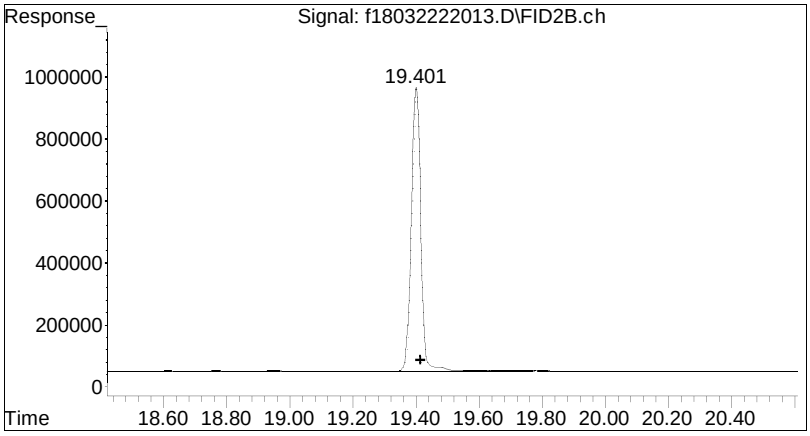
#4 n-Decane (C10)

R.T.: 10.003 min
Delta R.T.: -0.014 min
Response: 16054725
Conc: 17.76 ug/mL M4



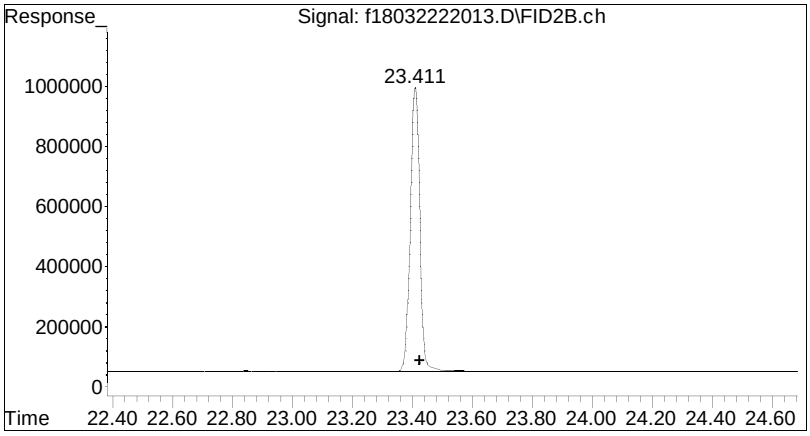
#6 n-Dodecane (C12)

R.T.: 14.925 min
Delta R.T.: -0.011 min
Response: 16834167
Conc: 18.30 ug/mL M4



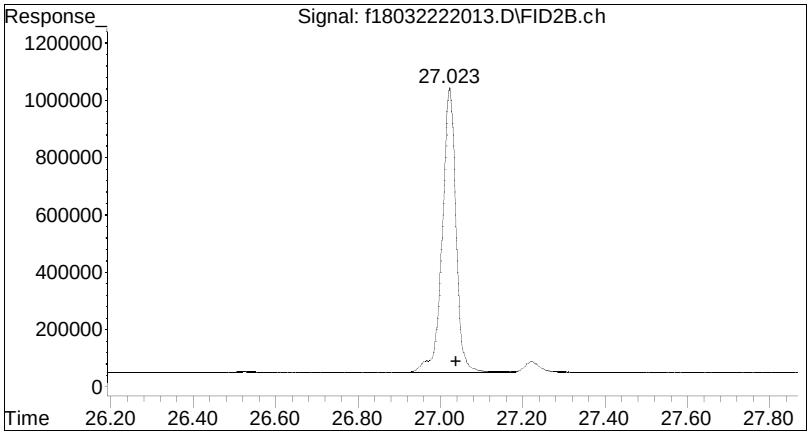
#9 n-Tetradecane (C14)

R.T.: 19.401 min
Delta R.T.: -0.013 min
Response: 18077201
Conc: 18.96 ug/mL M4



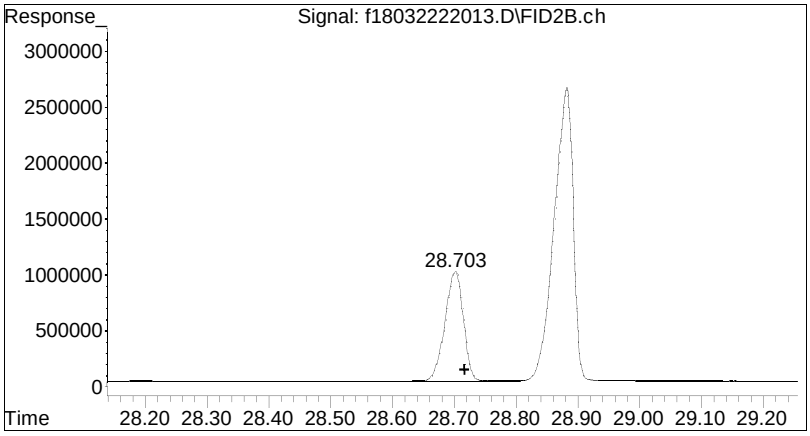
#12 n-Hexadecane (C16)

R.T.: 23.411 min
Delta R.T.: -0.013 min
Response: 19899046
Conc: 20.67 ug/mL M4



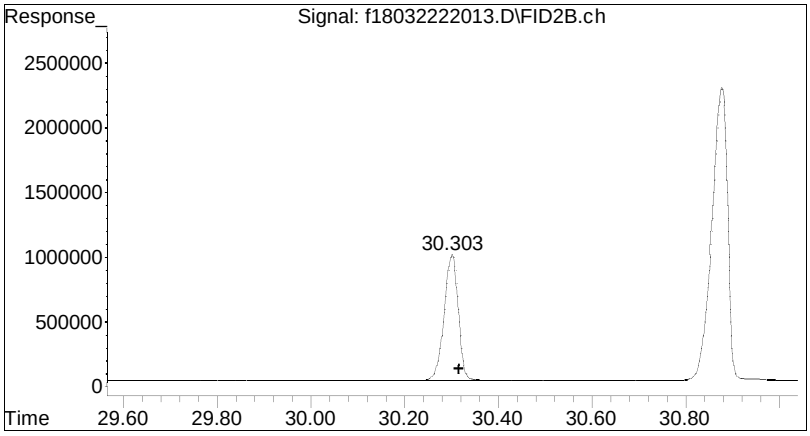
#16 n-Octadecane (C18)

R.T.: 27.023 min
Delta R.T.: -0.015 min
Response: 22105365
Conc: 22.30 ug/mL M4



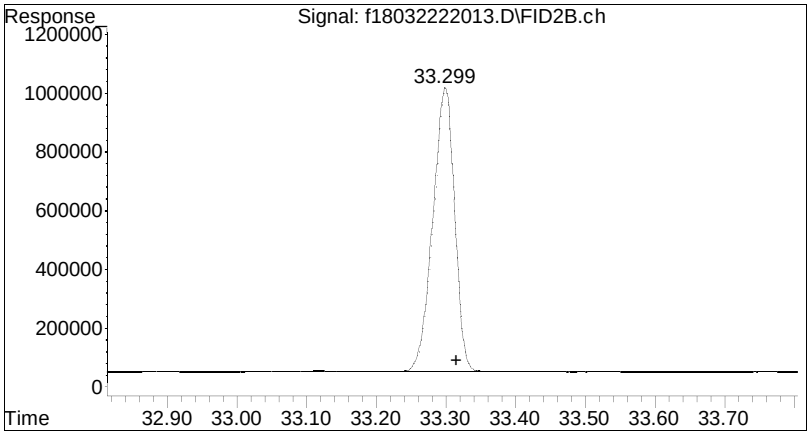
#18 n-Nonadecane (C19)

R.T.: 28.703 min
Delta R.T.: -0.015 min
Response: 20447630
Conc: 20.54 ug/mL M4



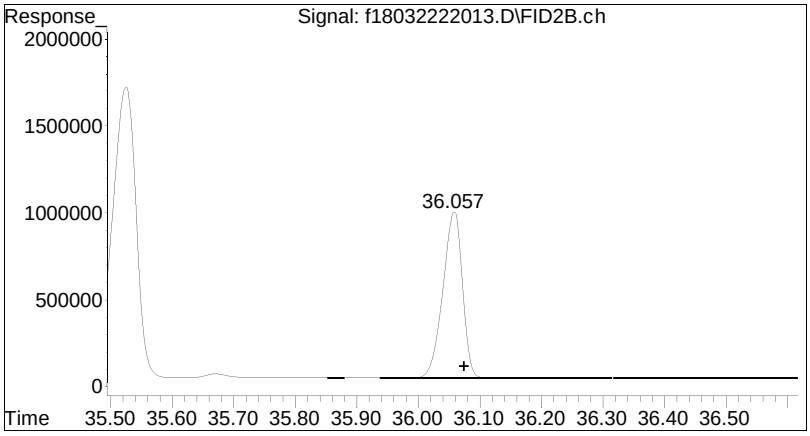
#20 n-Eicosane (C20)

R.T.: 30.303 min
Delta R.T.: -0.015 min
Response: 20392307
Conc: 20.31 ug/mL M4



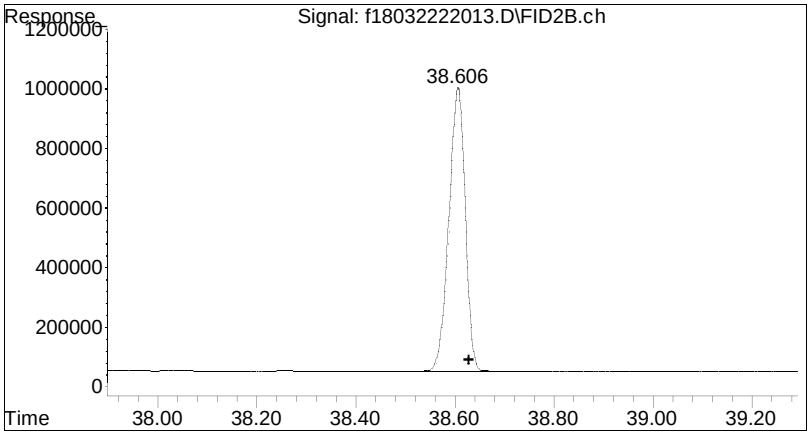
#22 n-Docosane (C22)

R.T.: 33.299 min
Delta R.T.: -0.016 min
Response: 20565456
Conc: 20.24 ug/mL M4



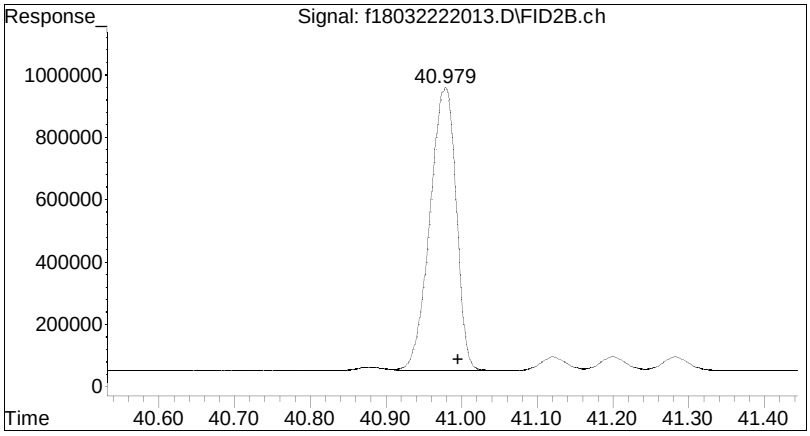
#25 n-Tetracosane (C24)

R.T.: 36.057 min
Delta R.T.: -0.018 min
Response: 21090469
Conc: 21.01 ug/mL M4



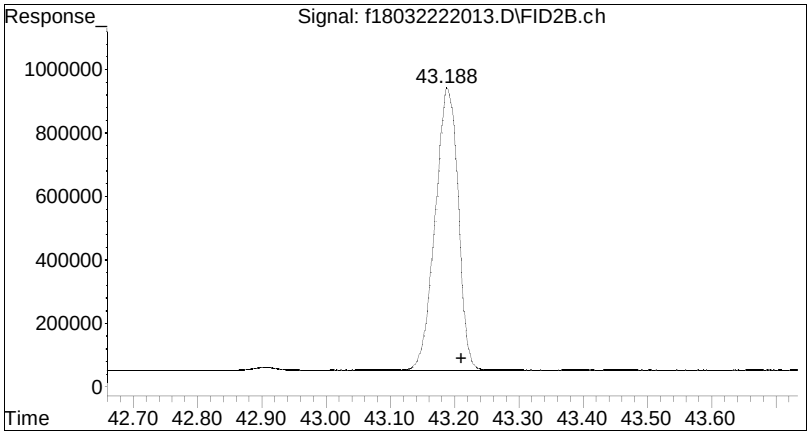
#27 n-Hexacosane (C26)

R.T.: 38.606 min
Delta R.T.: -0.021 min
Response: 21271120
Conc: 20.75 ug/mL M4



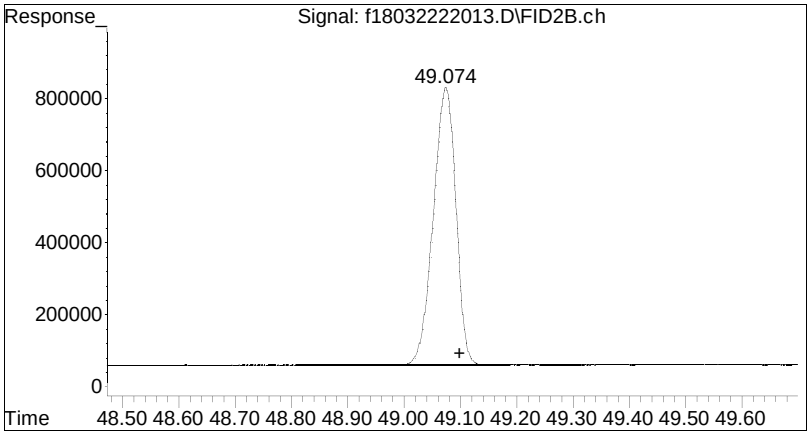
#29 n-Octacosane (C28)

R.T.: 40.979 min
Delta R.T.: -0.017 min
Response: 21462311
Conc: 20.53 ug/mL M4



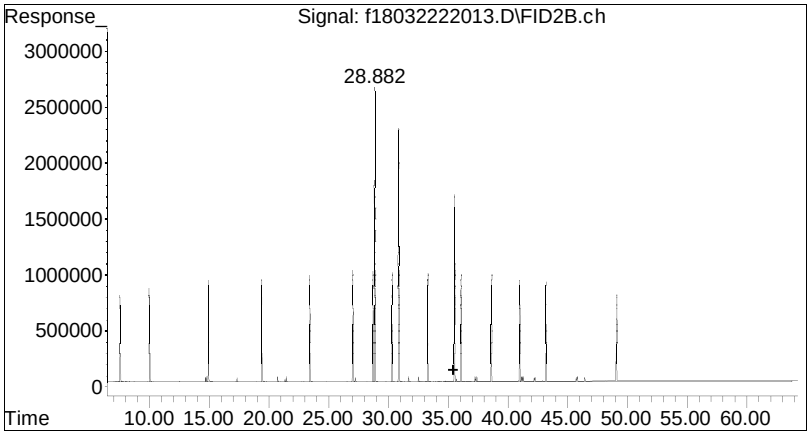
#31 n-Triacontane (C30)

R.T.: 43.188 min
Delta R.T.: -0.022 min
Response: 21558343
Conc: 20.57 ug/mL M4



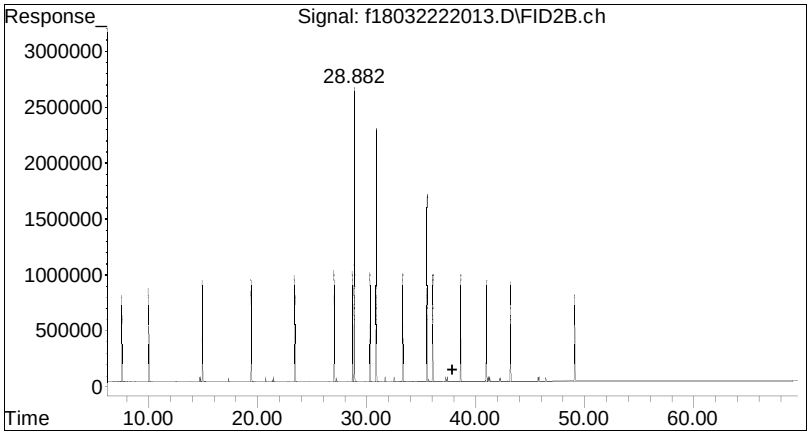
#37 n-Hexatriacontane (C36)

R.T.: 49.074 min
Delta R.T.: -0.025 min
Response: 20881086
Conc: 17.95 ug/mL M4



#42 C9-C44 Total Petroleum Hy

R.T.: 35.451 min
Delta R.T.: 0.000 min
Response: 476735217
Conc: 476.16 ug/mL m



#46 Total Resolved Hydrocarbo

R.T.: 37.870 min
Delta R.T.: 0.000 min
Response: 300840580
Conc: 300.48 ug/mL m

LCS Duplicate Raw Data

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222015.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 07:36 pm
Operator : FID18:WR
Sample : WG1618210-3,42,,
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 58 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 12:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : SHC_QC_Samples - SHC_QC_Samples

Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	30.879	55914396	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	28.884	60973999	52.545 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 105.09%	
24) s d50-Tetracosane	35.524	48763918	51.683 ug/mL M4
Spiked Amount 50.000 Range 50 - 130		Recovery = 103.37%	
Target Compounds			
3) t n-Nonane (C9)	7.528	15415319	16.494 ug/mL M4
4) t n-Decane (C10)	10.003	16975049	17.477 ug/mL M4
6) t n-Dodecane (C12)	14.925	18193680	18.403 ug/mL M4
9) t n-Tetradecane (C14)	19.401	19438053	18.969 ug/mL M4
12) t n-Hexadecane (C16)	23.410	21712928	20.982 ug/mL M4
16) t n-Octadecane (C18)	27.023	24005428	22.535 ug/mL M4
18) t n-Nonadecane (C19)	28.702	22156669	20.707 ug/mL M4
20) t n-Eicosane (C20)	30.302	22119116	20.502 ug/mL M4
22) t n-Docosane (C22)	33.300	22356256	20.469 ug/mL M4
25) t n-Tetracosane (C24)	36.057	22761330	21.099 ug/mL M4
27) t n-Hexacosane (C26)	38.607	22832341	20.727 ug/mL M4
29) t n-Octacosane (C28)	40.979	22925515	20.403 ug/mL M4
31) t n-Triacontane (C30)	43.193	22927943	20.358 ug/mL M4
37) t n-Hexatriacontane (C36)	49.076	22387734	17.904 ug/mL M4
42) h C9-C44 Total Petroleu...	35.451	505845870	470.134 ug/mL m
42) h C9-C44 Total Petroleu BS	35.451	309162314	287.336 ug/mLm
46) h Total Resolved Hydroc...	37.870	323016486	300.212 ug/mL m

SemiQuant Compounds - Not Calibrated on this Instrument

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222015.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 07:36 pm
Operator : FID18:WR
Sample : WG1618210-3,42,,
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 58 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 12:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

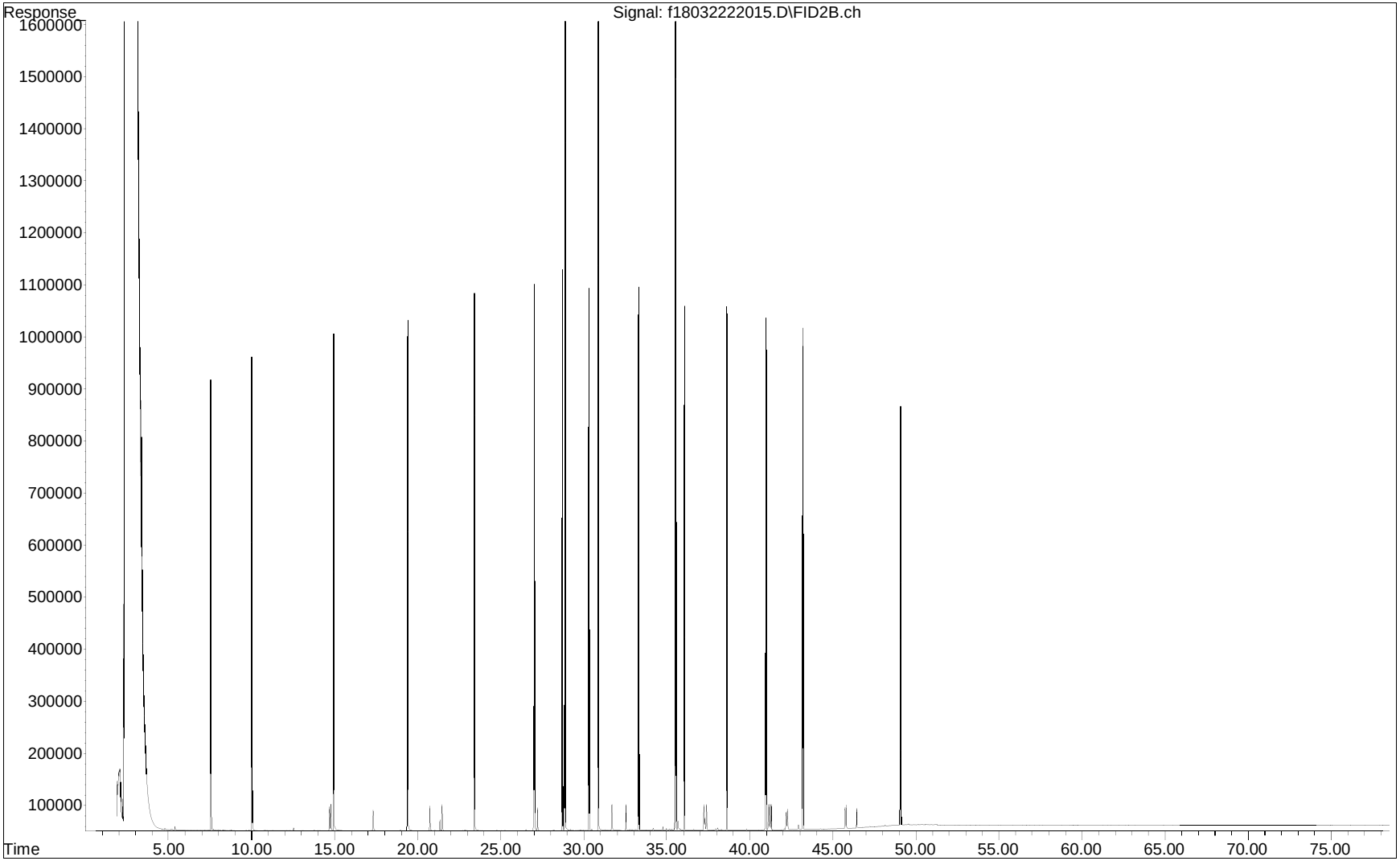
Sub List : SHC_QC_Samples - SHC_QC_Samples

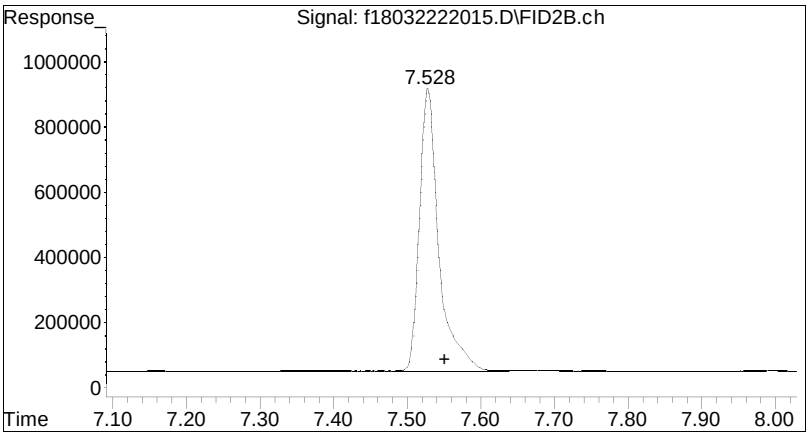
Compound	R.T.	Response	Conc Units

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

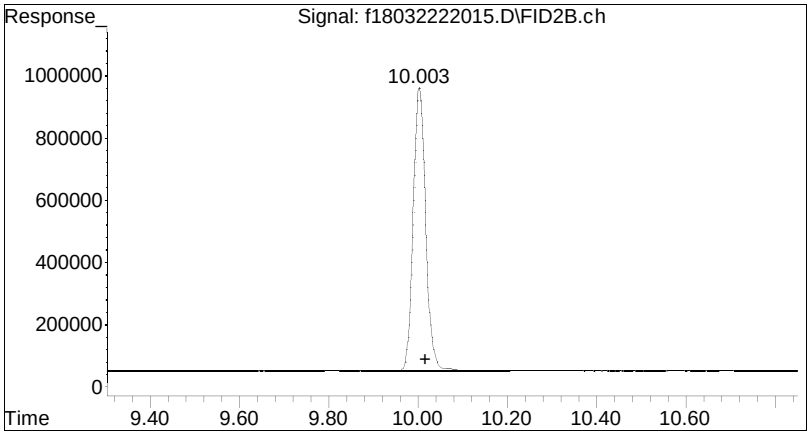
File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222015.D
Operator : FID18:WR
Acquired : 22 Mar 2022 07:36 pm using AcqMethod FID18.M
Sample Name: WG1618210-3,42,,
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 58
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M





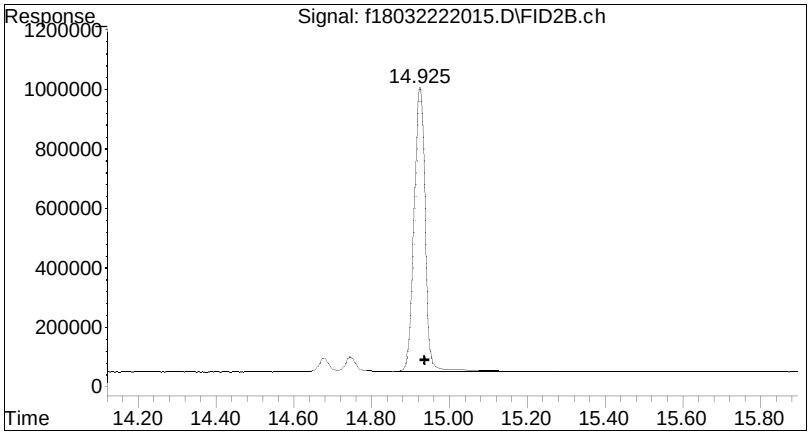
#3 n-Nonane (C9)

R.T.: 7.528 min
Delta R.T.: -0.023 min
Response: 15415319
Conc: 16.49 ug/mL M4



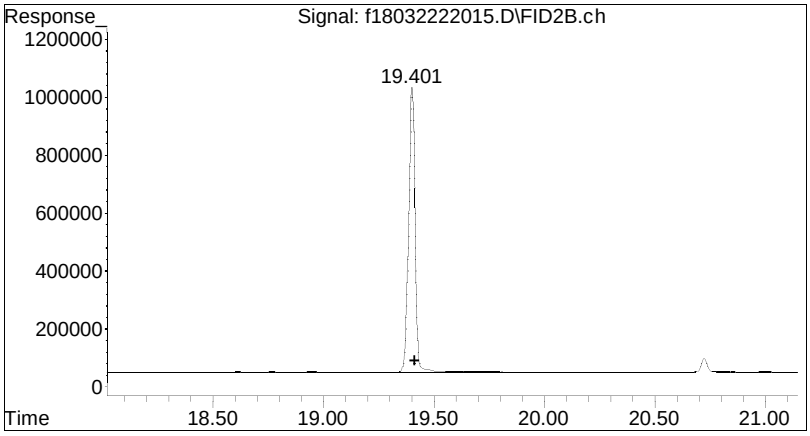
#4 n-Decane (C10)

R.T.: 10.003 min
Delta R.T.: -0.014 min
Response: 16975049
Conc: 17.48 ug/mL M4



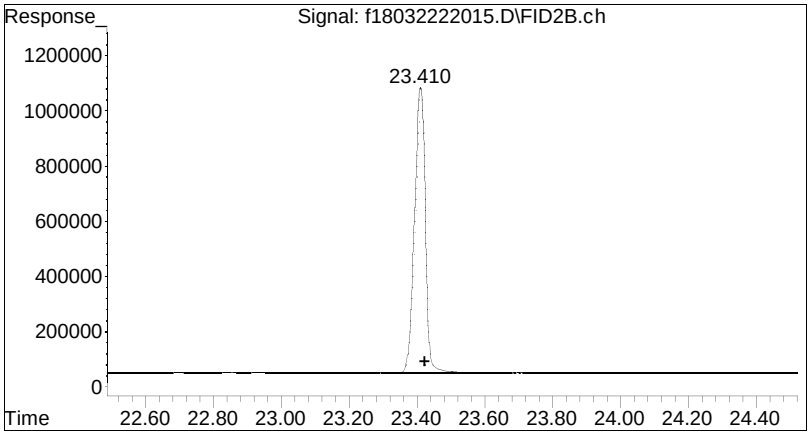
#6 n-Dodecane (C12)

R.T.: 14.925 min
Delta R.T.: -0.011 min
Response: 18193680
Conc: 18.40 ug/mL M4



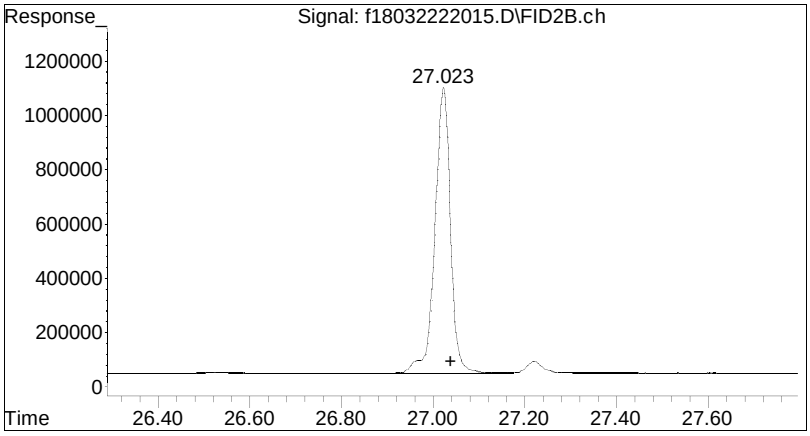
#9 n-Tetradecane (C14)

R.T.: 19.401 min
Delta R.T.: -0.013 min
Response: 19438053
Conc: 18.97 ug/mL M4



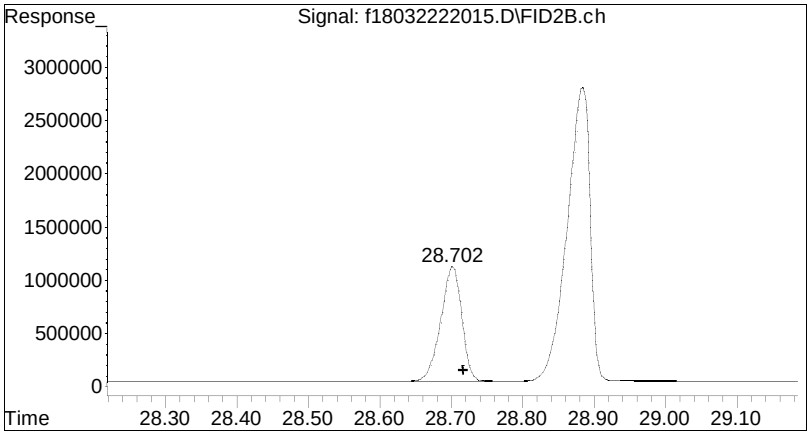
#12 n-Hexadecane (C16)

R.T.: 23.410 min
Delta R.T.: -0.014 min
Response: 21712928
Conc: 20.98 ug/mL M4



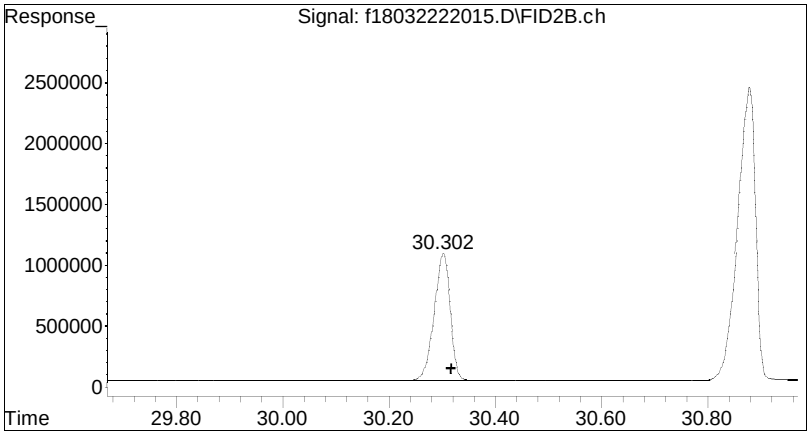
#16 n-Octadecane (C18)

R.T.: 27.023 min
Delta R.T.: -0.016 min
Response: 24005428
Conc: 22.54 ug/mL M4



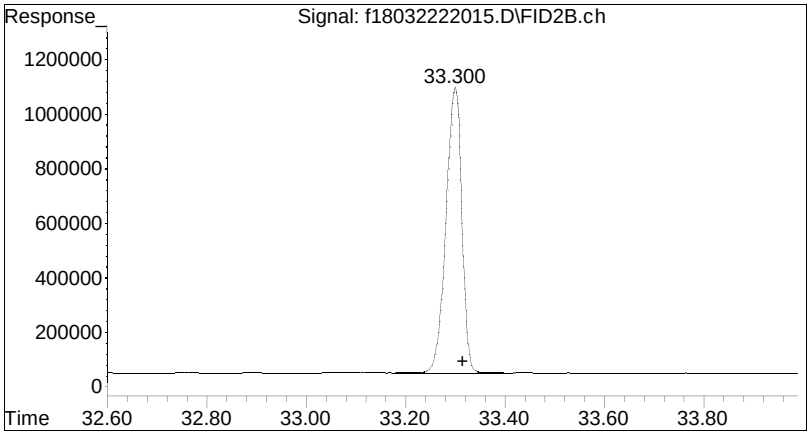
#18 n-Nonadecane (C19)

R.T.: 28.702 min
Delta R.T.: -0.015 min
Response: 22156669
Conc: 20.71 ug/mL M4



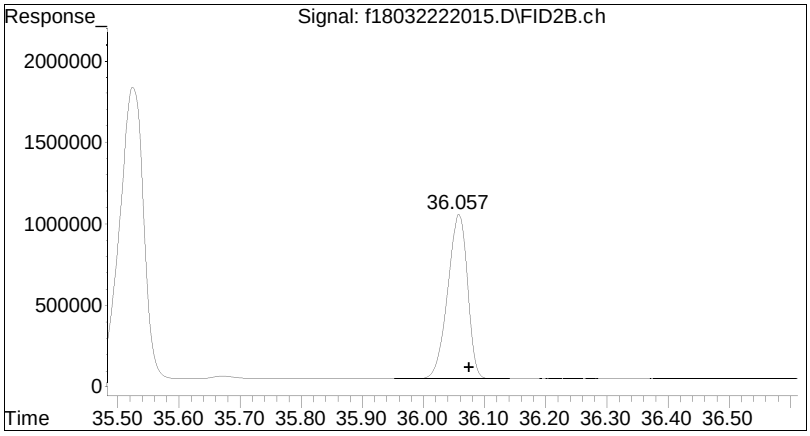
#20 n-Eicosane (C20)

R.T.: 30.302 min
Delta R.T.: -0.016 min
Response: 22119116
Conc: 20.50 ug/mL M4



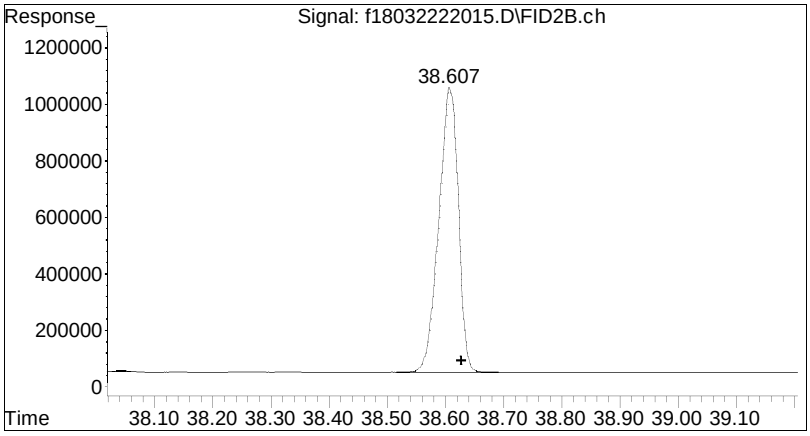
#22 n-Docosane (C22)

R.T.: 33.300 min
Delta R.T.: -0.015 min
Response: 22356256
Conc: 20.47 ug/mL M4



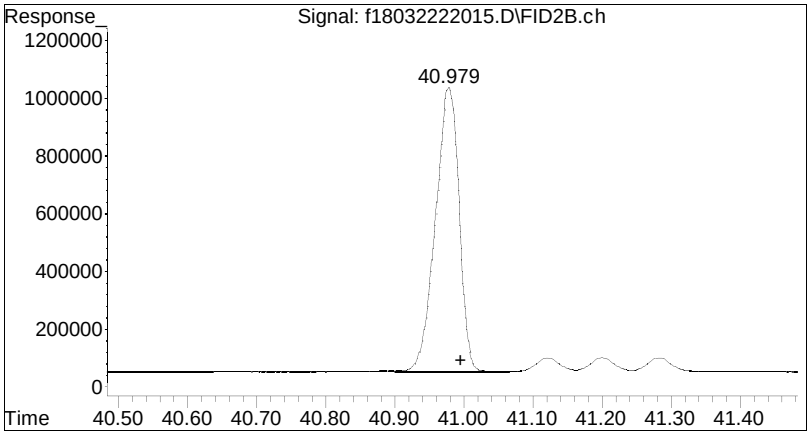
#25 n-Tetracosane (C24)

R.T.: 36.057 min
Delta R.T.: -0.018 min
Response: 22761330
Conc: 21.10 ug/mL M4



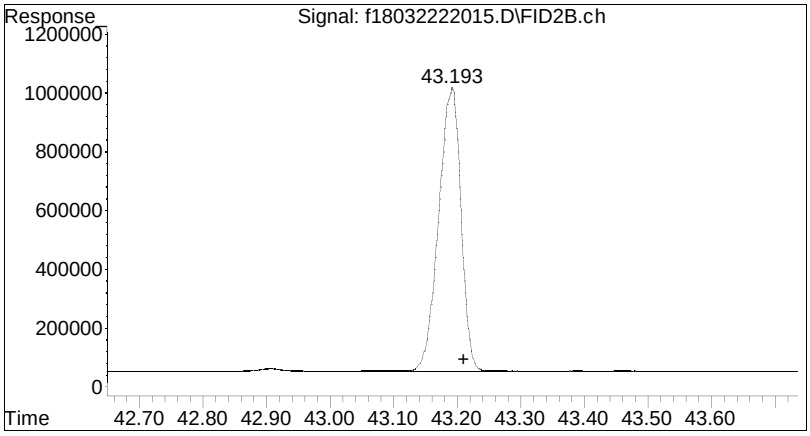
#27 n-Hexacosane (C26)

R.T.: 38.607 min
Delta R.T.: -0.020 min
Response: 22832341
Conc: 20.73 ug/mL M4



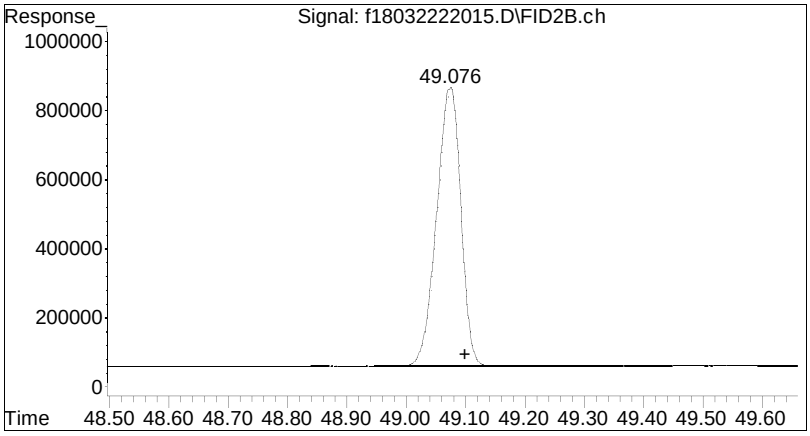
#29 n-Octacosane (C28)

R.T.: 40.979 min
Delta R.T.: -0.017 min
Response: 22925515
Conc: 20.40 ug/mL M4



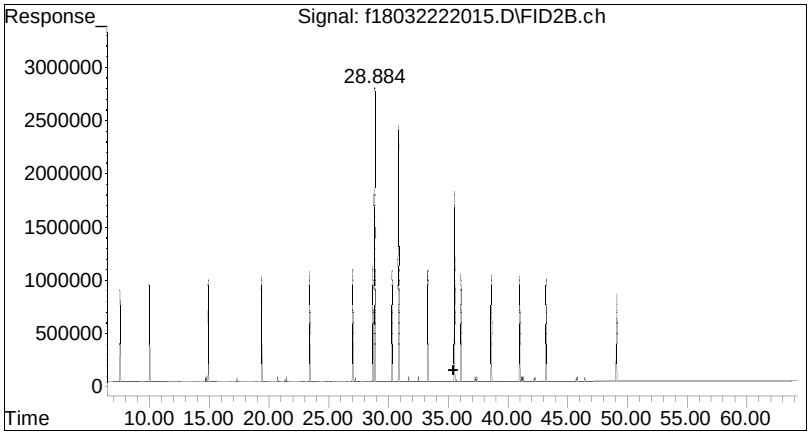
#31 n-Triacontane (C30)

R.T.: 43.193 min
Delta R.T.: -0.018 min
Response: 22927943
Conc: 20.36 ug/mL M4



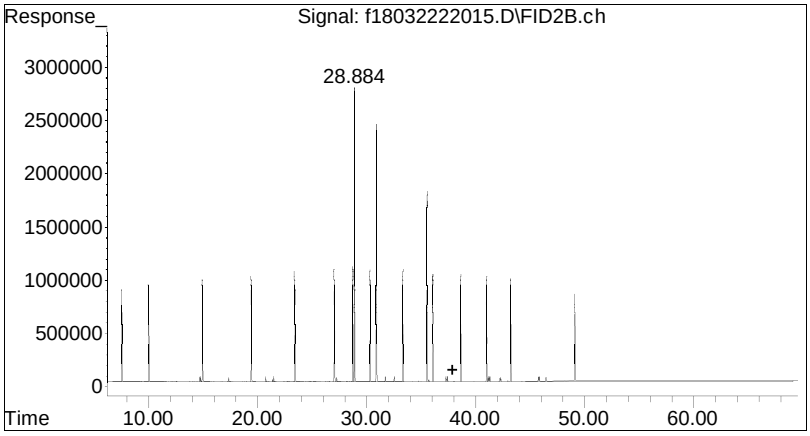
#37 n-Hexatriacontane (C36)

R.T.: 49.076 min
Delta R.T.: -0.024 min
Response: 22387734
Conc: 17.90 ug/mL M4



#42 C9-C44 Total Petroleum Hy

R.T.: 35.451 min
Delta R.T.: 0.000 min
Response: 505845870
Conc: 470.13 ug/mL m



#46 Total Resolved Hydrocarbo

R.T.: 37.870 min
Delta R.T.: 0.000 min
Response: 323016486
Conc: 300.21 ug/mL m

Instrument Blank
Raw Data

Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222007.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 01:42 pm
Operator : FID18:WR
Sample : IB1803222201R
Misc :
ALS Vial : 54 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 12:08:27 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Sub List : TPH_DRO_ORO - IS,SURR & RANGES

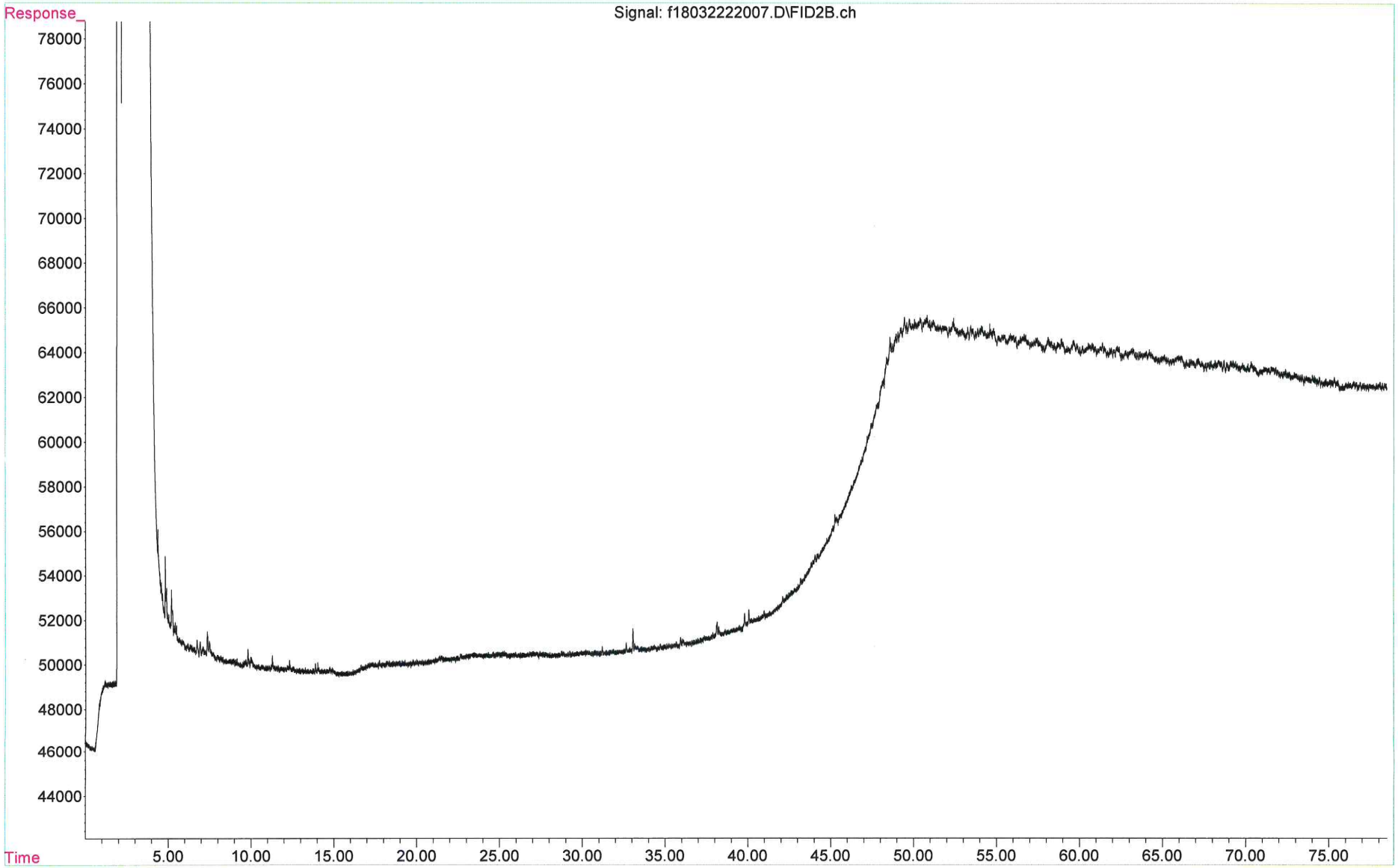
Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	30.870	11217	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	0.000	0	N.D. ug/mL
Spiked Amount 50.000 Range 50 - 130		Recovery =	0.00%#
24) s d50-Tetracosane	0.000	0	N.D. ug/mL
Spiked Amount 50.000 Range 50 - 130		Recovery =	0.00%#
Target Compounds			
42) h C9-C44 Total Petroleu...	35.451	196683556	911241.923 ug/mL M5
44) h C10-C28 DRO	25.502	26023125	123020.569 ug/mL M5
45) h C28-C40 ORO	47.557	85245499	380378.853 ug/mL M5
46) h Total Resolved Hydroc...	37.870	5547650	25702.459 ug/mL m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222007.D
Operator : FID18:WR
Acquired : 22 Mar 2022 01:42 pm using AcqMethod FID18.M
Sample Name: IB1803222201R
Instrument: FID 18
Misc Info :
Vial Number: 54
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Quantitation Report (QT Reviewed)

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222025.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 02:47 am
Operator : FID18:WR
Sample : IB1803222202R
Misc :
ALS Vial : 63 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:18:30 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : TPH_DRO_ORO - IS,SURR & RANGES

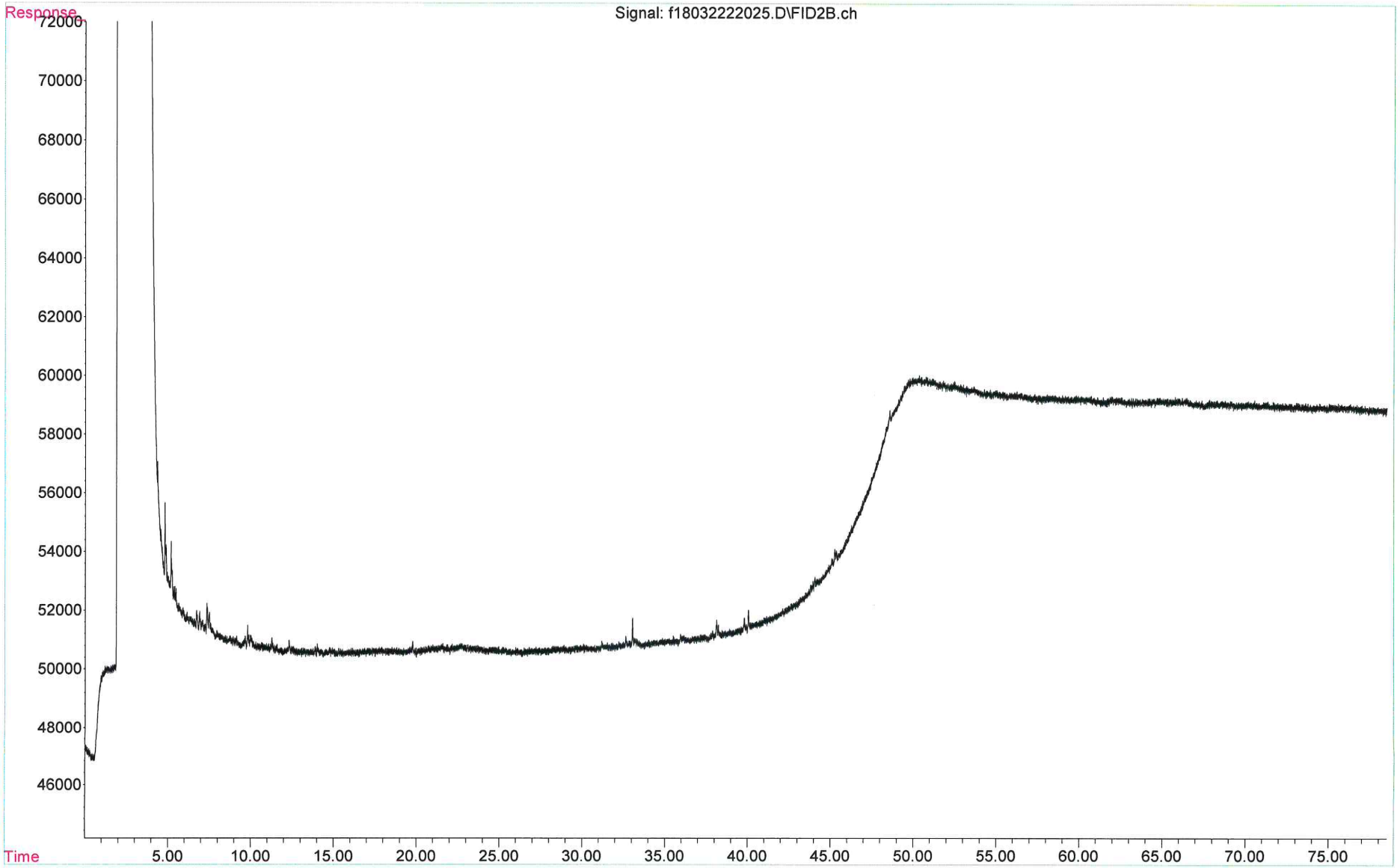
Compound	R.T.	Response	Conc Units
Internal Standards			
1) I 5-alpha-androstane	30.873	10513	50.000 ug/mL M4
System Monitoring Compounds			
19) s ortho-terphenyl	0.000	0	N.D. ug/mL
Spiked Amount 50.000	Range 50 - 130	Recovery =	0.00%#
24) s d50-Tetracosane	0.000	0	N.D. ug/mL
Spiked Amount 50.000	Range 50 - 130	Recovery =	0.00%#
Target Compounds			
42) h C9-C44 Total Petroleu...	35.451	146294284	723152.691 ug/mL m
42) h C9-C44 Total Petroleu BS	35.451	-50389272	N.D. ug/mLm
44) h C10-C28 DRO	25.502	32477555	163809.328 ug/mL m
44) h C10-C28 DRO BS	25.502	6454430	32554.664 ug/mLm
45) h C28-C40 ORO	47.557	54459988	259274.295 ug/mL m
45) h C28-C40 ORO BS	47.557	-30785511	N.D. ug/mLm
46) h Total Resolved Hydroc...	37.870	3319038	16406.460 ug/mL m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222025.D
Operator : FID18:WR
Acquired : 23 Mar 2022 02:47 am using AcqMethod FID18.M
Sample Name: IB1803222202R
Instrument: FID 18
Misc Info :
Vial Number: 63
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Sample Preparation

ORGANIC ELN REPORT

Workgroup: WG1618210

Prep Method: EPA 3510C
Solvent Type: DCM — **Lot #:** ED305-US
Surrogate Type: A2-PAH/SHC — **Lot #:** FRBE59
Spike Type: A2-PAH/SHC — **Lot #:** FRBE55
Spike Verify by: NA
Lims Spikelot: A2-PAH/SHC

Additional Reagents/Stds

Glass Wool	06521999
Na2SO4	211J1161019

Conc.Method: S-EVAP/N-EVAP
Solvent Type: DCM
Lot #: ED305-US

Additional Reagents/Stds

RIS	FRBE46

Cleanup 1

Cleanup Method 1:
Cleanup Method 2:
Solvent Type: **Lot #:**

Additional Reagents/Stds

Sample/ Type	Extraction: Extract Date	Analyst	Sample Vol ml	Surr Amt ml	Spike Amt ml	Concentration: Conc Date	Analyst	Final Vol ml	Conc Unit
L2213568-01 SAMP	03/22/22 05:01	(b) (6)	90	.5		03/22/22 06:16	(b) (6)	1	SEVAP 3/NEV AP2
WG1618210-1 BLANK	03/22/22 05:01	(b) (6)	90	.1		03/22/22 06:16	(b) (6)	1	SEVAP 3/NEV AP2
	Micro-extracted waters. BA 3/22/22								
WG1618210-2 LCS	03/22/22 05:01	(b) (6)	90	.1	.1	03/22/22 06:16	(b) (6)	1	SEVAP 3/NEV AP2
WG1618210-3 LCSD	03/22/22 05:01	(b) (6)	90	.1	.1	03/22/22 06:16	(b) (6)	1	SEVAP 3/NEV AP2

Reported: 23-MAR-22 04:28 PM

Alpha Report

ANALYTICAL REPORT

Lab Number:	L2213568
Client:	GSI Environmental Inc. 1001 Bishop Street Suite 1600 Honolulu, HI 96813
ATTN:	[redacted] (b) (6)
Phone:	[redacted] (b) (6)
Project Name:	SITE CHAR, CUTOUT ADIT 3
Project Number:	CTO-22F0106
Report Date:	03/23/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: SITE CHAR, CUTOUT ADIT 3
Project Number: CTO-22F0106

Lab Number: L2213568
Report Date: 03/23/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2213568-01	A3000-PRN01-220310	WATER	RHBFS A3+00 SAMPLE LOCATION	03/10/22 14:50	03/16/22

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Case Narrative (continued)

Report Revision

March 23, 2022: L2213568-01 - The sample matrix was determined to be aqueous rather than oil. The aqueous volume was extracted and the results are reported.

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

L2213568-01: The collection date and time on the chain of custody was 10-MAR-22 14:50; however, the collection date/time on the container label was 10-MAR-22 14:10. The collection date/time is reported as 10-MAR-22 14:50.

Saturated Hydrocarbons

L2213568-01: The sample was extracted with the method required holding time exceeded.

L2213568-01: The sample was extracted and then analyzed using a gas chromatograph equipped with a flame ionization detector (GC/FID). The temperature program and associated experimental conditions were optimized to obtain maximum resolution in an eighty minute chromatographic run representative of hydrocarbons in the n-Octane (C8) to n-Tetracontane (C40) range. Qualitative evaluation of the sample was conducted by reviewing the sample chromatogram in conjunction with a chromatogram of a normal alkane series generated with the same chromatographic conditions. Chromatograms of hydrocarbon reference materials obtained from our library of 82 reference standards were also utilized to provide the best possible sample match. Quantitative determination of the sample's hydrocarbon concentration was performed in accordance with EPA Method 8015M. The sample's total hydrocarbon concentration and all associated quality control data are included in the report.

The following qualitative information is based on a tentative interpretation of chromatographic pattern recognition and boiling point ranges:

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Case Narrative (continued)

Total Petroleum Hydrocarbon Identification

L2213568-01 contains hydrocarbons eluting in the range of n-Nonane (C9) to after the elution of n-Octadecane (C18).

Based on the data generated, L2213568-01 contains material eluting in the low to mid weight ranges of the chromatogram which is similar to a JP-5 Jet Fuel / Kerosene type product.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: (b) (6) [redacted]

Title: Technical Director/Representative Date: 03/23/22

ORGANICS

PETROLEUM HYDROCARBONS

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

SAMPLE RESULTS

Lab ID: L2213568-01
Client ID: A3000-PRN01-220310
Sample Location: RHBFS A3+00 SAMPLE LOCATION

Date Collected: 03/10/22 14:50
Date Received: 03/16/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 03/22/22 22:28
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 03/22/22 05:01

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	0.009	J	mg/l	0.011	0.004	1
n-Decane (C10)	0.636		mg/l	0.011	0.001	1
n-Undecane (C11)	5.05	E	mg/l	0.011	0.001	1
n-Dodecane (C12)	8.13	E	mg/l	0.011	0.001	1
n-Tridecane (C13)	7.79	E	mg/l	0.056	0.010	1
2,6,10-Trimethyldodecane (1380)	1.64		mg/l	0.011	0.001	1
n-Tetradecane (C14)	4.65	E	mg/l	0.011	0.001	1
2,6,10-Trimethyltridecane (1470)	1.20		mg/l	0.011	0.002	1
n-Pentadecane (C15)	1.80		mg/l	0.011	0.002	1
n-Hexadecane (C16)	0.339		mg/l	0.011	0.002	1
Norpristane (1650)	0.099		mg/l	0.011	0.002	1
n-Heptadecane (C17)	0.077		mg/l	0.011	0.002	1
Pristane	0.114		mg/l	0.011	0.002	1
n-Octadecane (C18)	0.029		mg/l	0.011	0.001	1
Phytane	0.052		mg/l	0.011	0.001	1
n-Nonadecane (C19)	0.009	J	mg/l	0.011	0.002	1
n-Eicosane (C20)	0.006	J	mg/l	0.011	0.001	1
n-Heneicosane (C21)	0.003	J	mg/l	0.011	0.001	1
n-Docosane (C22)	0.001	J	mg/l	0.011	0.0005	1
n-Tricosane (C23)	ND		mg/l	0.011	0.001	1
n-Tetracosane (C24)	ND		mg/l	0.011	0.001	1
n-Pentacosane (C25)	ND		mg/l	0.056	0.007	1
n-Hexacosane (C26)	0.001	J	mg/l	0.011	0.001	1
n-Heptacosane (C27)	0.002	J	mg/l	0.011	0.001	1
n-Octacosane (C28)	ND		mg/l	0.011	0.002	1
n-Nonacosane (C29)	ND		mg/l	0.011	0.001	1
n-Triacontane (C30)	ND		mg/l	0.011	0.001	1
n-Hentriacontane (C31)	ND		mg/l	0.011	0.001	1

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

SAMPLE RESULTS

Lab ID: L2213568-01 Date Collected: 03/10/22 14:50

Client ID: A3000-PRN01-220310 Date Received: 03/16/22

Sample Location: RHBFS A3+00 SAMPLE LOCATION Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	ND		mg/l	0.011	0.001	1
n-Tritriacontane (C33)	ND		mg/l	0.011	0.001	1
n-Tetratriacontane (C34)	ND		mg/l	0.011	0.002	1
n-Pentatriacontane (C35)	ND		mg/l	0.011	0.002	1
n-Hexatriacontane (C36)	ND		mg/l	0.011	0.002	1
n-Heptatriacontane (C37)	ND		mg/l	0.011	0.002	1
n-Octatriacontane (C38)	ND		mg/l	0.011	0.002	1
n-Nonatriacontane (C39)	ND		mg/l	0.011	0.002	1
n-Tetracontane (C40)	ND		mg/l	0.011	0.002	1
C9-C44 Total Petroleu	182		mg/l	0.367	0.062	1
C10-C28 DRO	185		mg/l	0.233	0.040	1
C28-C40 ORO	0.171		mg/l	0.122	0.018	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	108		50-130
d50-Tetracosane	106		50-130

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

SAMPLE RESULTS

Lab ID: L2213568-01 D
Client ID: A3000-PRN01-220310
Sample Location: RHBFS A3+00 SAMPLE LOCATION

Date Collected: 03/10/22 14:50
Date Received: 03/16/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 03/23/22 12:49
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 03/22/22 05:01

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Undecane (C11)	4.92		mg/l	0.222	0.021	20
n-Dodecane (C12)	7.80		mg/l	0.222	0.029	20
n-Tridecane (C13)	6.66		mg/l	1.11	0.197	20
n-Tetradecane (C14)	4.23		mg/l	0.222	0.022	20
Total Saturated Hydrocarbons	29.6		mg/l	0.011	0.0005	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	105		50-130
d50-Tetracosane	103		50-130

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 03/22/22 16:43
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 03/22/22 05:01

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01 Batch: WG1618210-1					
n-Nonane (C9)	ND		mg/l	0.011	0.004
n-Decane (C10)	ND		mg/l	0.011	0.001
n-Undecane (C11)	ND		mg/l	0.011	0.001
n-Dodecane (C12)	ND		mg/l	0.011	0.001
n-Tridecane (C13)	ND		mg/l	0.056	0.010
2,6,10-Trimethyldodecane (1380)	ND		mg/l	0.011	0.001
n-Tetradecane (C14)	ND		mg/l	0.011	0.001
2,6,10-Trimethyltridecane (1470)	ND		mg/l	0.011	0.002
n-Pentadecane (C15)	ND		mg/l	0.011	0.002
n-Hexadecane (C16)	ND		mg/l	0.011	0.002
Norpristane (1650)	ND		mg/l	0.011	0.002
n-Heptadecane (C17)	ND		mg/l	0.011	0.002
Pristane	ND		mg/l	0.011	0.002
n-Octadecane (C18)	ND		mg/l	0.011	0.001
Phytane	ND		mg/l	0.011	0.001
n-Nonadecane (C19)	ND		mg/l	0.011	0.002
n-Eicosane (C20)	ND		mg/l	0.011	0.001
n-Heneicosane (C21)	ND		mg/l	0.011	0.001
n-Docosane (C22)	ND		mg/l	0.011	0.0005
n-Tricosane (C23)	ND		mg/l	0.011	0.001
n-Tetracosane (C24)	ND		mg/l	0.011	0.001
n-Pentacosane (C25)	ND		mg/l	0.056	0.007
n-Hexacosane (C26)	ND		mg/l	0.011	0.001
n-Heptacosane (C27)	ND		mg/l	0.011	0.001
n-Octacosane (C28)	ND		mg/l	0.011	0.002
n-Nonacosane (C29)	ND		mg/l	0.011	0.001
n-Triacontane (C30)	ND		mg/l	0.011	0.001
n-Hentriacontane (C31)	ND		mg/l	0.011	0.001
n-Dotriacontane (C32)	ND		mg/l	0.011	0.001

Project Name: SITE CHAR, CUTOUT ADIT 3 **Lab Number:** L2213568

Project Number: CTO-22F0106 **Report Date:** 03/23/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 03/22/22 16:43
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 03/22/22 05:01

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01 Batch: WG1618210-1					
n-Tritriacontane (C33)	ND		mg/l	0.011	0.001
n-Tetratriacontane (C34)	ND		mg/l	0.011	0.002
n-Pentatriacontane (C35)	ND		mg/l	0.011	0.002
n-Hexatriacontane (C36)	ND		mg/l	0.011	0.002
n-Heptatriacontane (C37)	ND		mg/l	0.011	0.002
n-Octatriacontane (C38)	ND		mg/l	0.011	0.002
n-Nonatriacontane (C39)	ND		mg/l	0.011	0.002
n-Tetracontane (C40)	ND		mg/l	0.011	0.002
C9-C44 Total Petroleu	ND		mg/l	0.367	0.062
C10-C28 DRO	0.134	J	mg/l	0.233	0.040
C28-C40 ORO	ND		mg/l	0.122	0.018
Total Saturated Hydrocarbons	ND		mg/l	0.011	0.0005

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	110		50-130
d50-Tetracosane	108		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHAR, CUTOUT ADIT 3
Project Number: CTO-22F0106
Lab Number: L2213568
Report Date: 03/23/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01 Batch: WG1618210-2 WG1618210-3								
Nonane (C9)	84		82		50-130	2		30
n-Decane (C10)	89		87		50-130	2		30
n-Dodecane (C12)	91		92		50-130	1		30
n-Tetradecane (C14)	95		95		50-130	0		30
n-Hexadecane (C16)	103		105		50-130	2		30
n-Octadecane (C18)	112		113		50-130	1		30
n-Nonadecane (C19)	103		104		50-130	1		30
n-Eicosane (C20)	102		102		50-130	0		30
n-Docosane (C22)	101		102		50-130	1		30
n-Tetracosane (C24)	105		105		50-130	0		30
n-Hexacosane (C26)	104		104		50-130	0		30
n-Octacosane (C28)	103		102		50-130	1		30
n-Triacontane (C30)	103		102		50-130	1		30
n-Hexatriacontane (C36)	90		90		50-130	0		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	104		105		50-130
d50-Tetracosane	103		103		50-130

Project Name: SITE CHAR, CUTOUT ADIT 3
Project Number: CTO-22F0106

Lab Number: L2213568
Report Date: 03/23/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Present/Intact

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2213568-01A	Glass 250ml/8oz unpreserved	A	NA		3.6	Y	Present/Intact		A2-SHC(7)

*Values in parentheses indicate holding time in days

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

Data Qualifiers

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	SITE CHAR, CUTOUT ADIT 3	**Lab Number:**	L2213568
Project Number:	CTO-22F0106	**Report Date:**	03/23/22

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL World Class Chemistry

320 FORBES BLVD MANSFIELD MA 02048

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 3/16/22

ALPHA Job #: L2213568

Project Information

Project Name: SITE CHAR, CUTOUT ADIT 3

Project Location: RHBFS A3+00 Sample Location

Project #: CTO-22F0106

Project Manager: [redacted] (b) (6)

ALPHA Quote #:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☒ Same as Client info PO #: 02.30

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

Client Information

Client: GSI -Rhodes for CTO 22F0106 (AECOM)

Address: 1001 Bishop Street,Suite 1600

Honolulu, HI 96813, United States

Phone: [redacted] (b) (6)

Fax: -

Email: [redacted] (b) (6) @aecom.com

☐ These samples have been Previously analyzed by Alpha

Turn-Around Time

☐ Standard ☒ Rush (ONLY IF PRE-APPROVED)

Due Date: 3/20/2022 Time:

Other Project Specific Requirements/Comments/Detection Limits:

Run Saturated Hydrocarbon analysis (SHC)
Send results to peggy.schuler@aecom.com, Alethea.ramos@aecom.com
llrhodes@gsi-net.com and hold sample for possible additional analysis
C/O Susan Neal Mansfield

ANALYSIS

SAMPLE HANDLING
Filtration
☐ Done
☒ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

TOTAL # BOTTLES

Sample Specific Comments

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Saturated Hydrocarbon Analysis												Sample Specific Comments	TOTAL # BOTTLES
13568-01	A3000-PRN01-220310	03/10/22	1450	Product	JSH	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Product/waterJar	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	a/	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
					Container Type	-	-	-	-	-	-	-	-	-	-	-	-		
					Preservative	-	-	-	-	-	-	-	-	-	-	-	-		

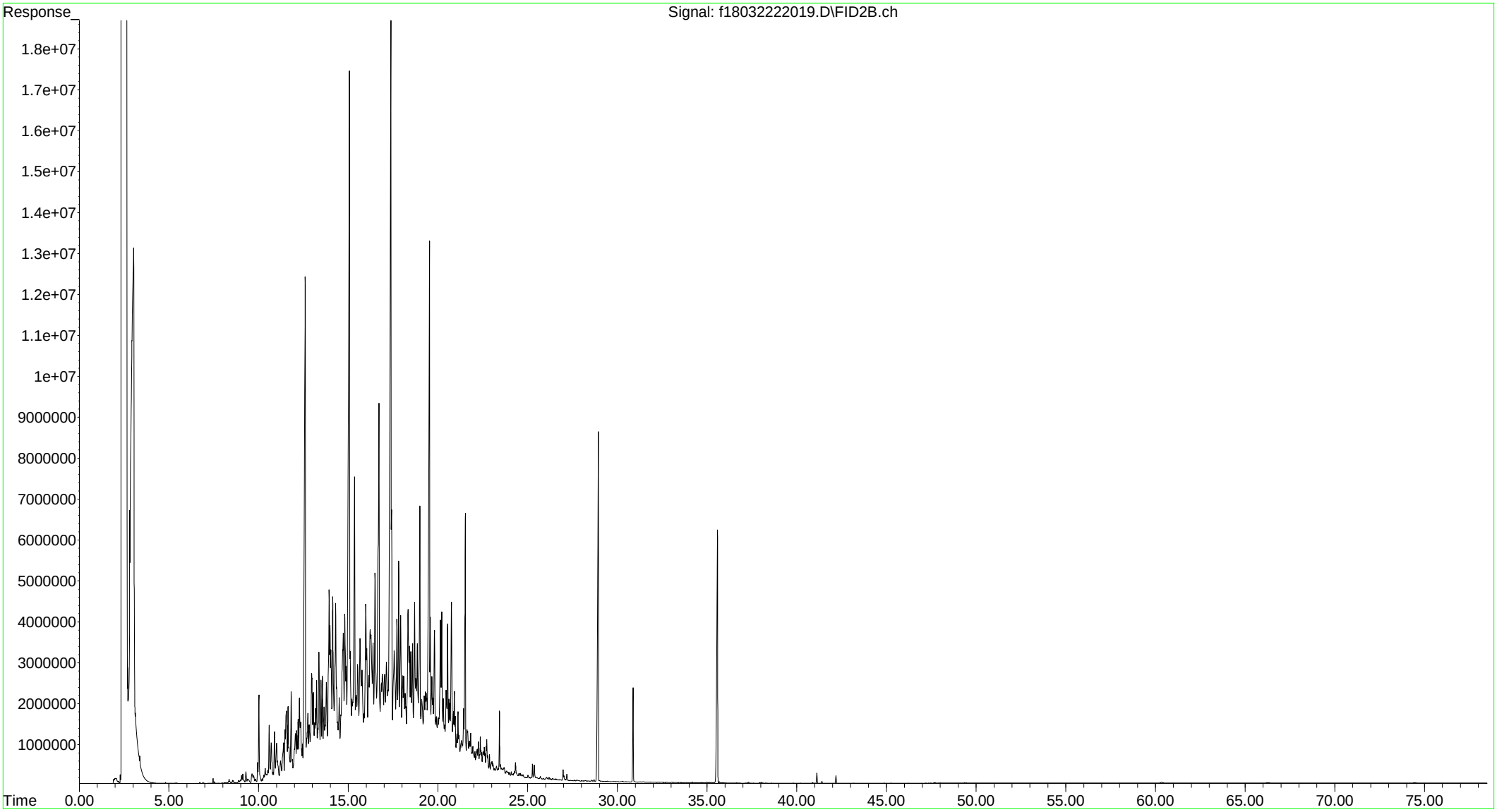
Relinquished By:	Date/Time	Received By:	Date/Time
[redacted] (b) (6)	Mar 11, 2022 1500	[redacted] (b) (6)	3/11/22 1500
	3/11/22 1531		
fedex	3/16/22 10:08		3/16/22 10:08

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

FORM NO: 01-01(I-NJ) (rev. 5-JAN-12)

GC-FID Chromatogram

```
File        :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222019.D
Operator    : FID18:WR
Acquired    : 22 Mar 2022  10:28 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: L2213568-01,42,,,R2C
Misc Info   : WG1618558,WG1618210,ICAL18676
Vial Number: 60
```



```
File       :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222029.D
Operator   : FID18:WR
Acquired   : 23 Mar 2022  12:49 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: l2213568-01d,42,20
Misc Info  : WG1618558,WG1618210,ICAL18676
Vial Number: 65
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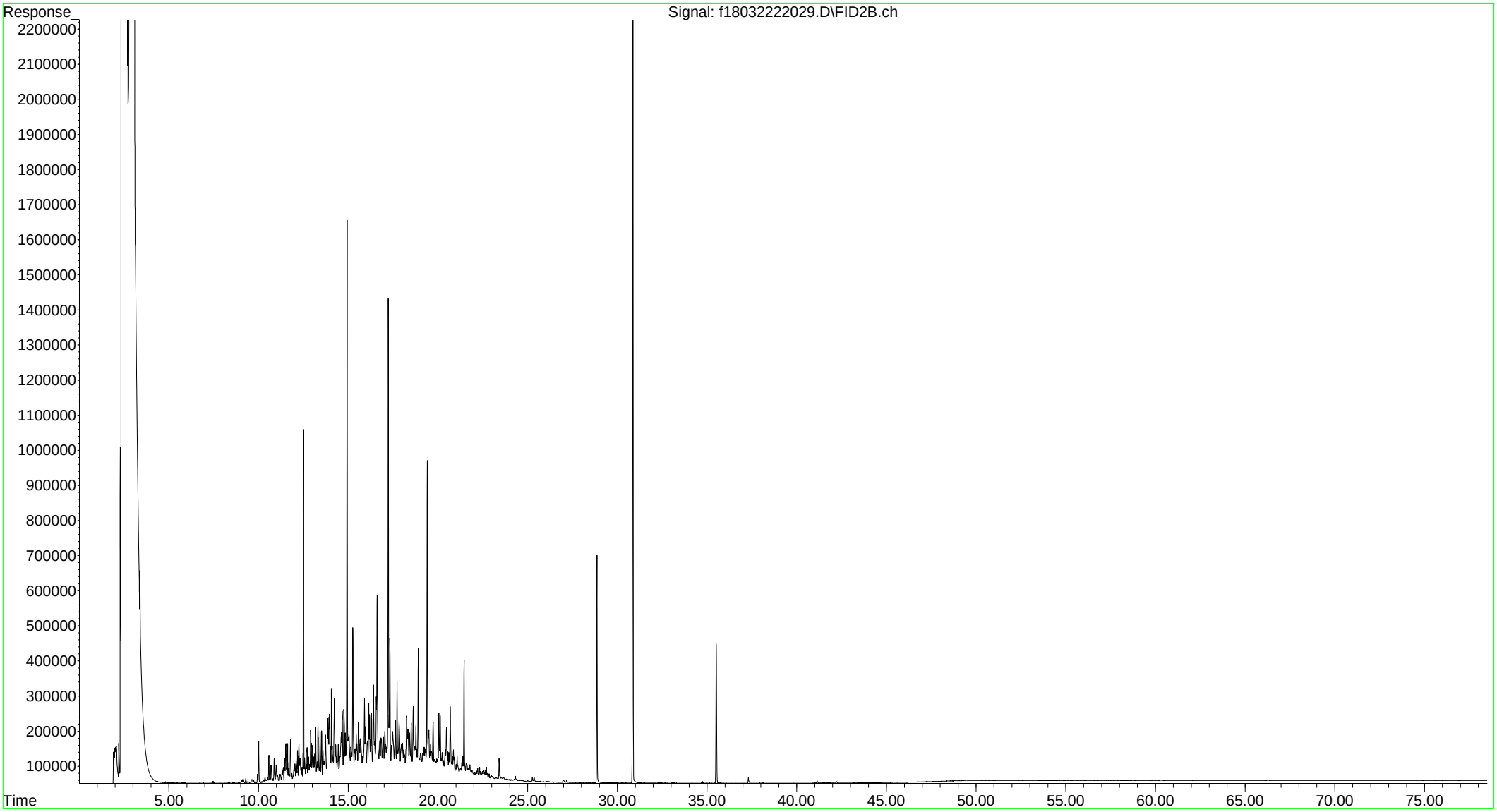

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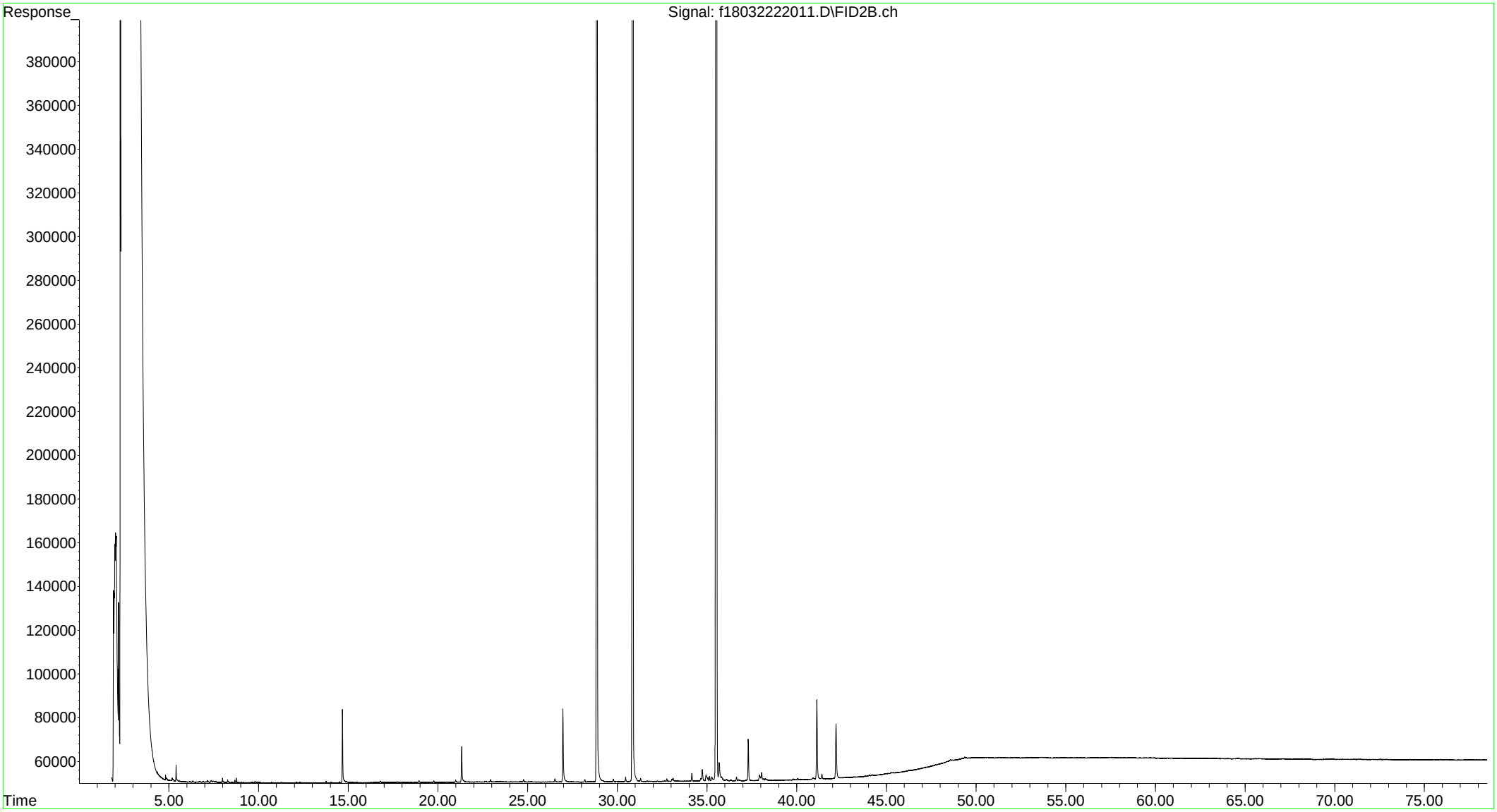
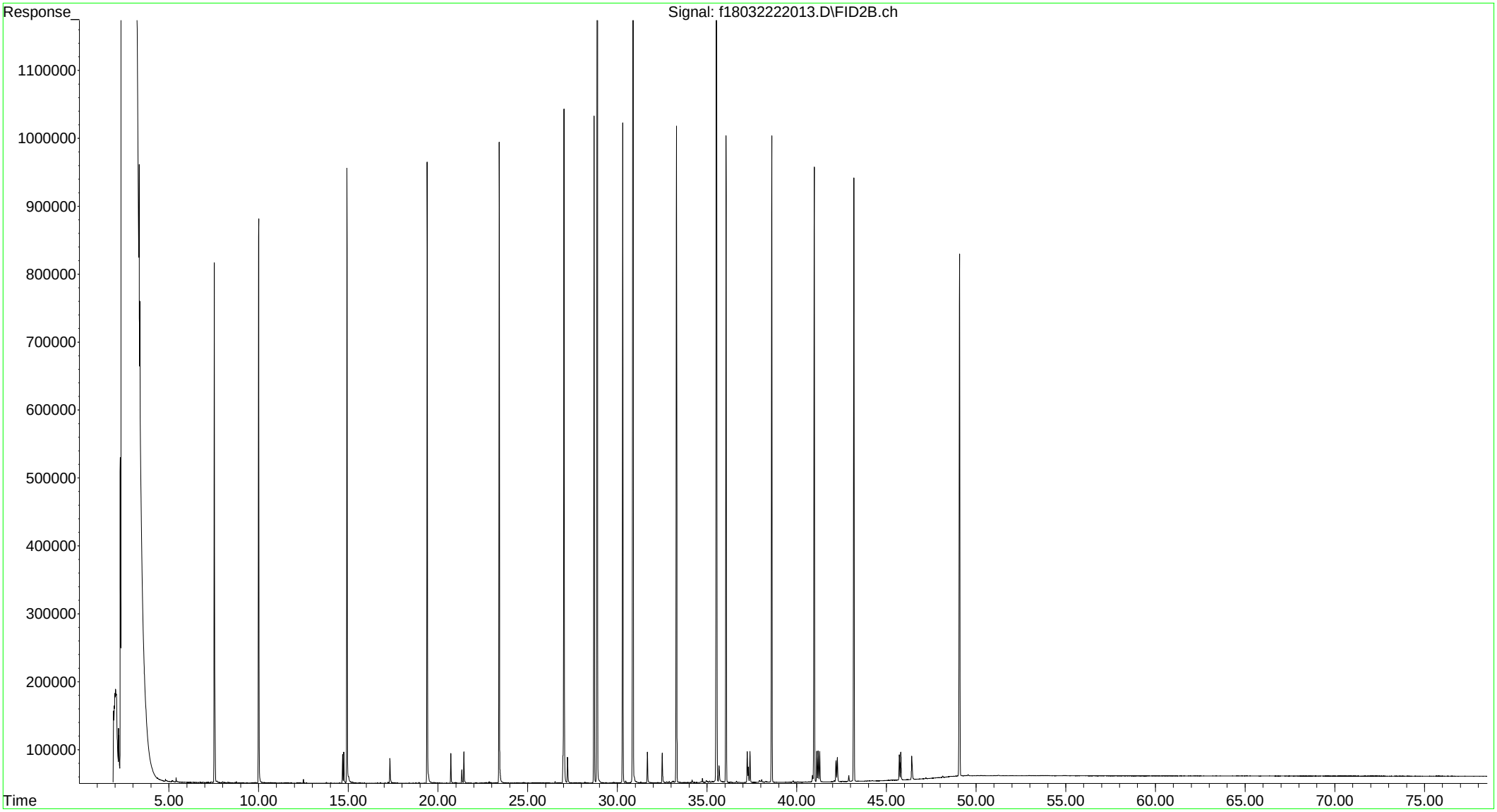
File        :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222011.D
Operator    : FID18:WR
Acquired    : 22 Mar 2022  04:43 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: WG1618210-1
Misc Info   : WG1618558,WG1618210,ICAL18676
Vial Number: 56
```

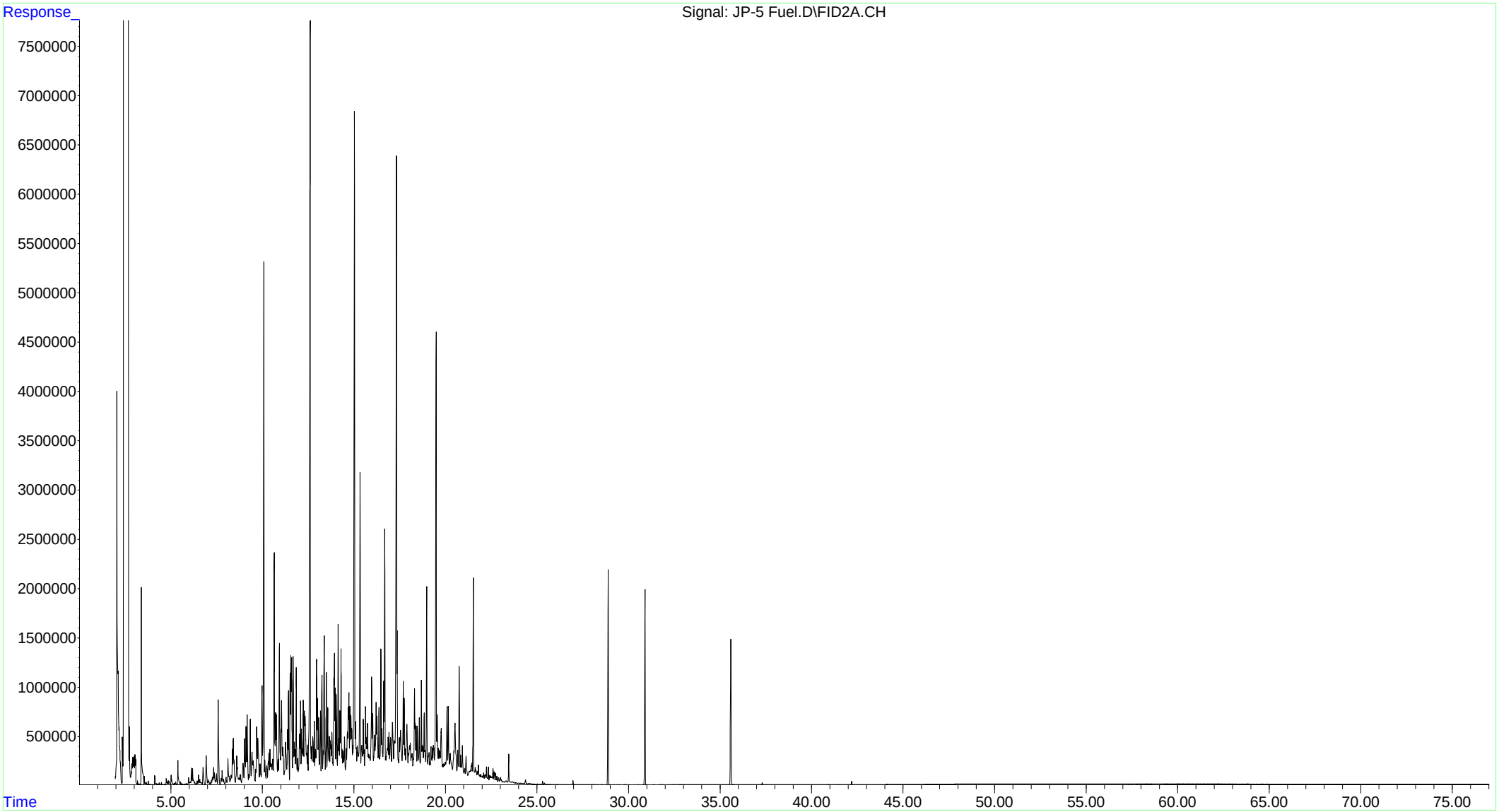


```
File        :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222013.D
Operator    : FID18:WR
Acquired    : 22 Mar 2022  06:09 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: WG1618210-2,42,,
Misc Info   : WG1618558,WG1618210,ICAL18676
Vial Number: 57
```

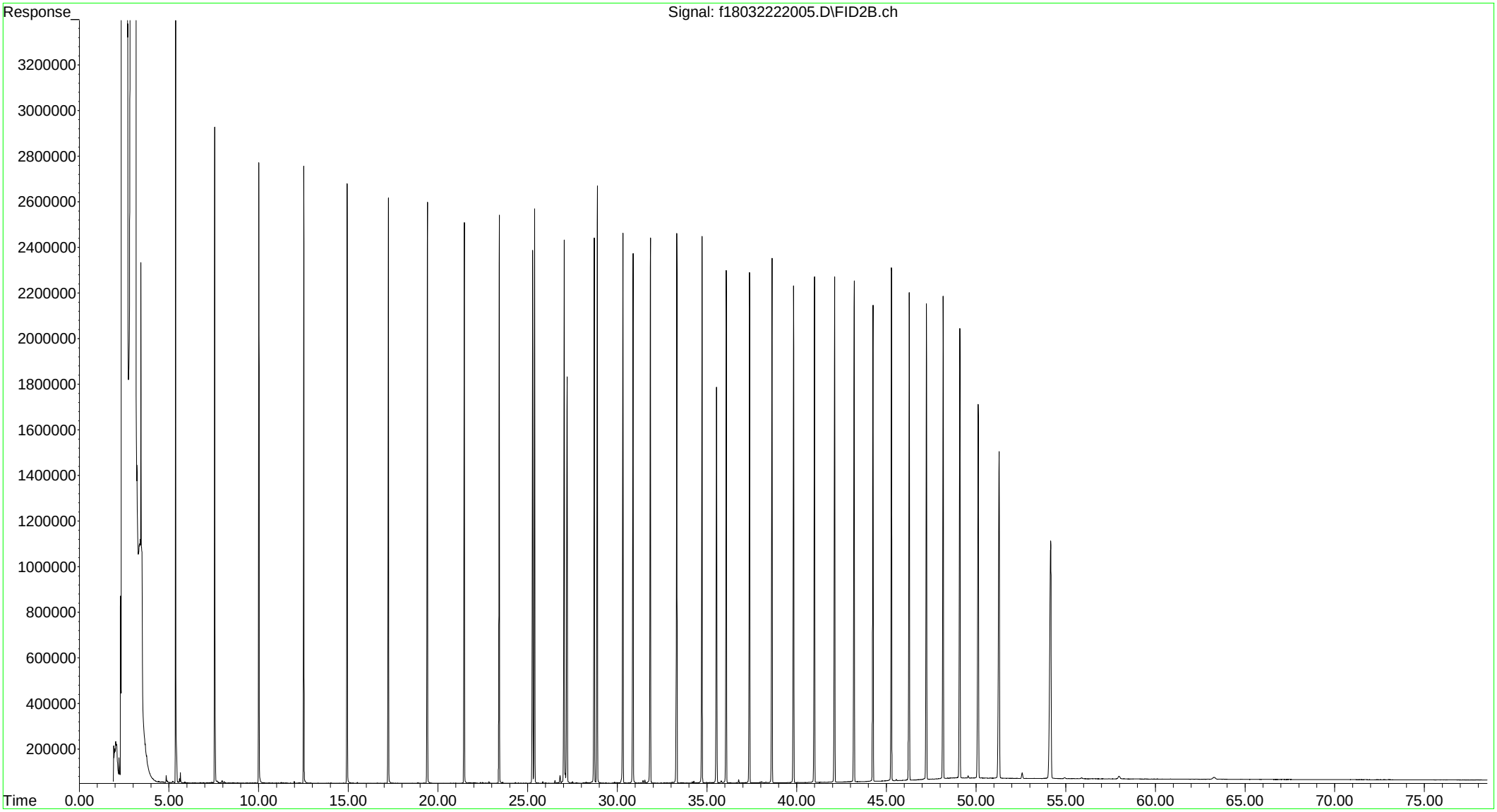


Petroleum Reference Standards

```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\JP-5 Fu
...         el.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 19 Nov 2011   4:22 pm using AcqMethod FRNC2AF.M
Sample    : JP-5 FUEL
Misc Info : F042710P
```



```
File       :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222005.D
Operator   : FID18:WR
Acquired   : 22 Mar 2022  12:16 pm using AcqMethod FID18.M
Instrument :   FID 18
Sample Name: WG1618558-1
Misc Info  : WG1618558,FRBE45,ICAL18676
Vial Number: 53
```



Total Saturated Hydrocarbons by GC/FID

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222019.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 10:28 pm
Operator : FID18:WR
Sample : L2213568-01,42,,,R2C
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 60 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

	Compound	R.T.	Response	Conc	Units	
	Internal Standards					
1) I	5-alpha-androstane	30.881	54723123	50.000	ug/mL	M4
	System Monitoring Compounds					
19) s	ortho-terphenyl	28.943	305984432	269.426	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	538.85%#
24) s	d50-Tetracosane	35.576	245518221	265.880	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	531.76%#
	Target Compounds					
2) t	n-Octane (C8)	0.000	0	N.D.	ug/mL	d
3) t	n-Nonane (C9)	7.529	778273	0.851	ug/mL	M4
4) t	n-Decane (C10)	10.017	54374551	57.200	ug/mL	M4
5) t	n-Undecane (C11)	12.595	434391544	454.690	ug/mL	M4
6) t	n-Dodecane (C12)	15.062f	708145884	731.890	ug/mL	M4
7) t	n-Tridecane (C13)	17.374f	683138568	701.132	ug/mL	M4
8) t	1380	18.993	148440109	148.010	ug/mL	M4
9) t	n-Tetradecane (C14)	19.529f	419776072	418.559	ug/mL	M4
10) t	1470	20.751	109294236	108.071	ug/mL	M4
11) t	n-Pentadecane (C15)	21.527	163490824	161.661	ug/mL	M4
12) t	n-Hexadecane (C16)	23.426	30896263	30.507	ug/mL	M4
13) t	1650	24.322	9212448	8.935	ug/mL	M4
14) t	n-Heptadecane (C17)	25.263	7134056	6.919	ug/mL	M4
15) t	Pristane	25.361	10695163	10.227	ug/mL	M4
16) t	n-Octadecane (C18)	27.017	2707523	2.597	ug/mL	M4
17) t	Phytane	27.179	4470790	4.636	ug/mL	M4
18) t	n-Nonadecane (C19)	28.702	888827	0.849	ug/mL	M4
20) t	n-Eicosane (C20)	30.295	594114	0.563	ug/mL	M4
21) t	n-Heneicosane (C21)	31.821	260006	0.244	ug/mL	M4
22) t	n-Docosane (C22)	33.290	111888	0.105	ug/mL	M4
23) t	n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d
25) t	n-Tetracosane (C24)	0.000	0	N.D.	ug/mL	d
26) t	n-Pentacosane (C25)	0.000	0	N.D.	ug/mL	d
27) t	n-Hexacosane (C26)	38.593	129376	0.120	ug/mL	M4
28) t	n-Heptacosane (C27)	39.805	164966	0.153	ug/mL	M4
29) t	n-Octacosane (C28)	40.967	154111	0.140	ug/mL	M4
30) t	n-Nonacosane (C29)	42.090	118681	0.108	ug/mL	M4
31) t	n-Triacontane (C30)	43.180	118231	0.107	ug/mL	M4
32) t	n-Hentriacontane (C31)	44.226	110925	0.104	ug/mL	M4
33) t	n-Dotriacontane (C32)	45.250	105556	0.094	ug/mL	M4
34) t	n-Tritriacontane (C33)	46.241	70678	0.065	ug/mL	M4
35) t	n-tetratriacontane (C34)	47.199	61959	0.057	ug/mL	M4
36) t	n-Pentatriacontane (C35)	48.134	55991	0.054	ug/mL	M4
37) t	n-Hexatriacontane (C36)	49.063	46807	0.038	ug/mL	M4
38) t	n-Heptatriacontane (C37)	50.086	36674	0.033	ug/mL	M4
39) t	n-Octatriacontane (C38)	51.245	23231	0.020	ug/mL	M4
40) t	n-Nonatriacontane (C39)	0.000	0	N.D.	ug/mL	
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL	
42) h	C9-C44 Total Petroleu...	35.451	17400771744	16524.367	ug/mL	m
42) h	C9-C44 Total Petroleu BS	35.451	17204088188	16337.590	ug/mL	m
43) h	C9-C40 Total Petroleu...	0.000	0	N.D.	ug/ml	d

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222019.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 10:28 pm
Operator : FID18:WR
Sample : L2213568-01,42,,,R2C
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 60 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

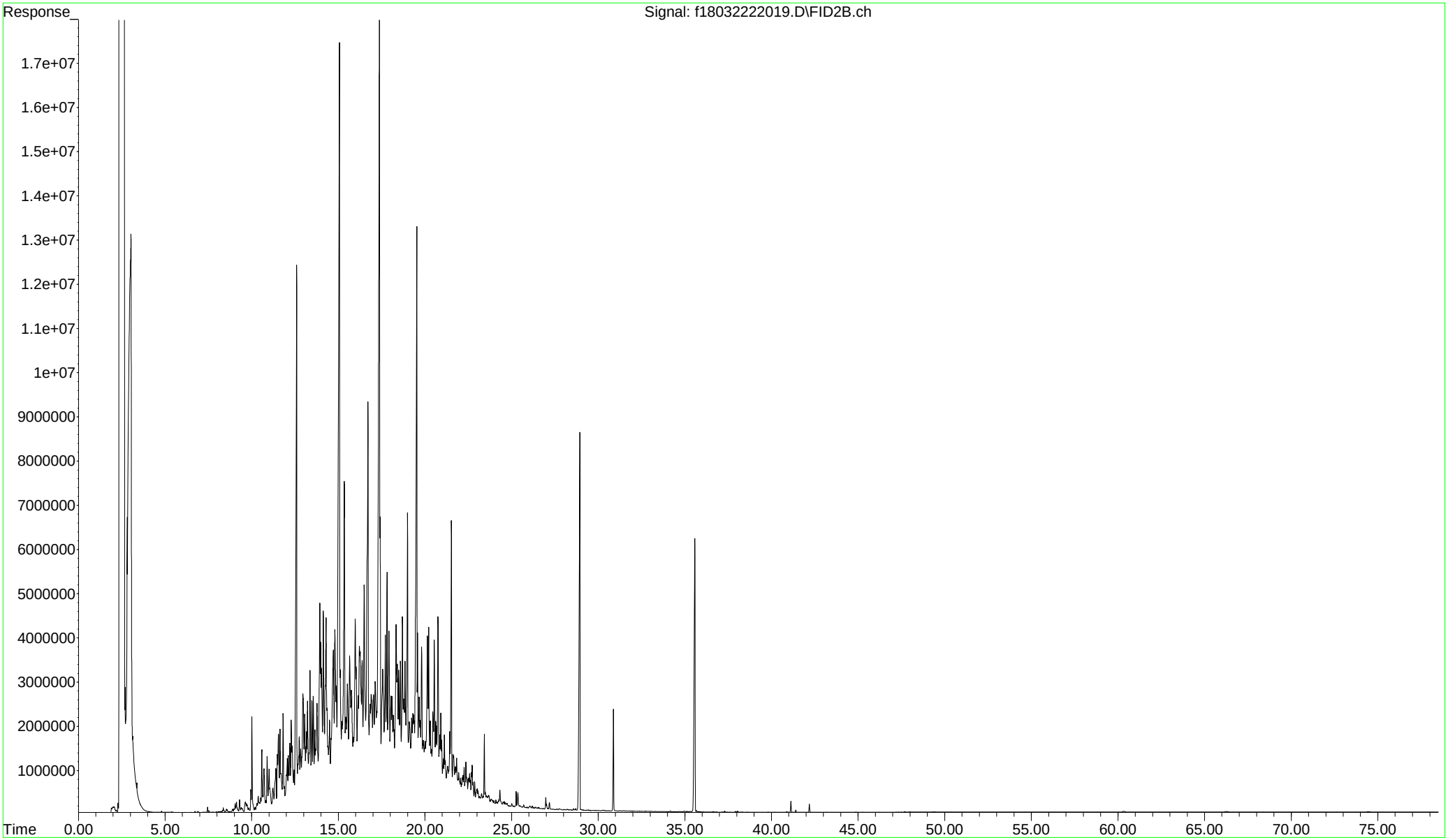
	Compound	R.T.	Response	Conc	Units	
44) h	C10-C28 DRO	25.502	17173074061	16640.141	ug/mL	m
44) h	C10-C28 DRO BS	25.502	17147050936	16614.926	ug/mL	m
45) h	C28-C40 ORO	47.557	102111105	93.392	ug/mL	m
45) h	C28-C40 ORO BS	47.557	16865606	15.425	ug/mL	m
46) h	Total Resolved Hydroc...	37.870	9656555327	9170.195	ug/mL	m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222019.D
Operator : FID18:WR
Acquired : 22 Mar 2022 10:28 pm using AcqMethod FID18.M
Sample Name: L2213568-01,42,,,R2C
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 60
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222029.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 12:49 pm
Operator : FID18:WR
Sample : l2213568-01d,42,20
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 65 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 14:19:49 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222202R
Blank File : f18032222025.D

Sub List : Default - All compounds listed

	Compound	R.T.	Response	Conc	Units	
	Internal Standards					
1) I	5-alpha-androstane	30.872	48454780	50.000	ug/mL	M4
	System Monitoring Compounds					
19) s	ortho-terphenyl	28.861	13184900	13.111	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	26.22%#
24) s	d50-Tetracosane	35.505	10567047	12.924	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	25.85%#
	Target Compounds					
2) t	n-Octane (C8)	0.000	0	N.D.	ug/mL	
3) t	n-Nonane (C9)	0.000	0	N.D.	ug/mL	d
4) t	n-Decane (C10)	0.000	0	N.D.	ug/mL	d
5) t	n-Undecane (C11)	12.507	18724495	22.135	ug/mL	M4
6) t	n-Dodecane (C12)	14.931	30069697	35.098	ug/mL	M4
7) t	n-Tridecane (C13)	17.229	25848589	29.961	ug/mL	M4
8) t	1380	0.000	0	N.D.	ug/mL	d
9) t	n-Tetradecane (C14)	19.402	16917955	19.051	ug/mL	M4
10) t	1470	0.000	0	N.D.	ug/mL	d
11) t	n-Pentadecane (C15)	0.000	0	N.D.	ug/mL	d
12) t	n-Hexadecane (C16)	0.000	0	N.D.	ug/mL	d
13) t	1650	0.000	0	N.D.	ug/mL	d
14) t	n-Heptadecane (C17)	0.000	0	N.D.	ug/mL	d
15) t	Pristane	0.000	0	N.D.	ug/mL	d
16) t	n-Octadecane (C18)	0.000	0	N.D.	ug/mL	d
17) t	Phytane	0.000	0	N.D.	ug/mL	d
18) t	n-Nonadecane (C19)	0.000	0	N.D.	ug/mL	d
20) t	n-Eicosane (C20)	0.000	0	N.D.	ug/mL	d
21) t	n-Heneicosane (C21)	0.000	0	N.D.	ug/mL	d
22) t	n-Docosane (C22)	0.000	0	N.D.	ug/mL	d
23) t	n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d
25) t	n-Tetracosane (C24)	0.000	0	N.D.	ug/mL	d
26) t	n-Pentacosane (C25)	0.000	0	N.D.	ug/mL	d
27) t	n-Hexacosane (C26)	0.000	0	N.D.	ug/mL	d
28) t	n-Heptacosane (C27)	0.000	0	N.D.	ug/mL	d
29) t	n-Octacosane (C28)	0.000	0	N.D.	ug/mL	d
30) t	n-Nonacosane (C29)	0.000	0	N.D.	ug/mL	d
31) t	n-Triacontane (C30)	0.000	0	N.D.	ug/mL	
32) t	n-Hentriacontane (C31)	0.000	0	N.D.	ug/mL	
33) t	n-Dotriacontane (C32)	0.000	0	N.D.	ug/mL	
34) t	n-Tritriacontane (C33)	0.000	0	N.D.	ug/mL	
35) t	n-tetratriacontane (C34)	0.000	0	N.D.	ug/mL	
36) t	n-Pentatriacontane (C35)	0.000	0	N.D.	ug/mL	
37) t	n-Hexatriacontane (C36)	0.000	0	N.D.	ug/mL	
38) t	n-Heptatriacontane (C37)	0.000	0	N.D.	ug/mL	
39) t	n-Octatriacontane (C38)	0.000	0	N.D.	ug/mL	
40) t	n-Nonatriacontane (C39)	0.000	0	N.D.	ug/mL	
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL	
42) h	C9-C44 Total Petroleu...	35.451	899042042	964.208	ug/mL	m
42) h	C9-C44 Total Petroleu BS	35.451	752747758	807.309	ug/mLm	
43) h	C9-C40 Total Petroleu...	0.000	0	N.D.	ug/ml	d

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222029.D
Signal(s) : FID2B.ch
Acq On : 23 Mar 2022 12:49 pm
Operator : FID18:WR
Sample : l2213568-01d,42,20
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 65 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 14:19:49 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222202R
Blank File : f18032222025.D

Sub List : Default - All compounds listed

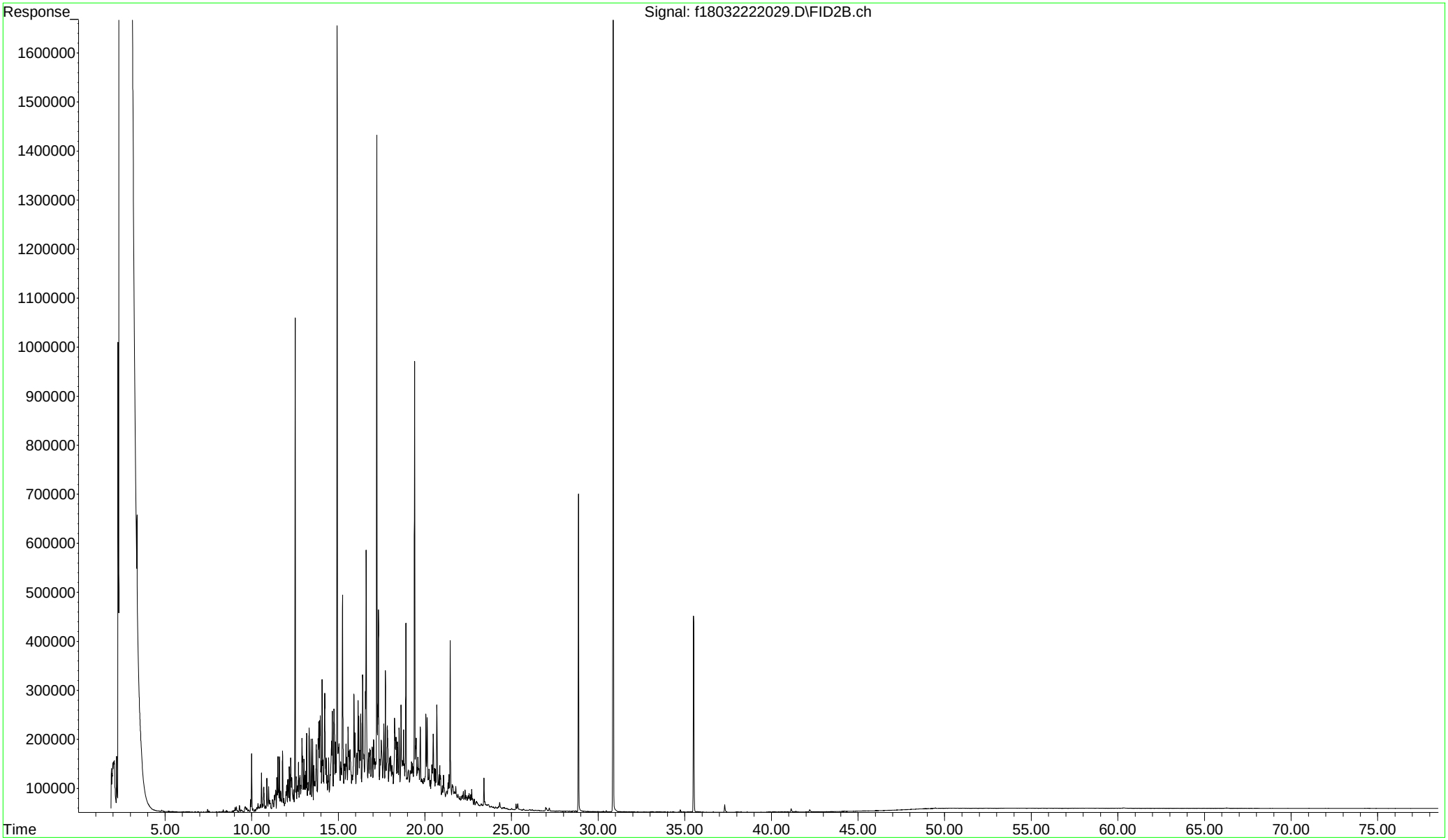
	Compound	R.T.	Response	Conc	Units	
44) h	C10-C28 DRO	25.502	779652031	853.187	ug/mL	m
44) h	C10-C28 DRO BS	25.502	747174476	817.646	ug/mL	m
45) h	C28-C40 ORO	47.557	55585714	57.416	ug/mL	m
45) h	C28-C40 ORO BS	47.557	1125726	1.163	ug/mL	m
46) h	Total Resolved Hydroc...	37.870	473710064	508.046	ug/mL	m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222029.D
Operator : FID18:WR
Acquired : 23 Mar 2022 12:49 pm using AcqMethod FID18.M
Sample Name: l2213568-01d,42,20
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 65
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222011.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 04:43 pm
Operator : FID18:WR
Sample : WG1618210-1
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 56 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:34 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

	Compound	R.T.	Response	Conc	Units	
	Internal Standards					
1) I	5-alpha-androstane	30.868	50483982	50.000	ug/mL	M4
	System Monitoring Compounds					
19) s	ortho-terphenyl	28.875	57421538	54.807	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	109.61%
24) s	d50-Tetracosane	35.518	45953855	53.944	ug/mL	M4
Spiked Amount	50.000	Range	50 - 130	Recovery	=	107.89%
	Target Compounds					
2) t	n-Octane (C8)	0.000	0	N.D.	ug/mL	d
3) t	n-Nonane (C9)	0.000	0	N.D.	ug/mL	
4) t	n-Decane (C10)	0.000	0	N.D.	ug/mL	
5) t	n-Undecane (C11)	0.000	0	N.D.	ug/mL	
6) t	n-Dodecane (C12)	0.000	0	N.D.	ug/mL	
7) t	n-Tridecane (C13)	0.000	0	N.D.	ug/mL	
8) t	1380	0.000	0	N.D.	ug/mL	
9) t	n-Tetradecane (C14)	0.000	0	N.D.	ug/mL	
10) t	1470	0.000	0	N.D.	ug/mL	
11) t	n-Pentadecane (C15)	0.000	0	N.D.	ug/mL	
12) t	n-Hexadecane (C16)	0.000	0	N.D.	ug/mL	
13) t	1650	0.000	0	N.D.	ug/mL	
14) t	n-Heptadecane (C17)	0.000	0	N.D.	ug/mL	
15) t	Pristane	0.000	0	N.D.	ug/mL	
16) t	n-Octadecane (C18)	0.000	0	N.D.	ug/mL	d
17) t	Phytane	0.000	0	N.D.	ug/mL	
18) t	n-Nonadecane (C19)	0.000	0	N.D.	ug/mL	
20) t	n-Eicosane (C20)	0.000	0	N.D.	ug/mL	
21) t	n-Heneicosane (C21)	0.000	0	N.D.	ug/mL	
22) t	n-Docosane (C22)	0.000	0	N.D.	ug/mL	
23) t	n-Tricosane (C23)	0.000	0	N.D.	ug/mL	d
25) t	n-Tetracosane (C24)	0.000	0	N.D.	ug/mL	
26) t	n-Pentacosane (C25)	0.000	0	N.D.	ug/mL	d
27) t	n-Hexacosane (C26)	0.000	0	N.D.	ug/mL	
28) t	n-Heptacosane (C27)	0.000	0	N.D.	ug/mL	
29) t	n-Octacosane (C28)	0.000	0	N.D.	ug/mL	d
30) t	n-Nonacosane (C29)	0.000	0	N.D.	ug/mL	d
31) t	n-Triacontane (C30)	0.000	0	N.D.	ug/mL	
32) t	n-Hentriacontane (C31)	0.000	0	N.D.	ug/mL	
33) t	n-Dotriacontane (C32)	0.000	0	N.D.	ug/mL	
34) t	n-Tritriacontane (C33)	0.000	0	N.D.	ug/mL	
35) t	n-tetratriacontane (C34)	0.000	0	N.D.	ug/mL	
36) t	n-Pentatriacontane (C35)	0.000	0	N.D.	ug/mL	
37) t	n-Hexatriacontane (C36)	0.000	0	N.D.	ug/mL	
38) t	n-Heptatriacontane (C37)	0.000	0	N.D.	ug/mL	
39) t	n-Octatriacontane (C38)	0.000	0	N.D.	ug/mL	
40) t	n-Nonatriacontane (C39)	0.000	0	N.D.	ug/mL	
41) t	n-Tetracontane (C40)	0.000	0	N.D.	ug/mL	
42) h	C9-C44 Total Petroleu...	35.451	175432930	180.586	ug/mL	m
42) h	C9-C44 Total Petroleu BS	35.451	-21250626	N.D.	ug/mLm	
43) h	C9-C40 Total Petroleu...	0.000	0	N.D.	ug/ml	d

Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222011.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 04:43 pm
Operator : FID18:WR
Sample : WG1618210-1
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 56 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:34 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : Default - All compounds listed

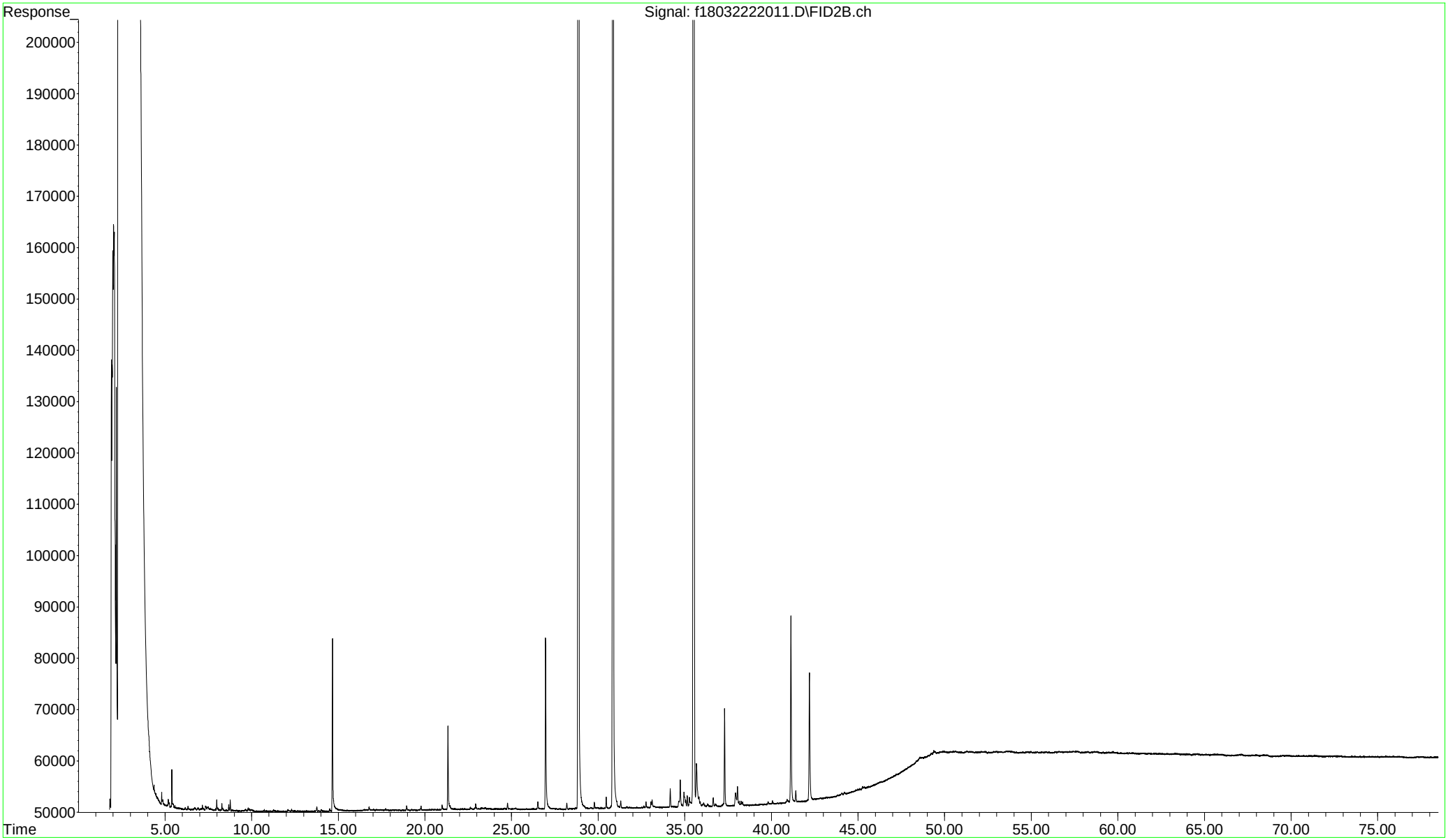
	Compound	R.T.	Response	Conc	Units	
44) h	C10-C28 DRO	25.502	37483589	39.370	ug/mL	m
44) h	C10-C28 DRO BS	25.502	11460464	12.037	ug/mL	m
45) h	C28-C40 ORO	47.557	67950383	67.367	ug/mL	m
45) h	C28-C40 ORO BS	47.557	-17295116	N.D.	ug/mL	m
46) h	Total Resolved Hydroc...	37.870	11300121	11.632	ug/mL	m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222011.D
Operator : FID18:WR
Acquired : 22 Mar 2022 04:43 pm using AcqMethod FID18.M
Sample Name: WG1618210-1
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 56
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222013.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 06:09 pm
Operator : FID18:WR
Sample : WG1618210-2,42,,
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 57 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:35 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

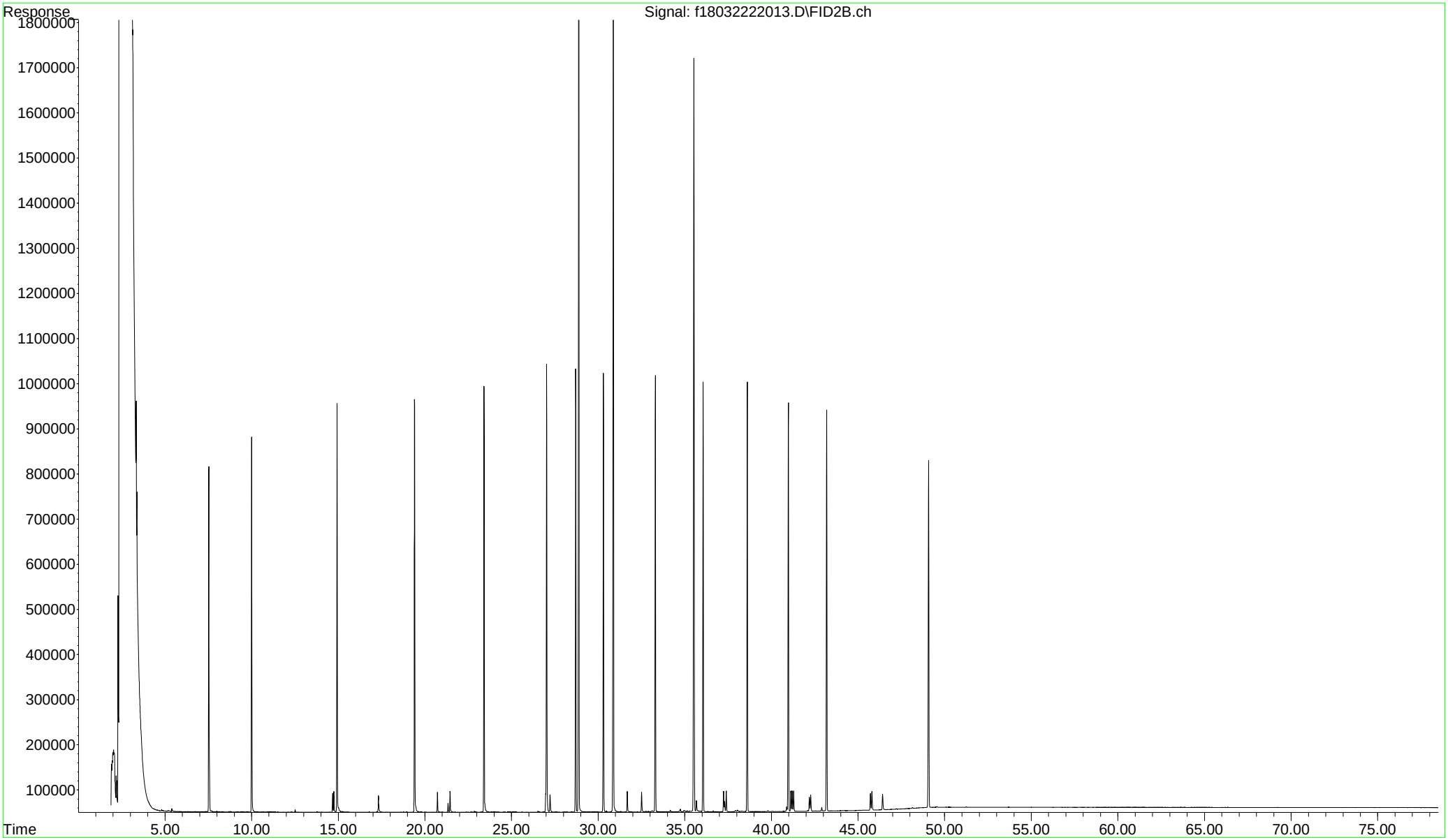
Sub List : SHC_QC_Samples - SHC_QC_Samples

	Compound	R.T.	Response	Conc Units
	Internal Standards			
1) I	5-alpha-androstane	30.877	52029457	50.000 ug/mL M4
	System Monitoring Compounds			
19) s	ortho-terphenyl	28.882	55885531	51.756 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery	= 103.51%
24) s	d50-Tetracosane	35.526	45301463	51.598 ug/mL M4
Spiked Amount	50.000	Range 50 - 130	Recovery	= 103.20%
	Target Compounds			
3) t	n-Nonane (C9)	7.528	14657467	16.854 ug/mL M4
4) t	n-Decane (C10)	10.003	16054725	17.763 ug/mL M4
6) t	n-Dodecane (C12)	14.925	16834167	18.299 ug/mL M4
9) t	n-Tetradecane (C14)	19.401	18077201	18.958 ug/mL M4
12) t	n-Hexadecane (C16)	23.411	19899046	20.665 ug/mL M4
16) t	n-Octadecane (C18)	27.023	22105365	22.301 ug/mL M4
18) t	n-Nonadecane (C19)	28.703	20447630	20.537 ug/mL M4
20) t	n-Eicosane (C20)	30.303	20392307	20.313 ug/mL M4
22) t	n-Docosane (C22)	33.299	20565456	20.236 ug/mL M4
25) t	n-Tetracosane (C24)	36.057	21090469	21.010 ug/mL M4
27) t	n-Hexacosane (C26)	38.606	21271120	20.752 ug/mL M4
29) t	n-Octacosane (C28)	40.979	21462311	20.527 ug/mL M4
31) t	n-Triacontane (C30)	43.188	21558343	20.571 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.074	20881086	17.946 ug/mL M4
42) h	C9-C44 Total Petroleu...	35.451	476735217	476.162 ug/mL m
42) h	C9-C44 Total Petroleu BS	35.451	280051661	279.715 ug/mLm
46) h	Total Resolved Hydroc...	37.870	300840580	300.479 ug/mL m
	SemiQuant Compounds - Not Calibrated on this Instrument			

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222013.D
Operator : FID18:WR
Acquired : 22 Mar 2022 06:09 pm using AcqMethod FID18.M
Sample Name: WG1618210-2,42,,
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 57
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Data Path : O:\Forensics\Data\FID18\2022\MAR22.SEC\
Data File : f18032222015.D
Signal(s) : FID2B.ch
Acq On : 22 Mar 2022 07:36 pm
Operator : FID18:WR
Sample : WG1618210-3,42,,
Misc : WG1618558,WG1618210,ICAL18676
ALS Vial : 58 Sample Multiplier: 1

Integration File: SHCINT2.E
Quant Time: Mar 23 13:12:36 2022
Quant Method : O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M
Quant Title : FID Forensics
QLast Update : Wed Mar 23 09:25:11 2022
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 1.0
Signal Phase : Rtx-5MS
Signal Info : 0.25mm

Blank Name : IB1803222201R
Blank File : f18032222007.D

Sub List : SHC_QC_Samples - SHC_QC_Samples

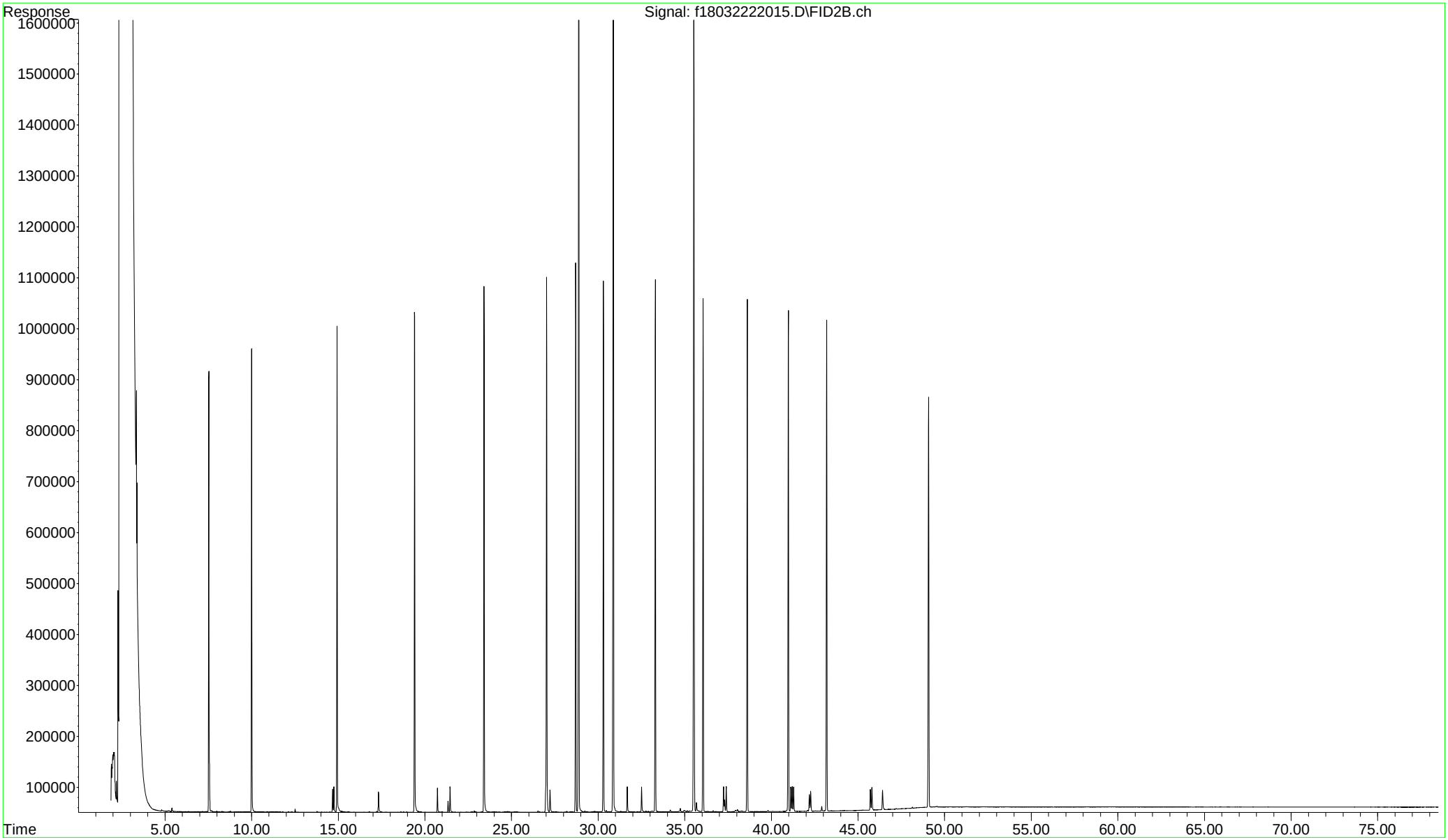
	Compound	R.T.	Response	Conc Units
	Internal Standards			
1) I	5-alpha-androstane	30.879	55914396	50.000 ug/mL M4
	System Monitoring Compounds			
19) s	ortho-terphenyl	28.884	60973999	52.545 ug/mL M4
Spiked Amount	50.000	Range	50 - 130	Recovery = 105.09%
24) s	d50-Tetracosane	35.524	48763918	51.683 ug/mL M4
Spiked Amount	50.000	Range	50 - 130	Recovery = 103.37%
	Target Compounds			
3) t	n-Nonane (C9)	7.528	15415319	16.494 ug/mL M4
4) t	n-Decane (C10)	10.003	16975049	17.477 ug/mL M4
6) t	n-Dodecane (C12)	14.925	18193680	18.403 ug/mL M4
9) t	n-Tetradecane (C14)	19.401	19438053	18.969 ug/mL M4
12) t	n-Hexadecane (C16)	23.410	21712928	20.982 ug/mL M4
16) t	n-Octadecane (C18)	27.023	24005428	22.535 ug/mL M4
18) t	n-Nonadecane (C19)	28.702	22156669	20.707 ug/mL M4
20) t	n-Eicosane (C20)	30.302	22119116	20.502 ug/mL M4
22) t	n-Docosane (C22)	33.300	22356256	20.469 ug/mL M4
25) t	n-Tetracosane (C24)	36.057	22761330	21.099 ug/mL M4
27) t	n-Hexacosane (C26)	38.607	22832341	20.727 ug/mL M4
29) t	n-Octacosane (C28)	40.979	22925515	20.403 ug/mL M4
31) t	n-Triacontane (C30)	43.193	22927943	20.358 ug/mL M4
37) t	n-Hexatriacontane (C36)	49.076	22387734	17.904 ug/mL M4
42) h	C9-C44 Total Petroleu...	35.451	505845870	470.134 ug/mL m
42) h	C9-C44 Total Petroleu BS	35.451	309162314	287.336 ug/mLm
46) h	Total Resolved Hydroc...	37.870	323016486	300.212 ug/mL m

SemiQuant Compounds - Not Calibrated on this Instrument

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

File :O:\Forensics\Data\FID18\2022\MAR22.SEC\f18032222015.D
Operator : FID18:WR
Acquired : 22 Mar 2022 07:36 pm using AcqMethod FID18.M
Sample Name: WG1618210-3,42,,
Instrument: FID 18
Misc Info : WG1618558,WG1618210,ICAL18676
Vial Number: 58
CurrentMeth: O:\Forensics\Data\FID18\2022\MAR22.SEC\HC18011822R_DRO.M



Alpha
Summary Forms

Organic Summary Forms

Results Summary
Form 1
Saturated Hydrocarbons by GC-FID

Client	: GSI Environmental Inc.	Lab Number	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	Project Number	: CTO-22F0106
Lab ID	: L2213568-01	Date Collected	: 03/10/22 14:50
Client ID	: A3000-PRN01-220310	Date Received	: 03/16/22
Sample Location	: RHBFS A3+00 SAMPLE LOCATION	Date Analyzed	: 03/22/22 22:28
Sample Matrix	: WATER	Date Extracted	: 03/22/22
Analytical Method	: 1,8015D(M)	Dilution Factor	: 1
Lab File ID	: F18032222019	Analyst	: WR
Sample Amount	: 90 ml	Instrument ID	: FID18
Extraction Method	: EPA 3510C	GC Column	: RTX-5
Extract Volume	: 1000 uL	%Solids	: N/A
GPC Cleanup	: N	Injection Volume	: 1 uL
Sulfur Cleanup	: N		

		mg/l			
CAS NO.	Parameter	Results	RL	MDL	Qualifier
111-84-2	n-Nonane (C9)	0.009	0.011	0.004	J
124-18-5	n-Decane (C10)	0.636	0.011	0.001	
1120-21-4	n-Undecane (C11)	5.05	0.011	0.001	E
112-40-3	n-Dodecane (C12)	8.13	0.011	0.001	E
629-50-5	n-Tridecane (C13)	7.79	0.056	0.010	E
3891-98-3	2,6,10-Trimethyldodecane (1380)	1.64	0.011	0.001	
629-59-4	n-Tetradecane (C14)	4.65	0.011	0.001	E
TMTD1470	2,6,10-Trimethyltridecane (1470)	1.20	0.011	0.002	
629-62-9	n-Pentadecane (C15)	1.80	0.011	0.002	
544-76-3	n-Hexadecane (C16)	0.339	0.011	0.002	
3892-00-0	Norpristane (1650)	0.099	0.011	0.002	
629-78-7	n-Heptadecane (C17)	0.077	0.011	0.002	
1921-70-6	Pristane	0.114	0.011	0.002	
593-45-3	n-Octadecane (C18)	0.029	0.011	0.001	
638-36-8	Phytane	0.052	0.011	0.001	
629-92-5	n-Nonadecane (C19)	0.009	0.011	0.002	J
112-95-8	n-Eicosane (C20)	0.006	0.011	0.001	J
629-94-7	n-Heneicosane (C21)	0.003	0.011	0.001	J
629-97-0	n-Docosane (C22)	0.001	0.011	0.0005	J
638-67-5	n-Tricosane (C23)	ND	0.011	0.001	U
646-31-1	n-Tetracosane (C24)	ND	0.011	0.001	U

Results Summary
Form 1
Saturated Hydrocarbons by GC-FID

Client	: GSI Environmental Inc.	Lab Number	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	Project Number	: CTO-22F0106
Lab ID	: L2213568-01	Date Collected	: 03/10/22 14:50
Client ID	: A3000-PRN01-220310	Date Received	: 03/16/22
Sample Location	: RHBFS A3+00 SAMPLE LOCATION	Date Analyzed	: 03/22/22 22:28
Sample Matrix	: WATER	Date Extracted	: 03/22/22
Analytical Method	: 1,8015D(M)	Dilution Factor	: 1
Lab File ID	: F18032222019	Analyst	: WR
Sample Amount	: 90 ml	Instrument ID	: FID18
Extraction Method	: EPA 3510C	GC Column	: RTX-5
Extract Volume	: 1000 uL	%Solids	: N/A
GPC Cleanup	: N	Injection Volume	: 1 uL
Sulfur Cleanup	: N		

		mg/l			
CAS NO.	Parameter	Results	RL	MDL	Qualifier
629-99-2	n-Pentacosane (C25)	ND	0.056	0.007	U
630-01-3	n-Hexacosane (C26)	0.001	0.011	0.001	J
593-49-7	n-Heptacosane (C27)	0.002	0.011	0.001	J
630-02-4	n-Octacosane (C28)	ND	0.011	0.002	U
630-03-5	n-Nonacosane (C29)	ND	0.011	0.001	U
638-68-6	n-Triacontane (C30)	ND	0.011	0.001	U
630-04-6	n-Hentriacontane (C31)	ND	0.011	0.001	U
544-85-4	n-Dotriacontane (C32)	ND	0.011	0.001	U
630-05-7	n-Tritriacontane (C33)	ND	0.011	0.001	U
14167-59-0	n-Tetratriacontane (C34)	ND	0.011	0.002	U
630-07-9	n-Pentatriacontane (C35)	ND	0.011	0.002	U
630-06-8	n-Hexatriacontane (C36)	ND	0.011	0.002	U
7194-84-5	n-Heptatriacontane (C37)	ND	0.011	0.002	U
7194-85-6	n-Octatriacontane (C38)	ND	0.011	0.002	U
7194-86-7	n-Nonatriacontane (C39)	ND	0.011	0.002	U
4181-95-7	n-Tetracontane (C40)	ND	0.011	0.002	U
NONE	C9-C44 Total Petroleu	182	0.367	0.062	
NONE	C10-C28 DRO	185	0.233	0.040	
NONE	C28-C40 ORO	0.171	0.122	0.018	

Results Summary
Form 1
Saturated Hydrocarbons by GC-FID

Client	: GSI Environmental Inc.	Lab Number	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	Project Number	: CTO-22F0106
Lab ID	: L2213568-01D	Date Collected	: 03/10/22 14:50
Client ID	: A3000-PRN01-220310	Date Received	: 03/16/22
Sample Location	: RHBFS A3+00 SAMPLE LOCATION	Date Analyzed	: 03/23/22 12:49
Sample Matrix	: WATER	Date Extracted	: 03/22/22
Analytical Method	: 1,8015D(M)	Dilution Factor	: 20
Lab File ID	: F18032222029	Analyst	: WR
Sample Amount	: 90 ml	Instrument ID	: FID18
Extraction Method	: EPA 3510C	GC Column	: RTX-5
Extract Volume	: 1000 uL	%Solids	: N/A
GPC Cleanup	: N	Injection Volume	: 1 uL
Sulfur Cleanup	: N		

		mg/l			
CAS NO.	Parameter	Results	RL	MDL	Qualifier
1120-21-4	n-Undecane (C11)	4.92	0.222	0.021	
112-40-3	n-Dodecane (C12)	7.80	0.222	0.029	
629-50-5	n-Tridecane (C13)	6.66	1.11	0.197	
629-59-4	n-Tetradecane (C14)	4.23	0.222	0.022	
TSATHC	Total Saturated Hydrocarbons	29.6	0.011	0.0005	

Results Summary
Form 1
Saturated Hydrocarbons by GC-FID

Client	: GSI Environmental Inc.	Lab Number	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	Project Number	: CTO-22F0106
Lab ID	: WG1618210-1	Date Collected	: NA
Client ID	: WG1618210-1BLANK	Date Received	: NA
Sample Location	:	Date Analyzed	: 03/22/22 16:43
Sample Matrix	: WATER	Date Extracted	: 03/22/22
Analytical Method	: 1,8015D(M)	Dilution Factor	: 1
Lab File ID	: F18032222011	Analyst	: WR
Sample Amount	: 90 ml	Instrument ID	: FID18
Extraction Method	: EPA 3510C	GC Column	: RTX-5
Extract Volume	: 1000 uL	%Solids	: N/A
GPC Cleanup	: N	Injection Volume	: 1 uL
Sulfur Cleanup	: N		

		mg/l			
CAS NO.	Parameter	Results	RL	MDL	Qualifier
111-84-2	n-Nonane (C9)	ND	0.011	0.004	U
124-18-5	n-Decane (C10)	ND	0.011	0.001	U
1120-21-4	n-Undecane (C11)	ND	0.011	0.001	U
112-40-3	n-Dodecane (C12)	ND	0.011	0.001	U
629-50-5	n-Tridecane (C13)	ND	0.056	0.010	U
3891-98-3	2,6,10-Trimethyldodecane (1380)	ND	0.011	0.001	U
629-59-4	n-Tetradecane (C14)	ND	0.011	0.001	U
TMTD1470	2,6,10-Trimethyltridecane (1470)	ND	0.011	0.002	U
629-62-9	n-Pentadecane (C15)	ND	0.011	0.002	U
544-76-3	n-Hexadecane (C16)	ND	0.011	0.002	U
3892-00-0	Norpristane (1650)	ND	0.011	0.002	U
629-78-7	n-Heptadecane (C17)	ND	0.011	0.002	U
1921-70-6	Pristane	ND	0.011	0.002	U
593-45-3	n-Octadecane (C18)	ND	0.011	0.001	U
638-36-8	Phytane	ND	0.011	0.001	U
629-92-5	n-Nonadecane (C19)	ND	0.011	0.002	U
112-95-8	n-Eicosane (C20)	ND	0.011	0.001	U
629-94-7	n-Heneicosane (C21)	ND	0.011	0.001	U
629-97-0	n-Docosane (C22)	ND	0.011	0.0005	U
638-67-5	n-Tricosane (C23)	ND	0.011	0.001	U
646-31-1	n-Tetracosane (C24)	ND	0.011	0.001	U

Results Summary
Form 1
Saturated Hydrocarbons by GC-FID

Client	: GSI Environmental Inc.	Lab Number	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	Project Number	: CTO-22F0106
Lab ID	: WG1618210-1	Date Collected	: NA
Client ID	: WG1618210-1BLANK	Date Received	: NA
Sample Location	:	Date Analyzed	: 03/22/22 16:43
Sample Matrix	: WATER	Date Extracted	: 03/22/22
Analytical Method	: 1,8015D(M)	Dilution Factor	: 1
Lab File ID	: F18032222011	Analyst	: WR
Sample Amount	: 90 ml	Instrument ID	: FID18
Extraction Method	: EPA 3510C	GC Column	: RTX-5
Extract Volume	: 1000 uL	%Solids	: N/A
GPC Cleanup	: N	Injection Volume	: 1 uL
Sulfur Cleanup	: N		

		mg/l			
CAS NO.	Parameter	Results	RL	MDL	Qualifier
629-99-2	n-Pentacosane (C25)	ND	0.056	0.007	U
630-01-3	n-Hexacosane (C26)	ND	0.011	0.001	U
593-49-7	n-Heptacosane (C27)	ND	0.011	0.001	U
630-02-4	n-Octacosane (C28)	ND	0.011	0.002	U
630-03-5	n-Nonacosane (C29)	ND	0.011	0.001	U
638-68-6	n-Triacontane (C30)	ND	0.011	0.001	U
630-04-6	n-Hentriacontane (C31)	ND	0.011	0.001	U
544-85-4	n-Dotriacontane (C32)	ND	0.011	0.001	U
630-05-7	n-Tritriacontane (C33)	ND	0.011	0.001	U
14167-59-0	n-Tetratriacontane (C34)	ND	0.011	0.002	U
630-07-9	n-Pentatriacontane (C35)	ND	0.011	0.002	U
630-06-8	n-Hexatriacontane (C36)	ND	0.011	0.002	U
7194-84-5	n-Heptatriacontane (C37)	ND	0.011	0.002	U
7194-85-6	n-Octatriacontane (C38)	ND	0.011	0.002	U
7194-86-7	n-Nonatriacontane (C39)	ND	0.011	0.002	U
4181-95-7	n-Tetracontane (C40)	ND	0.011	0.002	U
NONE	C9-C44 Total Petroleu	ND	0.367	0.062	U
NONE	C10-C28 DRO	0.134	0.233	0.040	J
NONE	C28-C40 ORO	ND	0.122	0.018	U
TSATHC	Total Saturated Hydrocarbons	ND	0.011	0.0005	U

Surrogate Recovery Summary
Form 2
Petroleum

Client: GSI Environmental Inc.
Project Name: SITE CHAR, CUTOUT ADIT 3

Lab Number: L2213568
Project Number: CTO-22F0106
Matrix: Water

GC Column 1: RTX-5

CLIENT ID (LAB SAMPLE NO.)	d50 %REC	OTP %REC	%REC	%REC	OTHER (1)	OTHER (2)	TOT OUT
A3000-PRN01-220310 (L2213568-01)	106	108	--	--			0
A3000-PRN01-220310 (L2213568-01D)	103	105	--	--			0
WG1618210-1BLANK	108	110	--	--			0
WG1618210-2LCS	103	104	--	--			0
WG1618210-3LCSD	103	105	--	--			0

QC LIMITS
(50-130) d50- = D50-TETRACOSANE
(50-130) OTP = O-TERPHENYL

*** Values outside of QC limits**

FORM II A2-SHC

Laboratory Control Sample Summary
Form 3
Petroleum

Client	: GSI Environmental Inc.	**Lab Number**	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	**Project Number**	: CTO-22F0106
Matrix	: WATER		
LCS Sample ID	: WG1618210-2 **Analysis Date** : 03/22/22 18:09	**File ID**	: f18032222013
LCSD Sample ID	: WG1618210-3 **Analysis Date** : 03/22/22 19:36	**File ID**	: f18032222015

	Laboratory Control Sample			Laboratory Control Duplicate					
Parameter	True (mg/l)	Found (mg/l)	%R	True (mg/l)	Found (mg/l)	%R	RPD	Recovery Limits	RPD Limit
Nonane (C9)	0.222	0.187	84	0.222	0.183	82	2	50-130	30
n-Decane (C10)	0.222	0.197	89	0.222	0.194	87	2	50-130	30
n-Dodecane (C12)	0.222	0.203	91	0.222	0.204	92	1	50-130	30
n-Tetradecane (C14)	0.222	0.211	95	0.222	0.211	95	0	50-130	30
n-Hexadecane (C16)	0.222	0.230	103	0.222	0.233	105	2	50-130	30
n-Octadecane (C18)	0.222	0.248	112	0.222	0.250	113	1	50-130	30
n-Nonadecane (C19)	0.222	0.228	103	0.222	0.230	104	1	50-130	30
n-Eicosane (C20)	0.222	0.226	102	0.222	0.228	102	0	50-130	30
n-Docosane (C22)	0.222	0.225	101	0.222	0.227	102	1	50-130	30
n-Tetracosane (C24)	0.222	0.233	105	0.222	0.234	105	0	50-130	30
n-Hexacosane (C26)	0.222	0.230	104	0.222	0.230	104	0	50-130	30
n-Octacosane (C28)	0.222	0.228	103	0.222	0.227	102	1	50-130	30
n-Triacontane (C30)	0.222	0.228	103	0.222	0.226	102	1	50-130	30
n-Hexatriacontane (C36)	0.222	0.199	90	0.222	0.199	90	0	50-130	30

Method Blank Summary
Form 4
Petroleum

Client	: GSI Environmental Inc.	Lab Number	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	Project Number	: CTO-22F0106
Lab Sample ID	: WG1618210-1	Lab File ID	: f18032222011
Instrument ID	: FID18	Extraction Date	: 03/22/22
Matrix	: WATER	Analysis Date	: 03/22/22 16:43
Level	: LOW		

Client Sample No.	Lab Sample ID	Analysis Date
WG1618210-2LCS	WG1618210-2	03/22/22 18:09
WG1618210-3LCSD	WG1618210-3	03/22/22 19:36
A3000-PRN01-220310	L2213568-01	03/22/22 22:28
A3000-PRN01-220310	L2213568-01D	03/23/22 12:49

Initial Calibration Summary
Form 6
Petroleum

Client	: GSI Environmental Inc.	**Lab Number**	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	**Project Number**	: CTO-22F0106
Instrument ID	: FID18	**Ical Ref**	: ICAL18676
Calibration dates	: 01/18/22 19:48 01/19/22 02:59		

Calibration Files
1 =f18011822011.D 10 =f18011822013.D 50 =f18011822015.D 100 =f18011822017.D 200 =f18011822019.D
500 =f18011822021.D

		Compound	1	10	50	100	200	500	Avg	%RSD
1)	I	5-alpha-androstane	----------ISTD----------							
2)	t	n-Octane (C8)	0.786	0.832	0.850	0.792	0.775		0.807	4.00
3)	t	n-Nonane (C9)	0.813	0.855	0.886	0.824	0.801		0.836	4.13
4)	t	n-Decane (C10)	0.838	0.887	0.917	0.866	0.835		0.869	4.00
5)	t	n-Undecane (C11)	0.836	0.888	0.934	0.871	0.836		0.873	4.71
6)	t	n-Dodecane (C12)	0.852	0.902	0.936	0.883	0.846		0.884	4.18
7)	t	n-Tridecane (C13)	0.862	0.909	0.944	0.886	0.850		0.890	4.25
8)	t	1380	0.897	0.939	0.962	0.910	0.874		0.916	3.80
9)	t	n-Tetradecane (C14)	0.897	0.939	0.962	0.910	0.874		0.916	3.80
10)	t	1470	0.916	0.949	0.957	0.916	0.881		0.924	3.27
11)	t	n-Pentadecane (C15)	0.916	0.949	0.957	0.916	0.881		0.924	3.27
12)	t	n-Hexadecane (C16)	0.917	0.946	0.975	0.911	0.877		0.925	4.02
13)	t	1650	0.934	0.963	0.994	0.925	0.895		0.942	4.00
14)	t	n-Heptadecane (C17)	0.934	0.963	0.994	0.925	0.895		0.942	4.00
15)	t	Pristane	0.953	0.983	0.996	0.943	0.903		0.955	3.82
16)	t	n-Octadecane (C18)	0.945	0.974	1.000	0.936	0.907		0.953	3.78
17)	t	Phytane	0.877	0.905	0.920	0.868	0.836		0.881	3.72
18)	t	n-Nonadecane (C19)	0.956	0.982	0.989	0.944	0.914		0.957	3.15
19)	s	ortho-terphenyl	1.057	1.037	1.070	1.018	0.983	1.062	1.038	3.15
20)	t	n-Eicosane (C20)	0.966	0.990	1.002	0.951	0.914		0.965	3.58
21)	t	n-Heneicosane (C21)	0.985	0.996	1.000	0.957	0.922		0.972	3.36
22)	t	n-Docosane (C22)	0.989	0.996	1.018	0.957	0.923		0.977	3.78
23)	t	n-Tricosane (C23)	0.974	0.995	1.020	0.959	0.925		0.974	3.67
24)	s	d50-Tetracosane	0.856	0.838	0.871	0.827	0.801	0.870	0.844	3.24
25)	t	n-Tetracosane (C24)	0.977	0.994	0.972	0.957	0.923		0.965	2.77
26)	t	n-Pentacosane (C25)	0.959	0.976	1.009	0.938	0.909		0.958	3.95
27)	t	n-Hexacosane (C26)	0.981	1.003	1.043	0.964	0.934		0.985	4.15
28)	t	n-Heptacosane (C27)	0.999	1.005	1.008	0.965	0.935		0.983	3.21
29)	t	n-Octacosane (C28)	1.004	1.025	1.051	0.986	0.957		1.005	3.60
30)	t	n-Nonacosane (C29)	0.998	1.022	1.052	0.984	0.954		1.002	3.72
31)	t	n-Triacontane (C30)	0.999	1.027	1.059	0.990	0.960		1.007	3.74
32)	t	n-Hentriacontane (C31)	0.979	0.993	1.031	0.958	0.929		0.978	3.93
33)	t	n-Dotriacontane (C32)	1.010	1.041	1.084	1.009	0.979		1.025	3.91
34)	t	n-Tritriacontane (C33)	0.979	1.012	1.051	0.984	0.954		0.996	3.70
35)	t	n-tetratriacontane (C34	0.969	1.008	1.051	0.983	0.954		0.993	3.84
36)	t	n-Pentatriacontane (C35	0.916	0.944	1.065	0.920	0.894		0.948	7.13

Initial Calibration Summary
Form 6
Petroleum

Client	: GSI Environmental Inc.	**Lab Number**	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	**Project Number**	: CTO-22F0106
Instrument ID	: FID18	**Ical Ref**	: ICAL18676
Calibration dates	: 01/18/22 19:48 01/19/22 02:59		

Calibration Files
1 =f18011822011.D 10 =f18011822013.D 50 =f18011822015.D 100 =f18011822017.D 200 =f18011822019.D
500 =f18011822021.D

	Compound	1	10	50	100	200	500	Avg	%RSD
37) t	n-Hexatriacontane (C36)	1.102	1.141	1.150	1.114	1.084		1.118	2.42
38) t	n-Heptatriacontane (C37	1.003	1.040	1.062	1.015	0.990		1.022	2.84
39) t	n-Octatriacontane (C38)	1.006	1.058	1.101	1.029	1.005		1.040	3.87
40) t	n-Nonatriacon	0.994	1.052	1.110	1.018	0.996		1.034	4.69
41) t	n-Tetracontane (C40)	0.994	1.052	1.110	1.018	0.996		1.034	4.69
42) h	C9-C44 Total	0.951	0.982	1.011	0.949	0.918		0.962	3.66
43) h	C9-C40 Total	0.951	0.982	1.011	0.949	0.918		0.962	3.66
44) h	C10-C28 DRO	0.936	0.964	0.986	0.931	0.898		0.943	3.57
45) h	C28-C40 ORO	0.997	1.030	1.072	0.999	0.897		0.999	6.49
46) h	Total Resolve	0.951	0.982	1.011	0.949	0.918		0.962	3.66

Calibration Verification Summary
Form 7
Petroleum

Client	: GSI Environmental Inc.	Lab Number	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	Project Number	: CTO-22F0106
Instrument ID	: FID18	Calibration Date	: 03/22/22 12:16
Lab File ID	: F18032222005	Init. Calib. Date(s)	: 01/18/22 01/19/22
Sample No	: WG1618558-1	Init. Calib. Times	: 19:48 02:59
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
5-alpha-androstane	1	1	.05	0	25	96	0
n-Octane (C8)	0.807	0.858	.05	-6.3	25	96	0
n-Nonane (C9)	0.836	0.9	.05	-7.7	25	97	0
n-Decane (C10)	0.869	0.934	.05	-7.5	25	97	0
n-Undecane (C11)	0.873	0.951	.05	-8.9	25	97	0
n-Dodecane (C12)	0.884	0.948	.05	-7.2	25	97	0
n-Tridecane (C13)	0.89	0.953	.05	-7.1	25	96	0
n-Tetradecane (C14)	0.916	0.967	.05	-5.6	25	96	0
n-Pentadecane (C15)	0.924	0.96	.05	-3.9	25	96	0
n-Hexadecane (C16)	0.925	0.974	.05	-5.3	25	95	0
n-Heptadecane (C17)	0.942	0.981	.05	-4.1	25	94	0
Pristane	0.955	1.003	.05	-5	25	96	0
n-Octadecane (C18)	0.953	0.987	.05	-3.6	25	94	0
Phytane	0.881	0.926	.05	-5.1	25	96	0
n-Nonadecane (C19)	0.957	0.983	.05	-2.7	25	95	0
ortho-terphenyl	1.038	1.077	.05	-3.8	25	96	0
n-Eicosane (C20)	0.965	0.998	.05	-3.4	25	95	0
n-Heneicosane (C21)	0.972	0.993	.05	-2.2	25	95	0
n-Docosane (C22)	0.977	1.008	.05	-3.2	25	95	0
n-Tricosane (C23)	0.974	1.012	.05	-3.9	25	95	0
d50-Tetracosane	0.844	0.86	.05	-1.9	25	94	0
n-Tetracosane (C24)	0.965	0.958	.05	0.7	25	94	0
n-Pentacosane (C25)	0.958	0.994	.05	-3.8	25	94	0
n-Hexacosane (C26)	0.985	1.023	.05	-3.9	25	94	0
n-Heptacosane (C27)	0.983	0.988	.05	-0.5	25	94	0
n-Octacosane (C28)	1.005	1.031	.05	-2.6	25	94	0
n-Nonacosane (C29)	1.002	1.025	.05	-2.3	25	93	0
n-Triacontane (C30)	1.007	1.029	.05	-2.2	25	93	0
n-Hentriacontane (C31)	0.978	1	.05	-2.2	25	93	0
n-Dotriacontane (C32)	1.025	1.051	.05	-2.5	25	93	0
n-Tritriacontane (C33)	0.996	1.012	.05	-1.6	25	92	0
n-tetratriacontane (C34)	0.993	1.008	.05	-1.5	25	92	0
n-Pentatriacontane (C35)	0.948	1.019	.05	-7.5	25	91	0
n-Hexatriacontane (C36)	1.118	1.093	.05	2.2	25	91	0
n-Heptatriacontane (C37)	1.022	1.006	.05	1.6	25	91	0
n-Octatriacontane (C38)	1.04	1.039	.05	0.1	25	90	0
n-Tetracontane (C40)	1.034	1.032	.05	0.2	25	89	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Petroleum

Client	: GSI Environmental Inc.	Lab Number	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	Project Number	: CTO-22F0106
Instrument ID	: FID18	Calibration Date	: 03/22/22 23:54
Lab File ID	: F18032222021	Init. Calib. Date(s)	: 01/18/22 01/19/22
Sample No	: WG1618558-2	Init. Calib. Times	: 19:48 02:59
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
5-alpha-androstane	1	1	.05	0	25	92	0
n-Octane (C8)	0.807	0.829	.05	-2.7	25	90	0
n-Nonane (C9)	0.836	0.879	.05	-5.1	25	91	0
n-Decane (C10)	0.869	0.917	.05	-5.5	25	92	0
n-Undecane (C11)	0.873	0.931	.05	-6.6	25	92	0
n-Dodecane (C12)	0.884	0.939	.05	-6.2	25	92	0
n-Tridecane (C13)	0.89	0.945	.05	-6.2	25	92	0
n-Tetradecane (C14)	0.916	0.962	.05	-5	25	92	0
n-Pentadecane (C15)	0.924	0.956	.05	-3.5	25	92	0
n-Hexadecane (C16)	0.925	0.972	.05	-5.1	25	92	0
n-Heptadecane (C17)	0.942	0.981	.05	-4.1	25	91	0
Pristane	0.955	1.005	.05	-5.2	25	93	0
n-Octadecane (C18)	0.953	0.987	.05	-3.6	25	91	0
Phytane	0.881	0.933	.05	-5.9	25	93	0
n-Nonadecane (C19)	0.957	0.987	.05	-3.1	25	92	0
ortho-terphenyl	1.038	1.075	.05	-3.6	25	93	0
n-Eicosane (C20)	0.965	1.008	.05	-4.5	25	93	0
n-Heneicosane (C21)	0.972	0.999	.05	-2.8	25	92	0
n-Docosane (C22)	0.977	1.018	.05	-4.2	25	92	0
n-Tricosane (C23)	0.974	1.023	.05	-5	25	92	0
d50-Tetracosane	0.844	0.87	.05	-3.1	25	92	0
n-Tetracosane (C24)	0.965	0.969	.05	-0.4	25	92	0
n-Pentacosane (C25)	0.958	1.007	.05	-5.1	25	92	0
n-Hexacosane (C26)	0.985	1.038	.05	-5.4	25	92	0
n-Heptacosane (C27)	0.983	1.004	.05	-2.1	25	92	0
n-Octacosane (C28)	1.005	1.048	.05	-4.3	25	92	0
n-Nonacosane (C29)	1.002	1.045	.05	-4.3	25	91	0
n-Triacontane (C30)	1.007	1.051	.05	-4.4	25	91	0
n-Hentriacontane (C31)	0.978	1.024	.05	-4.7	25	91	0
n-Dotriacontane (C32)	1.025	1.079	.05	-5.3	25	92	0
n-Tritriacontane (C33)	0.996	1.045	.05	-4.9	25	92	0
n-tetratriacontane (C34)	0.993	1.045	.05	-5.2	25	92	0
n-Pentatriacontane (C35)	0.948	1.06	.05	-11.8	25	92	0
n-Hexatriacontane (C36)	1.118	1.141	.05	-2.1	25	91	0
n-Heptatriacontane (C37)	1.022	1.051	.05	-2.8	25	91	0
n-Octatriacontane (C38)	1.04	1.094	.05	-5.2	25	92	0
n-Tetracontane (C40)	1.034	1.079	.05	-4.4	25	90	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Petroleum

Client	: GSI Environmental Inc.	Lab Number	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	Project Number	: CTO-22F0106
Instrument ID	: FID18	Calibration Date	: 03/23/22 14:16
Lab File ID	: F18032222031	Init. Calib. Date(s)	: 01/18/22 01/19/22
Sample No	: WG1618558-3	Init. Calib. Times	: 19:48 02:59
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
5-alpha-androstane	1	1	.05	0	25	91	0
n-Octane (C8)	0.807	0.839	.05	-4	25	90	0
n-Nonane (C9)	0.836	0.876	.05	-4.8	25	90	0
n-Decane (C10)	0.869	0.907	.05	-4.4	25	90	0
n-Undecane (C11)	0.873	0.927	.05	-6.2	25	91	0
n-Dodecane (C12)	0.884	0.928	.05	-5	25	91	0
n-Tridecane (C13)	0.89	0.935	.05	-5.1	25	90	0
n-Tetradecane (C14)	0.916	0.953	.05	-4	25	90	0
n-Pentadecane (C15)	0.924	0.948	.05	-2.6	25	91	0
n-Hexadecane (C16)	0.925	0.965	.05	-4.3	25	90	0
n-Heptadecane (C17)	0.942	0.973	.05	-3.3	25	90	0
Pristane	0.955	0.999	.05	-4.6	25	92	0
n-Octadecane (C18)	0.953	0.982	.05	-3	25	90	0
Phytane	0.881	0.929	.05	-5.4	25	92	0
n-Nonadecane (C19)	0.957	0.981	.05	-2.5	25	91	0
ortho-terphenyl	1.038	1.073	.05	-3.4	25	92	0
n-Eicosane (C20)	0.965	1.003	.05	-3.9	25	91	0
n-Heneicosane (C21)	0.972	0.999	.05	-2.8	25	91	0
n-Docosane (C22)	0.977	1.016	.05	-4	25	91	0
n-Tricosane (C23)	0.974	1.021	.05	-4.8	25	91	0
d50-Tetracosane	0.844	0.869	.05	-3	25	91	0
n-Tetracosane (C24)	0.965	0.968	.05	-0.3	25	91	0
n-Pentacosane (C25)	0.958	1.004	.05	-4.8	25	91	0
n-Hexacosane (C26)	0.985	1.036	.05	-5.2	25	91	0
n-Heptacosane (C27)	0.983	1	.05	-1.7	25	91	0
n-Octacosane (C28)	1.005	1.043	.05	-3.8	25	91	0
n-Nonacosane (C29)	1.002	1.038	.05	-3.6	25	90	0
n-Triacontane (C30)	1.007	1.041	.05	-3.4	25	90	0
n-Hentriacontane (C31)	0.978	1.01	.05	-3.3	25	89	0
n-Dotriacontane (C32)	1.025	1.06	.05	-3.4	25	89	0
n-Tritriacontane (C33)	0.996	1.023	.05	-2.7	25	89	0
n-tetratriacontane (C34)	0.993	1.019	.05	-2.6	25	89	0
n-Pentatriacontane (C35)	0.948	1.03	.05	-8.6	25	88	0
n-Hexatriacontane (C36)	1.118	1.107	.05	1	25	88	0
n-Heptatriacontane (C37)	1.022	1.018	.05	0.4	25	88	0
n-Octatriacontane (C38)	1.04	1.05	.05	-1	25	87	0
n-Tetracontane (C40)	1.034	1.045	.05	-1.1	25	86	0

* Value outside of QC limits.

Internal Standard Area and RT Summary
Form 8a
Petroleum

Client	: GSI Environmental Inc.	**Lab Number**	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	**Project Number**	: CTO-22F0106
Instrument ID	: FID18	**Analysis Date**	: 03/22/22 12:16:00
Sample No	: WG1618558-1	**Lab File ID**	: F18032222005

	5-a-androstane					
	Area	RT	Area	RT	Area	RT
WG1618558-1	54828827	30.88				
Upper Limit	109657654	31.38				
Lower Limit	27414414	30.38				
Sample ID						
WG1618210-1 BLANK	50483982	30.87				
WG1618210-2 LCS	52029457	30.88				
WG1618210-3 LCSD	55914396	30.88				
A3000-PRN01-220310	54723123	30.88				
WG1618558-2 CCAL	52812404	30.88				

Area Upper Limit = +100% of internal standard area
Area Lower Limit = - 50% of internal standard area

RT Upper Limit = +0.50 minutes of internal standard RT
RT Lower Limit = -0.50 minutes of internal standard RT

* Values outside of QC limits

Internal Standard Area and RT Summary
Form 8a
Petroleum

Client	: GSI Environmental Inc.	**Lab Number**	: L2213568
Project Name	: SITE CHAR, CUTOUT ADIT 3	**Project Number**	: CTO-22F0106
Instrument ID	: FID18	**Analysis Date**	: 03/22/22 23:54:00
Sample No	: WG1618558-2	**Lab File ID**	: F18032222021

	5-a-androstane					
	Area	RT	Area	RT	Area	RT
WG1618558-2	52812404	30.88				
Upper Limit	105624808	31.38				
Lower Limit	26406202	30.38				
Sample ID						
A3000-PRN01-220310	48454780	30.87				
WG1618558-3 CCAL	52374968	30.88				

Area Upper Limit = +100% of internal standard area
Area Lower Limit = - 50% of internal standard area

RT Upper Limit = +0.50 minutes of internal standard RT
RT Lower Limit = -0.50 minutes of internal standard RT

* Values outside of QC limits

ANALYTICAL REPORT

Lab Number:	L2250292
Client:	GSI Environmental Inc. 2211 Norfolk Suite 1000 Houston, TX 77098
ATTN:	[redacted] (b) (6)
Phone:	[redacted] (b) (6)
Project Name:	Not Specified
Project Number:	CTO-22F0106
Report Date:	10/04/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2250292-01	A3015TW-PRN01-WK2	WATER	Not Specified	09/12/22 13:15	09/15/22
L2250292-02	A3-010DSVMP-PRN01-WK2	WATER	Not Specified	09/12/22 12:55	09/15/22

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

PIANO Volatile Organics

The WG1691160-5 Method Blank, associated with L2250292-01, has concentrations below the reporting limits and "J" qualified. Associated field sample results are "B" qualified if the concentrations are less than 10x the concentrations in the blank.

Saturated Hydrocarbons

L2250292-01 and -02: The sample was extracted and then analyzed using a gas chromatograph equipped with a flame ionization detector (GC/FID). The temperature program and associated experimental conditions were optimized to obtain maximum resolution in an eighty minute chromatographic run representative of hydrocarbons in the n-Octane (C8) to n-Tetracontane (C40) range. Qualitative evaluation of the sample was conducted by reviewing the sample chromatogram in conjunction with a chromatogram of a normal alkane series generated with the same chromatographic conditions. Chromatograms of hydrocarbon reference materials obtained from our library of 82 reference standards were also utilized to provide the best possible sample match. Quantitative determination of the sample's hydrocarbon concentration was performed in accordance with EPA Method 8015M. The sample's total hydrocarbon concentration and all associated quality control data are included in the report.

The following qualitative information is based on a tentative interpretation of chromatographic pattern recognition and boiling point ranges:

Total Petroleum Hydrocarbon Identification

L2250292-01 and -02 contain hydrocarbons eluting in the range of n-Nonane (C9) to after the elution of n-Octadecane (C18).

Based on the data generated, L2250292-01 and -02 containsmaterial eluting in the low to mid weight ranges of the chromatogram which is similar to a JP-5 Jet Fuel / Kerosene type product.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: (b) (6) [redacted]

Title: Technical Director/Representative

Date: 10/04/22

ORGANICS

VOLATILES

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8260B
Analytical Date: 09/23/22 10:22
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3-Methyl-1-butene	ND		ug/l	2.00	0.297	1
Isopentane	ND		ug/l	2.00	0.366	1
1-Pentene	ND		ug/l	2.00	0.365	1
2-Methyl-1-Butene	ND		ug/l	2.00	0.311	1
Pentane	ND		ug/l	2.00	0.624	1
trans-2-Pentene	ND		ug/l	2.00	0.270	1
Isoprene	ND		ug/l	2.00	0.357	1
cis-2-Pentene	ND		ug/l	2.00	0.322	1
Tertiary Butanol	ND		ug/l	25.0	3.24	1
2,2-Dimethylbutane	ND		ug/l	2.00	0.617	1
4-Methyl-1-pentene	ND		ug/l	2.00	0.311	1
Cyclopentane	ND		ug/l	2.00	0.519	1
2,3-Dimethylbutane	ND		ug/l	2.00	0.826	1
2-Methylpentane	ND		ug/l	2.00	0.542	1
Methyl tert butyl ether	ND		ug/l	2.00	0.412	1
3-Methylpentane	ND		ug/l	2.00	0.317	1
1-Hexene	ND		ug/l	2.00	0.281	1
n-Hexane	ND		ug/l	2.00	0.329	1
Isopropyl Ether	ND		ug/l	2.00	0.242	1
trans-2-Hexene	ND		ug/l	2.00	0.261	1
2-Methyl-2-pentene	ND		ug/l	2.00	0.306	1
cis-2-Hexene	ND		ug/l	2.00	0.271	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.00	0.303	1
2,2-Dimethylpentane	ND		ug/l	2.00	0.269	1
Methylcyclopentane	ND		ug/l	2.00	0.268	1
2,4-Dimethylpentane	ND		ug/l	2.00	0.247	1
2,2,3-Trimethylbutane	ND		ug/l	2.00	0.270	1
1,2-Dichloroethane	ND		ug/l	2.00	0.295	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3,3-Dimethylpentane	ND		ug/l	2.00	0.372	1
Cyclohexane	ND		ug/l	2.00	0.247	1
2-Methylhexane	ND		ug/l	2.00	0.315	1
Benzene	ND		ug/l	2.00	0.305	1
2,3-Dimethylpentane	ND		ug/l	2.00	0.265	1
Thiophene	ND		ug/l	2.00	0.284	1
1,1-Dimethylcyclopentane	ND		ug/l	2.00	0.240	1
3-Methylhexane	ND		ug/l	2.00	0.320	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.00	0.246	1
3-Ethylpentane	ND		ug/l	2.00	0.289	1
1-Heptene/1,2-DMCP (trans)	ND		ug/l	4.00	0.585	1
Isooctane	ND		ug/l	2.00	0.218	1
trans-3-Heptene	ND		ug/l	2.00	0.311	1
Heptane	ND		ug/l	2.00	0.348	1
trans-2-Heptene	ND		ug/l	2.00	0.256	1
cis-2-Heptene	ND		ug/l	2.00	0.387	1
2,2-Dimethylhexane	ND		ug/l	2.00	0.290	1
Methylcyclohexane	ND		ug/l	2.00	0.270	1
2,5-Dimethylhexane	ND		ug/l	2.00	0.348	1
2,4-Dimethylhexane	ND		ug/l	2.00	0.243	1
Ethylcyclopentane	ND		ug/l	2.00	0.265	1
2,2,3-Trimethylpentane	ND		ug/l	2.00	0.347	1
2,3,4-Trimethylpentane	ND		ug/l	2.00	0.261	1
2,3,3-Trimethylpentane	ND		ug/l	2.00	0.397	1
Xylene (Total)[1]	14.0		ug/l	2.00	0.209	1
2,3-Dimethylhexane	ND		ug/l	2.00	0.485	1
2-Methylheptane	ND		ug/l	2.00	0.338	1
4-Methylheptane	ND		ug/l	2.00	0.344	1
3-Methylheptane	ND		ug/l	2.00	0.385	1
3-Ethylhexane	ND		ug/l	2.00	0.358	1
Toluene	ND		ug/l	2.00	0.271	1
2-Methylthiophene	ND		ug/l	2.00	0.170	1
1,4-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.260	1
3-Methylthiophene	ND		ug/l	2.00	0.234	1
1-Octene	ND		ug/l	5.00	0.307	1
Octane	ND		ug/l	2.00	0.235	1
1,2-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.294	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1,2-Dibromoethane	ND		ug/l	2.00	0.320	1
cis-2-Octene	ND		ug/l	2.00	0.229	1
Isopropylcyclopentane	ND		ug/l	2.00	0.293	1
1,2-Dimethylcyclohexane (cis)	ND		ug/l	2.00	0.581	1
2,5-Dimethylheptane	ND		ug/l	2.00	0.335	1
3,5-Dimethylheptane	ND		ug/l	2.00	0.282	1
3,3-Dimethylheptane	ND		ug/l	2.00	0.242	1
1,1,4-Trimethylcyclohexane	ND		ug/l	2.00	0.199	1
2,3-Dimethylheptane	ND		ug/l	2.00	0.228	1
3,4-Dimethylheptane	ND		ug/l	2.00	0.340	1
4-Methyloctane	ND		ug/l	2.00	0.334	1
2-Methyloctane	ND		ug/l	2.00	0.512	1
Ethylbenzene	ND		ug/l	2.00	0.216	1
2-Ethylthiophene	ND		ug/l	2.00	0.176	1
3-Methyloctane	ND		ug/l	2.00	0.224	1
3,3-Diethylpentane	ND		ug/l	2.00	0.233	1
p/m-Xylene	ND		ug/l	4.00	0.381	1
1-Nonene	ND		ug/l	5.00	0.270	1
trans-3-Nonene	ND		ug/l	2.00	0.237	1
cis-3-Nonene	ND		ug/l	2.00	0.374	1
Nonane (C9)	ND		ug/l	2.00	0.311	1
Styrene	ND		ug/l	2.00	0.202	1
o-Xylene	14.0		ug/l	2.00	0.209	1
2-Nonene	ND		ug/l	5.00	0.254	1
Isopropylcyclohexane	ND		ug/l	2.00	0.212	1
Isopropylbenzene	ND		ug/l	2.00	0.187	1
3,3-Dimethyloctane	ND		ug/l	2.00	0.202	1
n-Propylbenzene	ND		ug/l	2.00	0.177	1
2-Methylnonane	ND		ug/l	2.00	0.283	1
3-Methylnonane	ND		ug/l	2.00	0.279	1
1-Methyl-3-Ethylbenzene	ND		ug/l	2.00	0.316	1
1-Methyl-4-Ethylbenzene	5.46		ug/l	2.00	0.282	1
1,3,5-Trimethylbenzene	24.0		ug/l	2.00	0.230	1
1-Decene	ND		ug/l	2.00	0.260	1
Isobutylcyclohexane	ND		ug/l	2.00	0.163	1
1-Methyl-2-Ethylbenzene	25.9		ug/l	2.00	0.170	1
Decane (C10)	ND		ug/l	2.00	0.271	1

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01 Date Collected: 09/12/22 13:15

Client ID: A3015TW-PRN01-WK2 Date Received: 09/15/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
tert-Butylbenzene	0.417	J	ug/l	2.00	0.211	1
1,2,4-Trimethylbenzene	ND		ug/l	2.00	0.207	1
Isobutylbenzene	ND		ug/l	2.00	0.270	1
sec-Butylbenzene	0.290	J	ug/l	2.00	0.259	1
1-Methyl-3-Isopropylbenzene	7.65		ug/l	2.00	0.258	1
1-Methyl-4-Isopropylbenzene	4.11		ug/l	2.00	0.212	1
1,2,3-Trimethylbenzene	87.3		ug/l	2.00	0.223	1
1-Methyl-2-Isopropylbenzene	2.52		ug/l	2.00	0.217	1
Indane	6.33		ug/l	2.00	0.123	1
1,3-Diethylbenzene	6.24		ug/l	2.00	0.249	1
1-Methyl-3-N-Propylbenzene	7.01		ug/l	2.00	0.202	1
Indene	0.689	J	ug/l	2.00	0.116	1
1-Methyl-4-N-Propylbenzene	2.91		ug/l	2.00	0.250	1
n-Butylbenzene	ND		ug/l	2.00	0.197	1
1,2-Dimethyl-4-Ethylbenzene	18.8		ug/l	2.00	0.245	1
1,2-Diethylbenzene	6.93		ug/l	2.00	0.296	1
1-Methyl-2-N-Propylbenzene	18.2		ug/l	2.00	0.249	1
1,4-Dimethyl-2-Ethylbenzene	1.44	J	ug/l	2.00	0.187	1
Undecane	0.999	J	ug/l	2.00	0.222	1
1,3-Dimethyl-4-Ethylbenzene	2.52		ug/l	2.00	0.194	1
1,3-Dimethyl-5-Ethylbenzene	19.4		ug/l	2.00	0.236	1
1,3-Dimethyl-2-Ethylbenzene	10.4		ug/l	2.00	0.149	1
1,2-Dimethyl-3-Ethylbenzene	22.9		ug/l	2.00	0.127	1
1,2,4,5-Tetramethylbenzene	15.9		ug/l	2.00	0.155	1
1,2,3,5-Tetramethylbenzene	41.8		ug/l	2.00	0.152	1
N-Pentylbenzene	ND		ug/l	2.00	0.249	1
1,2,3,4-Tetramethylbenzene	58.9		ug/l	2.00	0.214	1
1,3-Dimethyl-5-tert-Butylbenzene	ND		ug/l	2.00	0.285	1
Dodecane (C12)	2.61	J	ug/l	5.00	0.657	1
1,3,5-Triethylbenzene	ND		ug/l	2.00	0.380	1
Naphthalene	ND		ug/l	2.00	0.835	1
Benzothiophene	ND		ug/l	2.00	1.06	1
1,2,4-Triethylbenzene	ND		ug/l	2.00	0.340	1
Hexylbenzene	ND		ug/l	2.00	0.385	1
MMT	ND		ug/l	5.00	1.29	1
Tridecane	5.06		ug/l	5.00	1.39	1
2-Methylnaphthalene	ND		ug/l	5.00	1.32	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1-Methylnaphthalene	4.30	J	ug/l	5.00	1.47	1
Tetradecane (C14)	7.18		ug/l	5.00	0.612	1
Pentadecane	3.78	J	ug/l	5.00	1.12	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	108		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	99		70-130

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
3-Methyl-1-butene	ND		ug/l	2.00	0.297
Isopentane	ND		ug/l	2.00	0.366
1-Pentene	ND		ug/l	2.00	0.365
2-Methyl-1-Butene	ND		ug/l	2.00	0.311
Pentane	ND		ug/l	2.00	0.624
trans-2-Pentene	ND		ug/l	2.00	0.270
Isoprene	ND		ug/l	2.00	0.357
cis-2-Pentene	ND		ug/l	2.00	0.322
Tertiary Butanol	15.3	J	ug/l	25.0	3.24
2,2-Dimethylbutane	ND		ug/l	2.00	0.617
4-Methyl-1-pentene	ND		ug/l	2.00	0.311
Cyclopentane	ND		ug/l	2.00	0.519
2,3-Dimethylbutane	ND		ug/l	2.00	0.826
2-Methylpentane	ND		ug/l	2.00	0.542
Methyl tert butyl ether	ND		ug/l	2.00	0.412
3-Methylpentane	ND		ug/l	2.00	0.317
1-Hexene	ND		ug/l	2.00	0.281
n-Hexane	ND		ug/l	2.00	0.329
Isopropyl Ether	ND		ug/l	2.00	0.242
trans-2-Hexene	ND		ug/l	2.00	0.261
2-Methyl-2-pentene	ND		ug/l	2.00	0.306
cis-2-Hexene	ND		ug/l	2.00	0.271
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.00	0.303
2,2-Dimethylpentane	ND		ug/l	2.00	0.269
Methylcyclopentane	ND		ug/l	2.00	0.268
2,4-Dimethylpentane	ND		ug/l	2.00	0.247
2,2,3-Trimethylbutane	ND		ug/l	2.00	0.270
1,2-Dichloroethane	ND		ug/l	2.00	0.295
3,3-Dimethylpentane	ND		ug/l	2.00	0.372

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
Cyclohexane	ND		ug/l	2.00	0.247
2-Methylhexane	ND		ug/l	2.00	0.315
Benzene	ND		ug/l	2.00	0.305
2,3-Dimethylpentane	ND		ug/l	2.00	0.265
Thiophene	ND		ug/l	2.00	0.284
1,1-Dimethylcyclopentane	ND		ug/l	2.00	0.240
3-Methylhexane	ND		ug/l	2.00	0.320
Tertiary-Amyl Methyl Ether	ND		ug/l	2.00	0.246
3-Ethylpentane	ND		ug/l	2.00	0.289
1-Heptene/1,2-DMCP (trans)	ND		ug/l	4.00	0.585
Isooctane	ND		ug/l	2.00	0.218
trans-3-Heptene	ND		ug/l	2.00	0.311
Heptane	ND		ug/l	2.00	0.348
trans-2-Heptene	ND		ug/l	2.00	0.256
cis-2-Heptene	ND		ug/l	2.00	0.387
2,2-Dimethylhexane	ND		ug/l	2.00	0.290
Methylcyclohexane	ND		ug/l	2.00	0.270
2,5-Dimethylhexane	ND		ug/l	2.00	0.348
2,4-Dimethylhexane	ND		ug/l	2.00	0.243
Ethylcyclopentane	ND		ug/l	2.00	0.265
2,2,3-Trimethylpentane	ND		ug/l	2.00	0.347
2,3,4-Trimethylpentane	ND		ug/l	2.00	0.261
2,3,3-Trimethylpentane	ND		ug/l	2.00	0.397
Xylene (Total)[1]	ND		ug/l	2.00	0.209
2,3-Dimethylhexane	ND		ug/l	2.00	0.485
2-Methylheptane	ND		ug/l	2.00	0.338
4-Methylheptane	ND		ug/l	2.00	0.344
3-Methylheptane	ND		ug/l	2.00	0.385
3-Ethylhexane	ND		ug/l	2.00	0.358

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
Toluene	ND		ug/l	2.00	0.271
2-Methylthiophene	ND		ug/l	2.00	0.170
1,4-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.260
3-Methylthiophene	ND		ug/l	2.00	0.234
1-Octene	ND		ug/l	5.00	0.307
Octane	ND		ug/l	2.00	0.235
1,2-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.294
1,2-Dibromoethane	ND		ug/l	2.00	0.320
cis-2-Octene	ND		ug/l	2.00	0.229
Isopropylcyclopentane	ND		ug/l	2.00	0.293
1,2-Dimethylcyclohexane (cis)	ND		ug/l	2.00	0.581
2,5-Dimethylheptane	ND		ug/l	2.00	0.335
3,5-Dimethylheptane	ND		ug/l	2.00	0.282
3,3-Dimethylheptane	ND		ug/l	2.00	0.242
1,1,4-Trimethylcyclohexane	ND		ug/l	2.00	0.199
2,3-Dimethylheptane	ND		ug/l	2.00	0.228
3,4-Dimethylheptane	ND		ug/l	2.00	0.340
4-Methyloctane	ND		ug/l	2.00	0.334
2-Methyloctane	ND		ug/l	2.00	0.512
Ethylbenzene	ND		ug/l	2.00	0.216
2-Ethylthiophene	ND		ug/l	2.00	0.176
3-Methyloctane	ND		ug/l	2.00	0.224
3,3-Diethylpentane	ND		ug/l	2.00	0.233
p/m-Xylene	ND		ug/l	4.00	0.381
1-Nonene	ND		ug/l	5.00	0.270
trans-3-Nonene	ND		ug/l	2.00	0.237
cis-3-Nonene	ND		ug/l	2.00	0.374
Nonane (C9)	ND		ug/l	2.00	0.311
Styrene	ND		ug/l	2.00	0.202

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
o-Xylene	ND		ug/l	2.00	0.209
2-Nonene	ND		ug/l	5.00	0.254
Isopropylcyclohexane	ND		ug/l	2.00	0.212
Isopropylbenzene	ND		ug/l	2.00	0.187
3,3-Dimethyloctane	ND		ug/l	2.00	0.202
n-Propylbenzene	ND		ug/l	2.00	0.177
2-Methylnonane	ND		ug/l	2.00	0.283
3-Methylnonane	ND		ug/l	2.00	0.279
1-Methyl-3-Ethylbenzene	ND		ug/l	2.00	0.316
1-Methyl-4-Ethylbenzene	ND		ug/l	2.00	0.282
1,3,5-Trimethylbenzene	ND		ug/l	2.00	0.230
1-Decene	ND		ug/l	2.00	0.260
Isobutylcyclohexane	ND		ug/l	2.00	0.163
1-Methyl-2-Ethylbenzene	ND		ug/l	2.00	0.170
Decane (C10)	ND		ug/l	2.00	0.271
tert-Butylbenzene	ND		ug/l	2.00	0.211
1,2,4-Trimethylbenzene	ND		ug/l	2.00	0.207
Isobutylbenzene	ND		ug/l	2.00	0.270
sec-Butylbenzene	ND		ug/l	2.00	0.259
1-Methyl-3-Isopropylbenzene	ND		ug/l	2.00	0.258
1-Methyl-4-Isopropylbenzene	ND		ug/l	2.00	0.212
1,2,3-Trimethylbenzene	ND		ug/l	2.00	0.223
1-Methyl-2-Isopropylbenzene	ND		ug/l	2.00	0.217
Indane	ND		ug/l	2.00	0.123
1,3-Diethylbenzene	ND		ug/l	2.00	0.249
1-Methyl-3-N-Propylbenzene	ND		ug/l	2.00	0.202
Indene	ND		ug/l	2.00	0.116
1-Methyl-4-N-Propylbenzene	ND		ug/l	2.00	0.250
n-Butylbenzene	ND		ug/l	2.00	0.197

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
1,2-Dimethyl-4-Ethylbenzene	ND		ug/l	2.00	0.245
1,2-Diethylbenzene	ND		ug/l	2.00	0.296
1-Methyl-2-N-Propylbenzene	ND		ug/l	2.00	0.249
1,4-Dimethyl-2-Ethylbenzene	ND		ug/l	2.00	0.187
Undecane	ND		ug/l	2.00	0.222
1,3-Dimethyl-4-Ethylbenzene	ND		ug/l	2.00	0.194
1,3-Dimethyl-5-Ethylbenzene	ND		ug/l	2.00	0.236
1,3-Dimethyl-2-Ethylbenzene	ND		ug/l	2.00	0.149
1,2-Dimethyl-3-Ethylbenzene	ND		ug/l	2.00	0.127
1,2,4,5-Tetramethylbenzene	ND		ug/l	2.00	0.155
1,2,3,5-Tetramethylbenzene	ND		ug/l	2.00	0.152
N-Pentylbenzene	ND		ug/l	2.00	0.249
1,2,3,4-Tetramethylbenzene	ND		ug/l	2.00	0.214
1,3-Dimethyl-5-tert-Butylbenzene	ND		ug/l	2.00	0.285
Dodecane (C12)	ND		ug/l	5.00	0.657
1,3,5-Triethylbenzene	ND		ug/l	2.00	0.380
Naphthalene	ND		ug/l	2.00	0.835
Benzothiophene	ND		ug/l	2.00	1.06
1,2,4-Triethylbenzene	ND		ug/l	2.00	0.340
Hexylbenzene	ND		ug/l	2.00	0.385
MMT	ND		ug/l	5.00	1.29
Tridecane	ND		ug/l	5.00	1.39
2-Methylnaphthalene	ND		ug/l	5.00	1.32
1-Methylnaphthalene	ND		ug/l	5.00	1.47
Tetradecane (C14)	ND		ug/l	5.00	0.612
Pentadecane	ND		ug/l	5.00	1.12

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	107		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	97		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01 Batch: WG1691160-3 WG1691160-4								
1-Pentene	104		109		50-130	5		30
Pentane	85		90		50-130	6		30
Tertiary Butanol	91		88		50-130	3		30
Cyclopentane	90		96		50-130	6		30
2-Methylpentane	92		95		50-130	3		30
Methyl tert butyl ether	80		82		50-130	2		30
3-Methylpentane	96		99		50-130	3		30
1-Hexene	100		103		50-130	3		30
n-Hexane	90		94		50-130	4		30
Isopropyl Ether	85		87		50-130	2		30
Ethyl-Tert-Butyl-Ether	75		76		50-130	1		30
Methylcyclopentane	100		104		50-130	4		30
2,4-Dimethylpentane	92		97		50-130	5		30
Cyclohexane	101		105		50-130	4		30
2-Methylhexane	94		96		50-130	2		30
Benzene	90		92		50-130	2		30
2,3-Dimethylpentane	96		98		50-130	2		30
3-Methylhexane	86		86		50-130	0		30
Tertiary-Amyl Methyl Ether	79		80		50-130	1		30
Isooctane	100		102		50-130	2		30
Heptane	102		102		50-130	0		30
Methylcyclohexane	94		94		50-130	0		30
2-Methylheptane	100		102		50-130	2		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01 Batch: WG1691160-3 WG1691160-4								
3-Methylheptane	99		100		50-130	1		30
Toluene	90		92		50-130	2		30
Octane	102		102		50-130	0		30
Ethylbenzene	90		93		50-130	3		30
p/m-Xylene	96		98		50-130	2		30
Nonane (C9)	95		96		50-130	1		30
o-Xylene	96		98		50-130	2		30
Isopropylbenzene	98		100		50-130	2		30
n-Propylbenzene	100		103		50-130	3		30
1-Methyl-3-Ethylbenzene	98		100		50-130	2		30
1-Methyl-4-Ethylbenzene	102		104		50-130	2		30
1,3,5-Trimethylbenzene	100		104		50-130	4		30
1-Decene	78		80		50-130	3		30
1-Methyl-2-Ethylbenzene	100		103		50-130	3		30
Decane (C10)	106		110		50-130	4		30
1,2,4-Trimethylbenzene	96		97		50-130	1		30
sec-Butylbenzene	106		108		50-130	2		30
1-Methyl-4-N-Propylbenzene	98		100		50-130	2		30
n-Butylbenzene	100		103		50-130	3		30
1,2-Diethylbenzene	99		100		50-130	1		30
Undecane	102		106		50-130	4		30
N-Pentylbenzene	99		102		50-130	3		30
Dodecane (C12)	124		126		50-130	2		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: Not Specified

Project Number: CTO-22F0106

Lab Number: L2250292

Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01 Batch: WG1691160-3 WG1691160-4								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Dibromofluoromethane	102		102		70-130
Toluene-d8	102		101		70-130
4-Bromofluorobenzene	102		102		70-130

PETROLEUM HYDROCARBONS

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 09/20/22 00:11
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	ND		mg/l	0.014	0.004	1
n-Decane (C10)	0.010	J	mg/l	0.014	0.002	1
n-Undecane (C11)	0.050		mg/l	0.014	0.001	1
n-Dodecane (C12)	0.093		mg/l	0.014	0.002	1
n-Tridecane (C13)	0.156		mg/l	0.069	0.012	1
2,6,10-Trimethyldodecane (1380)	0.020		mg/l	0.014	0.001	1
n-Tetradecane (C14)	0.075		mg/l	0.014	0.001	1
2,6,10-Trimethyltridecane (1470)	0.013	J	mg/l	0.014	0.002	1
n-Pentadecane (C15)	0.021		mg/l	0.014	0.002	1
n-Hexadecane (C16)	0.007	J	mg/l	0.014	0.002	1
Norpristane (1650)	ND		mg/l	0.014	0.002	1
n-Heptadecane (C17)	0.002	J	mg/l	0.014	0.002	1
Pristane	ND		mg/l	0.014	0.002	1
n-Octadecane (C18)	0.002	J	mg/l	0.014	0.001	1
Phytane	ND		mg/l	0.014	0.001	1
n-Nonadecane (C19)	ND		mg/l	0.014	0.002	1
n-Eicosane (C20)	ND		mg/l	0.014	0.001	1
n-Heneicosane (C21)	ND		mg/l	0.014	0.001	1
n-Docosane (C22)	ND		mg/l	0.014	0.001	1
n-Tricosane (C23)	0.004	J	mg/l	0.014	0.001	1
n-Tetracosane (C24)	ND		mg/l	0.014	0.001	1
n-Pentacosane (C25)	ND		mg/l	0.069	0.008	1
n-Hexacosane (C26)	ND		mg/l	0.014	0.002	1
n-Heptacosane (C27)	ND		mg/l	0.014	0.001	1
n-Octacosane (C28)	0.070	C	mg/l	0.014	0.003	1
n-Nonacosane (C29)	0.003	J	mg/l	0.014	0.002	1
n-Triacontane (C30)	0.003	J	mg/l	0.014	0.002	1
n-Hentriacontane (C31)	0.003	J	mg/l	0.014	0.002	1

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01 Date Collected: 09/12/22 13:15

Client ID: A3015TW-PRN01-WK2 Date Received: 09/15/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	0.003	J	mg/l	0.014	0.002	1
n-Tritriacontane (C33)	0.003	J	mg/l	0.014	0.002	1
n-Tetratriacontane (C34)	0.003	J	mg/l	0.014	0.002	1
n-Pentatriacontane (C35)	0.003	J	mg/l	0.014	0.002	1
n-Hexatriacontane (C36)	0.002	J	mg/l	0.014	0.002	1
n-Heptatriacontane (C37)	ND		mg/l	0.014	0.003	1
n-Octatriacontane (C38)	ND		mg/l	0.014	0.003	1
n-Nonatriacontane (C39)	ND		mg/l	0.014	0.002	1
n-Tetracontane (C40)	ND		mg/l	0.014	0.002	1
C9-C44 Total Petroleu	4.20		mg/l	0.458	0.077	1
C10-C28 DRO	4.60		mg/l	0.292	0.050	1
C28-C40 ORO	ND		mg/l	0.153	0.023	1
Total Saturated Hydrocarbons	0.546	J	mg/l	0.014	0.001	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	89		50-130
d50-Tetracosane	91		50-130

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-02
Client ID: A3-010DSVMP-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 12:55
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 09/20/22 01:41
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	0.006	J	mg/l	0.008	0.003	1
n-Decane (C10)	0.104		mg/l	0.008	0.001	1
n-Undecane (C11)	0.674		mg/l	0.008	0.001	1
n-Dodecane (C12)	1.28		mg/l	0.008	0.001	1
n-Tridecane (C13)	1.45		mg/l	0.042	0.007	1
2,6,10-Trimethyldodecane (1380)	0.407		mg/l	0.008	0.001	1
n-Tetradecane (C14)	1.14		mg/l	0.008	0.001	1
2,6,10-Trimethyltridecane (1470)	0.377		mg/l	0.008	0.001	1
n-Pentadecane (C15)	0.537		mg/l	0.008	0.001	1
n-Hexadecane (C16)	0.139		mg/l	0.008	0.001	1
Norpristane (1650)	0.043		mg/l	0.008	0.001	1
n-Heptadecane (C17)	0.050		mg/l	0.008	0.001	1
Pristane	0.048		mg/l	0.008	0.001	1
n-Octadecane (C18)	0.025		mg/l	0.008	0.001	1
Phytane	0.028		mg/l	0.008	0.001	1
n-Nonadecane (C19)	ND		mg/l	0.008	0.001	1
n-Eicosane (C20)	0.009		mg/l	0.008	0.0005	1
n-Heneicosane (C21)	0.005	J	mg/l	0.008	0.001	1
n-Docosane (C22)	0.005	J	mg/l	0.008	0.0004	1
n-Tricosane (C23)	0.004	J	mg/l	0.008	0.001	1
n-Tetracosane (C24)	0.004	J	mg/l	0.008	0.001	1
n-Pentacosane (C25)	ND		mg/l	0.042	0.005	1
n-Hexacosane (C26)	0.003	J	mg/l	0.008	0.001	1
n-Heptacosane (C27)	ND		mg/l	0.008	0.001	1
n-Octacosane (C28)	0.044	C	mg/l	0.008	0.002	1
n-Nonacosane (C29)	0.031		mg/l	0.008	0.001	1
n-Triacontane (C30)	0.006	J	mg/l	0.008	0.001	1
n-Hentriacontane (C31)	ND		mg/l	0.008	0.001	1

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-02 Date Collected: 09/12/22 12:55

Client ID: A3-010DSVMP-PRN01-WK2 Date Received: 09/15/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	0.005	J	mg/l	0.008	0.001	1
n-Tritriacontane (C33)	0.002	J	mg/l	0.008	0.001	1
n-Tetratriacontane (C34)	0.003	J	mg/l	0.008	0.001	1
n-Pentatriacontane (C35)	ND		mg/l	0.008	0.001	1
n-Hexatriacontane (C36)	0.002	J	mg/l	0.008	0.001	1
n-Heptatriacontane (C37)	ND		mg/l	0.008	0.002	1
n-Octatriacontane (C38)	0.002	J	mg/l	0.008	0.002	1
n-Nonatriacontane (C39)	ND		mg/l	0.008	0.001	1
n-Tetracontane (C40)	ND		mg/l	0.008	0.001	1
C9-C44 Total Petroleu	46.4		mg/l	0.275	0.046	1
C10-C28 DRO	45.5		mg/l	0.175	0.030	1
C28-C40 ORO	12.3		mg/l	0.092	0.014	1
Total Saturated Hydrocarbons	6.43	J	mg/l	0.008	0.0004	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	88		50-130
d50-Tetracosane	88		50-130

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 09/19/22 18:10
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1688303-1					
n-Nonane (C9)	ND		mg/l	0.001	0.0003
n-Decane (C10)	ND		mg/l	0.001	0.0001
n-Undecane (C11)	ND		mg/l	0.001	0.0001
n-Dodecane (C12)	ND		mg/l	0.001	0.0001
n-Tridecane (C13)	ND		mg/l	0.005	0.001
2,6,10-Trimethyldodecane (1380)	ND		mg/l	0.001	0.0001
n-Tetradecane (C14)	ND		mg/l	0.001	0.0001
2,6,10-Trimethyltridecane (1470)	ND		mg/l	0.001	0.0001
n-Pentadecane (C15)	ND		mg/l	0.001	0.0001
n-Hexadecane (C16)	ND		mg/l	0.001	0.0001
Norpristane (1650)	ND		mg/l	0.001	0.0001
n-Heptadecane (C17)	ND		mg/l	0.001	0.0001
Pristane	ND		mg/l	0.001	0.0002
n-Octadecane (C18)	ND		mg/l	0.001	0.0001
Phytane	ND		mg/l	0.001	0.0001
n-Nonadecane (C19)	ND		mg/l	0.001	0.0002
n-Eicosane (C20)	ND		mg/l	0.001	0.0001
n-Heneicosane (C21)	ND		mg/l	0.001	0.0001
n-Docosane (C22)	ND		mg/l	0.001	0.00004
n-Tricosane (C23)	ND		mg/l	0.001	0.0001
n-Tetracosane (C24)	ND		mg/l	0.001	0.0001
n-Pentacosane (C25)	ND		mg/l	0.005	0.001
n-Hexacosane (C26)	ND		mg/l	0.001	0.0001
n-Heptacosane (C27)	ND		mg/l	0.001	0.0001
n-Octacosane (C28)	0.001	JC	mg/l	0.001	0.0002
n-Nonacosane (C29)	ND		mg/l	0.001	0.0001
n-Triacontane (C30)	ND		mg/l	0.001	0.0001
n-Hentriacontane (C31)	ND		mg/l	0.001	0.0001
n-Dotriacontane (C32)	ND		mg/l	0.001	0.0001

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 09/19/22 18:10
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1688303-1					
n-Tritriacontane (C33)	ND		mg/l	0.001	0.0001
n-Tetratriacontane (C34)	ND		mg/l	0.001	0.0002
n-Pentatriacontane (C35)	ND		mg/l	0.001	0.0002
n-Hexatriacontane (C36)	ND		mg/l	0.001	0.0001
n-Heptatriacontane (C37)	ND		mg/l	0.001	0.0002
n-Octatriacontane (C38)	ND		mg/l	0.001	0.0002
n-Nonatriacontane (C39)	ND		mg/l	0.001	0.0002
n-Tetracontane (C40)	ND		mg/l	0.001	0.0002
C9-C44 Total Petroleu	ND		mg/l	0.033	0.006
C10-C28 DRO	0.008	J	mg/l	0.021	0.004
C28-C40 ORO	ND		mg/l	0.011	0.002
Total Saturated Hydrocarbons	0.001	J	mg/l	0.001	0.00004

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	90		50-130
d50-Tetracosane	92		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01-02 Batch: WG1688303-2 WG1688303-3								
Nonane (C9)	76		72		50-130	5		30
n-Decane (C10)	85		81		50-130	5		30
n-Dodecane (C12)	90		88		50-130	2		30
n-Tetradecane (C14)	89		90		50-130	1		30
n-Hexadecane (C16)	93		94		50-130	1		30
n-Octadecane (C18)	94		96		50-130	2		30
n-Nonadecane (C19)	100		100		50-130	0		30
n-Eicosane (C20)	94		96		50-130	2		30
n-Docosane (C22)	95		95		50-130	0		30
n-Tetracosane (C24)	101		101		50-130	0		30
n-Hexacosane (C26)	96		97		50-130	1		30
n-Octacosane (C28)	100		101		50-130	1		30
n-Triacontane (C30)	95		96		50-130	1		30
n-Hexatriacontane (C36)	81		82		50-130	1		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	89		89		50-130
d50-Tetracosane	93		93		50-130

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2250292-01A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		A2-SHC(7)
L2250292-01X	Vial HCl preserved split	A	NA		3.2	Y	Absent		A2-PIANO8260(14)
L2250292-01Y	Vial HCl preserved split	A	NA		3.2	Y	Absent		-
L2250292-02A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		A2-SHC(7)

*Values in parentheses indicate holding time in days

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

COC# 09132022SIT-Alpha -~~01~~ 02

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193

Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 9/15/22

ALPHA Job #: L2250292

Project Information

Project Name: Site Characterization/Adit 3

Project Location: RHBFSF-Adit 3

Project #: CTO-22F0106

Project Manager: [redacted] (b) (6)

ALPHA Quote #:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #: 02.30.01.

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

Client Information

Client: GSI-Rhodes for CTO22F0106 (AECOM)

Address: 1001 Bishop Street, Ste 1600

Honolulu, Hawaii

Phone: [redacted] (b) (6)

Fax:

Email: [redacted] (b) (6) @aecom.com

☐ These samples have been Previously analyzed by Alpha

Turn-Around Time

☐ Standard ☐ Rush (ONLY IF PRE-APPROVED)

Due Date: Time:

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS

Saturated Hydrocarbon ANalysis — PIANO

[redacted] (b) (6) 9/13/22

SAMPLE HANDLING

Filtration

☐ Done

☐ Not Needed

☐ Lab to do

Preservation

☐ Lab to do

(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Saturated Hydrocarbon ANalysis	PIANO											Sample Specific Comments	Total # Bottles
50292-01	A3015TW-PRN01-WK2	9/12/22	1315	~~Product~~ WW grab	[redacted] (b) (6)	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is wat/prod	
	~~A3-010TW-PRN01-WK2~~	~~9/12/22~~	1335	~~Product~~		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is product	
	~~A3-040TW-PRN01-WK2~~	~~9/12/22~~	1410	~~Product~~		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is product	
-02	A3-010DSVMP-PRN01-WK2	9/12/222	1255	~~Product~~ WATER		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is wat/prod	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		

9/12/22 [redacted]

Container Type	-	-	-	-	-	-	-	-	-	-	-	-
Preservative	-	-	-	-	-	-	-	-	-	-	-	-

[redacted] (b) (6) 9/15/22 10:08

Relinquished By:	Date/Time	Received By:	Date/Time
[redacted] (b) (6)	9/12/22 1600	[redacted] (b) (6)	9/12/22 1600
	9/13/22 1330		FEDEX
FEDEX	9/15/22 1000		9/15/22 1000

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

ORIGIN ID:HNLA (724) 504-2836
[redacted] (b) (6)
RECOM
1001 BISHOP ST STE 1600

HONOLULU, HI 96813
UNITED STATES US

SHIP DATE: 13SEP22
ACTWGT: 38.75 LB
CAD: 6994244/SSFE2322
DIMS: 24x14x14 IN

BILL THIRD PARTY

TO ATTN: [redacted] (b) (6)
ALPHA ANALYTICAL
320 FORBES BLVD.

MANSFIELD MA 02048
(508) 822-9300
INV:
PO:
REF: 60674414.02.30.01
DEPT:

FedEx Express

TRK# 0201 2779 4907 3052

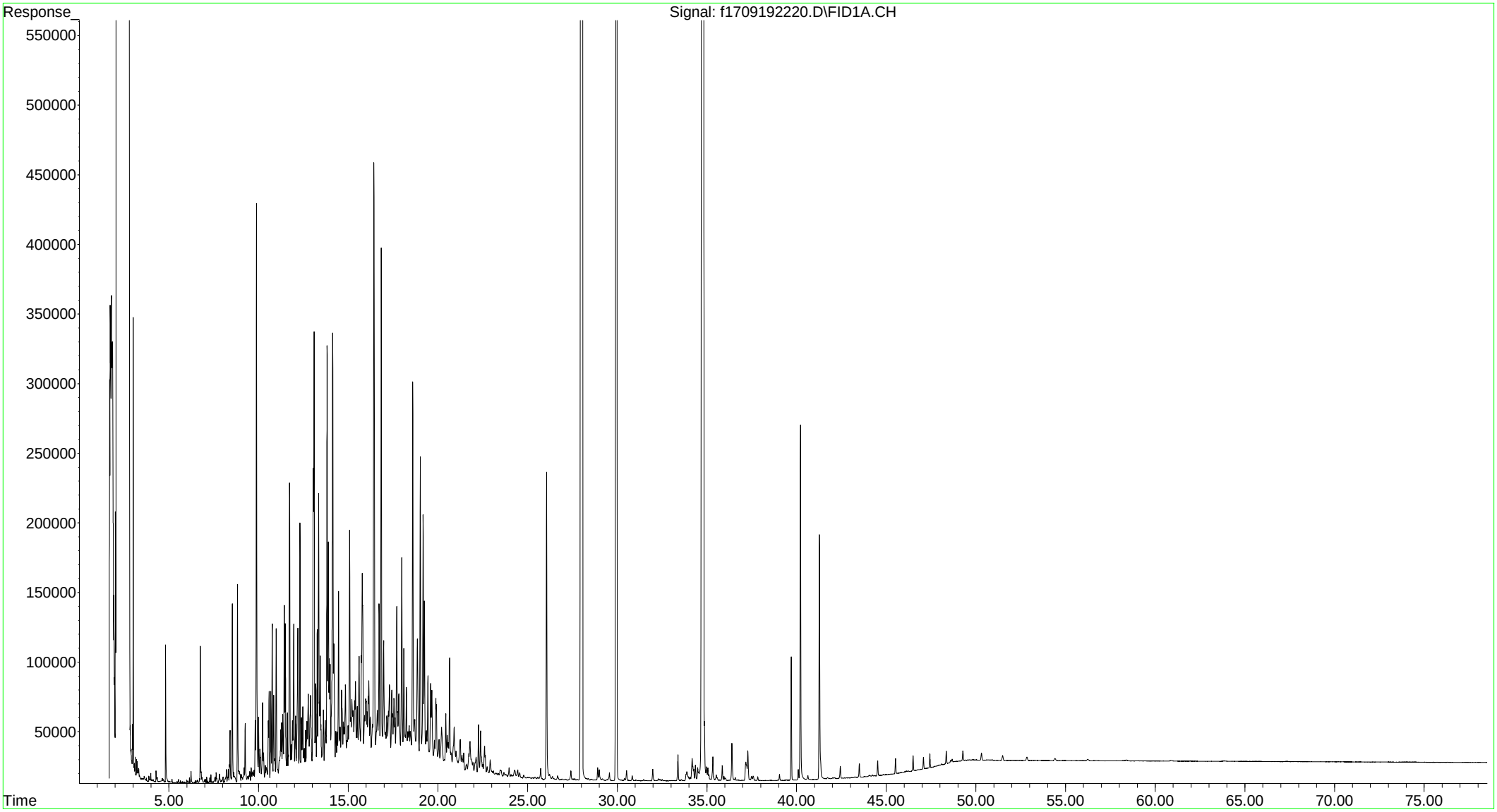
THU - 15 SEP 10:30A
PRIORITY OVERNIGHT
AHS
02048
MA-US BOS

XE PYMA

Part # 150287-435 RRDB EXP 06/23
121/3C3/1T1B5

GC-FID Chromatogram

```
File        :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192220.D
Operator    : FID17:WR
Acquired    : 20 Sep 2022  12:11 am using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: l2250292-01,42,,
Misc Info   : WG1689232,WG1688303,ICAL18753
Vial Number: 10
```



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File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192222.D
Operator   : FID17:WR
Acquired   : 20 Sep 2022   1:41 am using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: l2250292-02,42,,
Misc Info  : WG1689232,WG1688303,ICAL18753
Vial Number: 11
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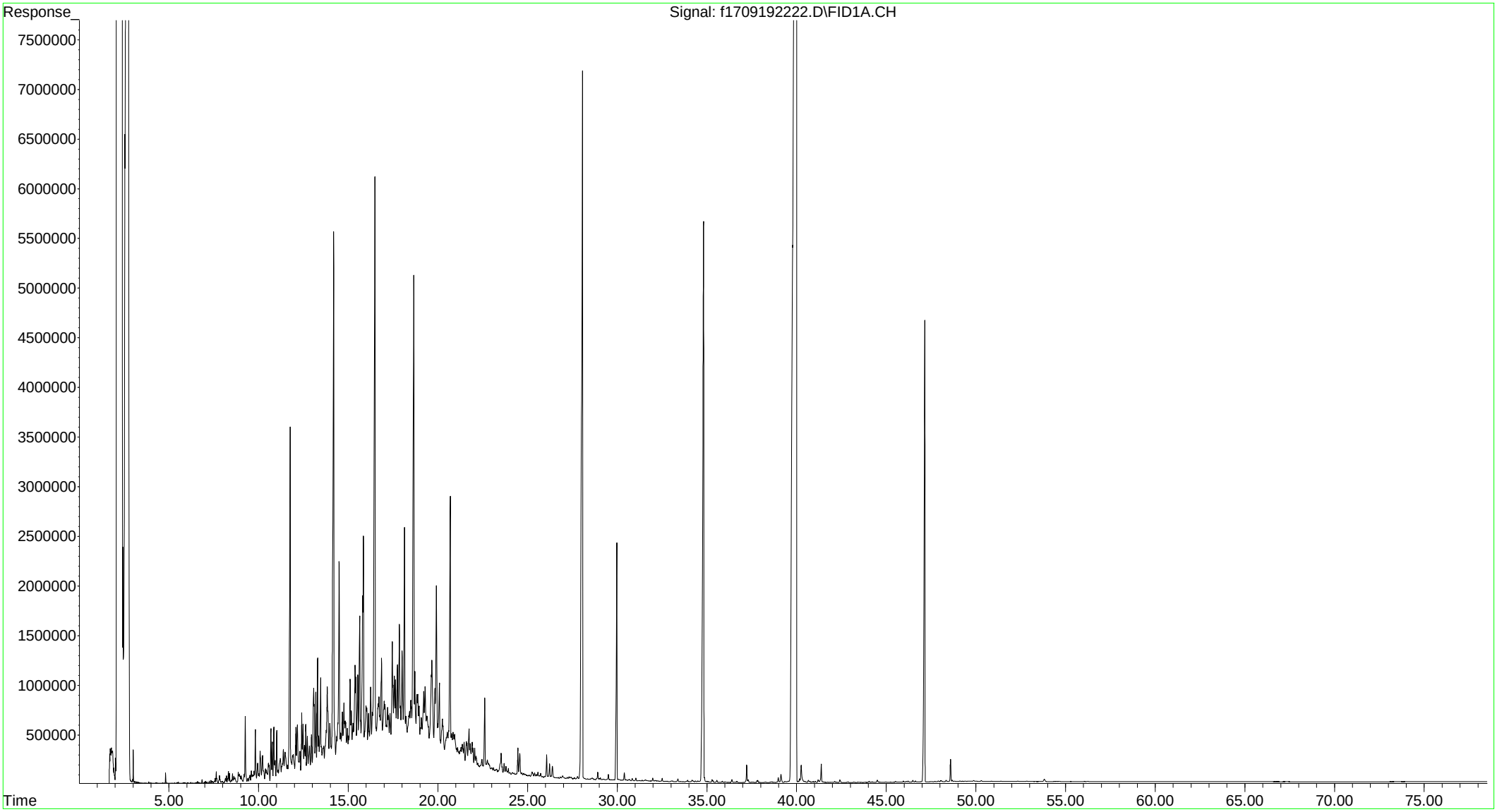

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File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192212.D
Operator   : FID17:WR
Acquired   : 19 Sep 2022   6:10 pm using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: WG1688303-1,42,,
Misc Info  : WG1689232,WG1688303,ICAL18753
Vial Number: 6
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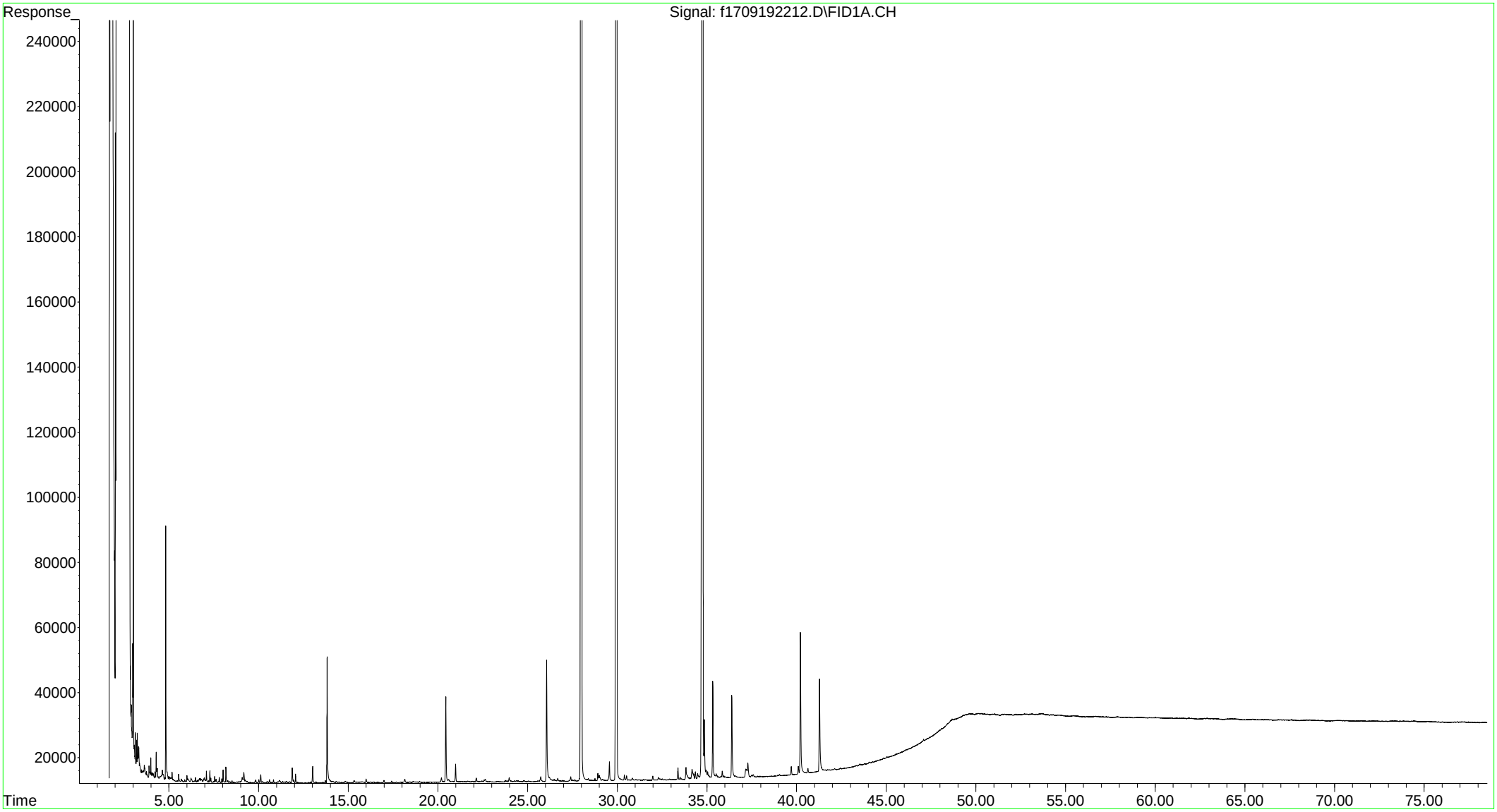
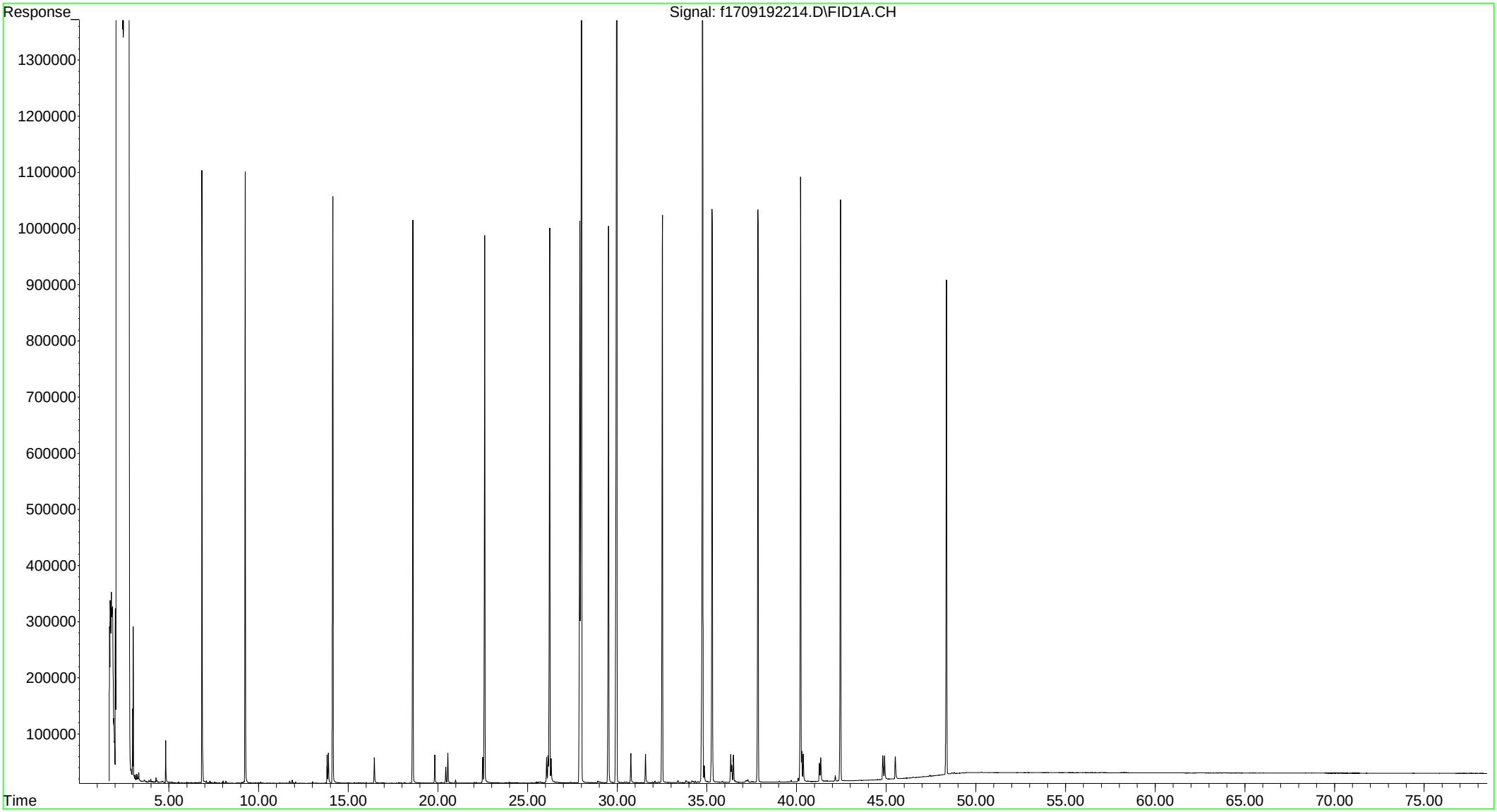
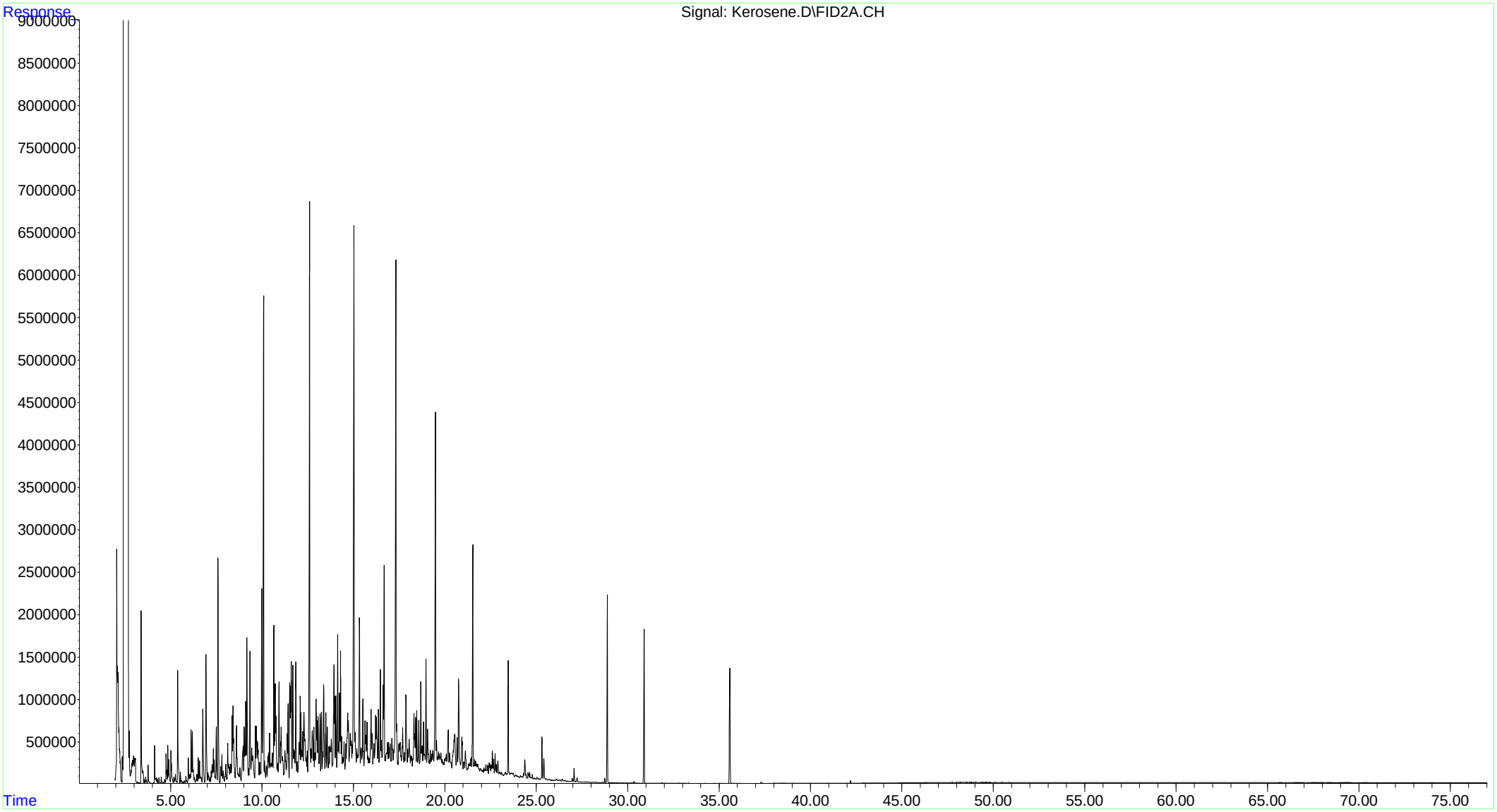


```
File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192214.D
Operator   : FID17:WR
Acquired   : 19 Sep 2022   7:40 pm using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: wg1688303-2,32,,
Misc Info  : WG1689232,WG1688303,ICAL18753
Vial Number: 7
```



Petroleum Reference Standards

```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\Kerosen
...         e.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 21 Nov 2011   9:22 pm using AcqMethod FRNC2AF.M
Sample    : KEROSENE
Misc Info : 1X F042710G
```



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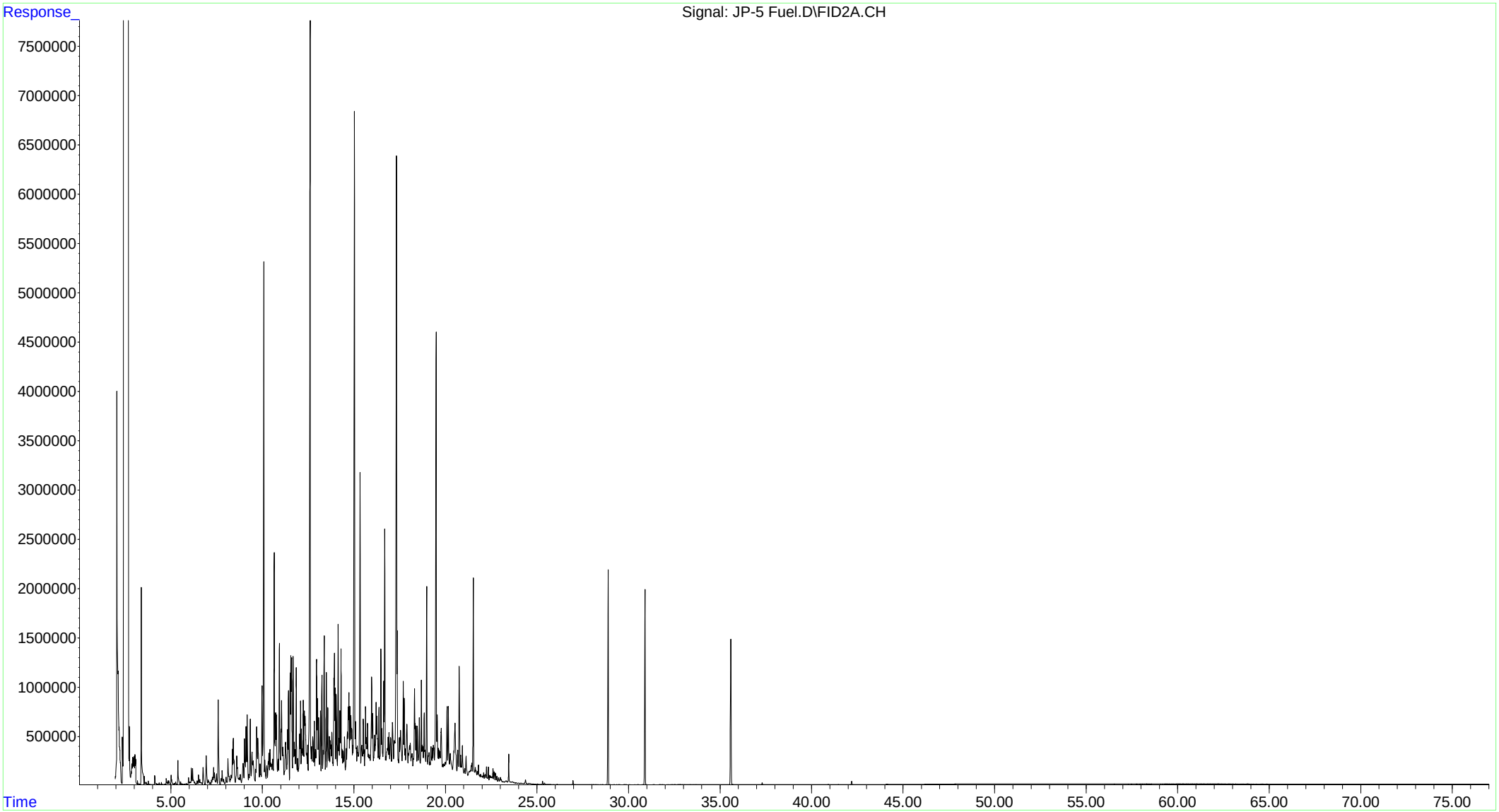
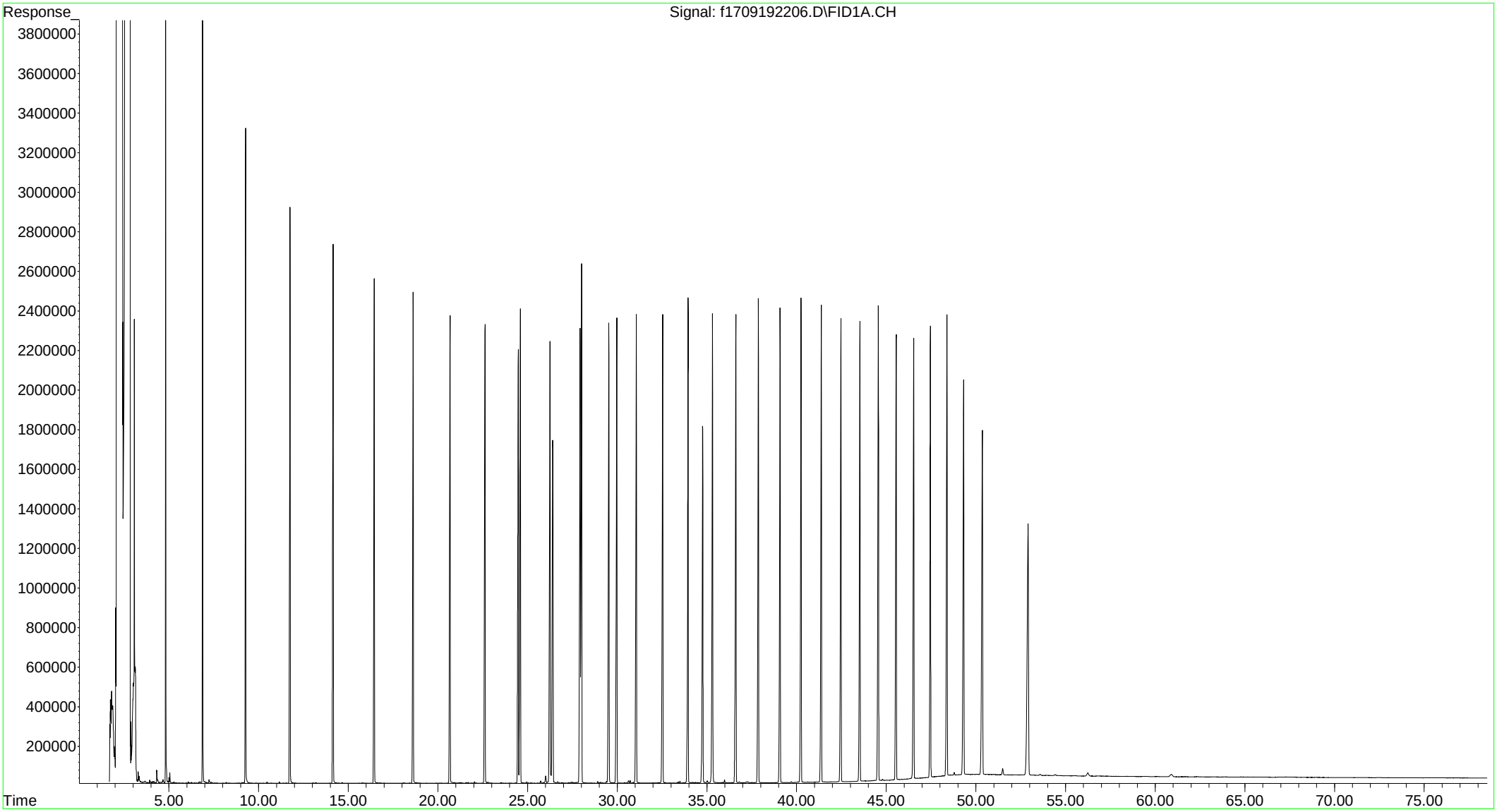
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\JP-5 Fu
...         el.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 19 Nov 2011   4:22 pm using AcqMethod FRNC2AF.M
Sample    : JP-5 FUEL
Misc Info : F042710P
```



```
File        :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192206.D
Operator    : FID17:WR
Acquired    : 19 Sep 2022   1:39 pm using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: WG1689232-1
Misc Info   : WG1689232,FRBE91,ICAL18753
Vial Number: 3
```



ANALYTICAL REPORT

Lab Number:	L2250426
Client:	GSI Environmental Inc. 2211 Norfolk Suite 1000 Houston, TX 77098
ATTN:	[redacted] (b) (6)
Phone:	[redacted] (b) (6)
Project Name:	SITE CHARACTERIZATION/ADIT 3
Project Number:	CTO-22F0106
Report Date:	10/07/22

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Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106

Lab Number: L2250426
Report Date: 10/07/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2250426-01	A3-010TW-PRN01-WK2	OIL	Not Specified	09/12/22 13:35	09/20/22
L2250426-02	A3-040TW-PRN01-WK2	OIL	Not Specified	09/12/22 14:10	09/20/22

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

PIANO Volatile Organics

L2250426-01D and -02D: The samples have elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the samples.

L2250426-01D2 and -02D2: The samples were re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range.

The WG1692182-5 Method Blank, associated with L2250426-01D2, -01D, -02D2, and -02D, has concentrations below the reporting limits and "J" qualified. Associated field sample results are "B" qualified if the concentrations are less than 10x the concentrations in the blank.

Saturated Hydrocarbons

L2250426-01 and -02: The sample was extracted and then analyzed using a gas chromatograph equipped with a flame ionization detector (GC/FID). The temperature program and associated experimental conditions were optimized to obtain maximum resolution in an eighty minute chromatographic run representative of hydrocarbons in the n-Octane (C8) to n-Tetracontane (C40) range. Qualitative evaluation of the sample was conducted by reviewing the sample chromatogram in conjunction with a chromatogram of a normal alkane series generated with the same chromatographic conditions. Chromatograms of hydrocarbon reference materials obtained from our library of 82 reference standards were also utilized to provide the best possible sample match. Quantitative determination of the sample's hydrocarbon concentration was performed in accordance with EPA Method 8015M. The sample's total hydrocarbon concentration and all associated quality control data are included in the report.

The following qualitative information is based on a tentative interpretation of chromatographic pattern

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Case Narrative (continued)

recognition and boiling point ranges:

Total Petroleum Hydrocarbon Identification

L2250426-01 and -02 contain hydrocarbons eluting in the range of n-Octane (C8) to after the elution of n-Heptadecane (C17).

Based on the data generated, L2250426-01 and -02 contain material eluting in the low to mid weight ranges of the chromatogram which is similar to a JP-5 Jet Fuel / Kerosene type product.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: [redacted]

Title: Technical Director/Representative Date: 10/07/22

ORGANICS

VOLATILES

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D2 Date Collected: 09/12/22 13:35
Client ID: A3-010TW-PRN01-WK2 Date Received: 09/20/22
Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 21:42
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
Decane (C10)	14200		mg/kg	1950	265.	200
Undecane	38600		mg/kg	1950	217.	200
Dodecane (C12)	40600		mg/kg	4880	642.	200
Tridecane	30200		mg/kg	4880	1360	200
Tetradecane (C14)	19600		mg/kg	4880	598.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	92		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	100		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 18:09
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3-Methyl-1-butene	ND		mg/kg	97.6	14.5	10
Isopentane	ND		mg/kg	97.6	17.9	10
1-Pentene	ND		mg/kg	97.6	17.8	10
2-Methyl-1-Butene	ND		mg/kg	97.6	15.2	10
Pentane	ND		mg/kg	97.6	30.5	10
trans-2-Pentene	ND		mg/kg	97.6	13.2	10
Isoprene	ND		mg/kg	97.6	17.4	10
cis-2-Pentene	ND		mg/kg	97.6	15.7	10
Tertiary Butanol	ND		mg/kg	1220	158.	10
2,2-Dimethylbutane	ND		mg/kg	97.6	30.1	10
4-Methyl-1-pentene	ND		mg/kg	97.6	15.2	10
Cyclopentane	ND		mg/kg	97.6	25.3	10
2,3-Dimethylbutane	ND		mg/kg	97.6	40.3	10
2-Methylpentane	ND		mg/kg	97.6	26.5	10
Methyl tert butyl ether	ND		mg/kg	97.6	20.1	10
3-Methylpentane	ND		mg/kg	97.6	15.5	10
1-Hexene	ND		mg/kg	97.6	13.7	10
n-Hexane	ND		mg/kg	97.6	16.1	10
Isopropyl Ether	ND		mg/kg	97.6	11.8	10
trans-2-Hexene	ND		mg/kg	97.6	12.7	10
2-Methyl-2-pentene	ND		mg/kg	97.6	14.9	10
cis-2-Hexene	ND		mg/kg	97.6	13.2	10
Ethyl-Tert-Butyl-Ether	ND		mg/kg	97.6	14.8	10
2,2-Dimethylpentane	ND		mg/kg	97.6	13.1	10
Methylcyclopentane	ND		mg/kg	97.6	13.1	10
2,4-Dimethylpentane	ND		mg/kg	97.6	12.1	10
2,2,3-Trimethylbutane	ND		mg/kg	97.6	13.2	10
1,2-Dichloroethane	ND		mg/kg	97.6	14.4	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3,3-Dimethylpentane	ND		mg/kg	97.6	18.2	10
Cyclohexane	ND		mg/kg	97.6	12.1	10
2-Methylhexane	ND		mg/kg	97.6	15.4	10
Benzene	ND		mg/kg	97.6	14.9	10
2,3-Dimethylpentane	ND		mg/kg	97.6	12.9	10
Thiophene	ND		mg/kg	97.6	13.9	10
1,1-Dimethylcyclopentane	ND		mg/kg	97.6	11.7	10
3-Methylhexane	ND		mg/kg	97.6	15.6	10
Tertiary-Amyl Methyl Ether	ND		mg/kg	97.6	12.0	10
3-Ethylpentane	ND		mg/kg	97.6	14.1	10
1-Heptene/1,2-DMCP (trans)	ND		mg/kg	195	28.6	10
Isooctane	ND		mg/kg	97.6	10.6	10
trans-3-Heptene	ND		mg/kg	97.6	15.2	10
Heptane	25.2	J	mg/kg	97.6	17.0	10
trans-2-Heptene	ND		mg/kg	97.6	12.5	10
cis-2-Heptene	ND		mg/kg	97.6	18.9	10
2,2-Dimethylhexane	ND		mg/kg	97.6	14.2	10
Methylcyclohexane	81.1	J	mg/kg	97.6	13.2	10
2,5-Dimethylhexane	ND		mg/kg	97.6	17.0	10
2,4-Dimethylhexane	ND		mg/kg	97.6	11.9	10
Ethylcyclopentane	ND		mg/kg	97.6	12.9	10
2,2,3-Trimethylpentane	ND		mg/kg	97.6	16.9	10
2,3,4-Trimethylpentane	ND		mg/kg	97.6	12.7	10
Xylene (Total)[1]	594		mg/kg	97.6	10.2	10
2,3,3-Trimethylpentane	ND		mg/kg	97.6	19.4	10
2,3-Dimethylhexane	ND		mg/kg	97.6	23.7	10
2-Methylheptane	86.1	J	mg/kg	97.6	16.5	10
4-Methylheptane	ND		mg/kg	97.6	16.8	10
3-Methylheptane	93.4	J	mg/kg	97.6	13.9	10
3-Ethylhexane	ND		mg/kg	97.6	17.5	10
Toluene	16.2	J	mg/kg	97.6	13.2	10
2-Methylthiophene	ND		mg/kg	97.6	8.30	10
1,4-Dimethylcyclohexane (trans)	75.0	J	mg/kg	97.6	12.7	10
3-Methylthiophene	ND		mg/kg	97.6	11.4	10
1-Octene	ND		mg/kg	244	15.0	10
Octane	324		mg/kg	97.6	11.5	10
1,2-Dimethylcyclohexane (trans)	144		mg/kg	97.6	14.4	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1,2-Dibromoethane	ND		mg/kg	97.6	15.6	10
cis-2-Octene	ND		mg/kg	97.6	11.2	10
Isopropylcyclopentane	ND		mg/kg	97.6	14.3	10
1,2-Dimethylcyclohexane (cis)	73.7	J	mg/kg	97.6	28.4	10
2,5-Dimethylheptane	160		mg/kg	97.6	16.4	10
3,5-Dimethylheptane	42.3	J	mg/kg	97.6	13.8	10
3,3-Dimethylheptane	19.9	J	mg/kg	97.6	11.8	10
1,1,4-Trimethylcyclohexane	ND		mg/kg	97.6	9.72	10
2,3-Dimethylheptane	304		mg/kg	97.6	11.1	10
3,4-Dimethylheptane	149		mg/kg	97.6	16.6	10
4-Methyloctane	323		mg/kg	97.6	16.3	10
2-Methyloctane	338		mg/kg	97.6	25.0	10
Ethylbenzene	141		mg/kg	97.6	10.5	10
2-Ethylthiophene	ND		mg/kg	97.6	8.59	10
3-Methyloctane	554		mg/kg	97.6	10.9	10
3,3-Diethylpentane	ND		mg/kg	97.6	11.4	10
p/m-Xylene	448		mg/kg	195	18.6	10
1-Nonene	ND		mg/kg	244	13.2	10
trans-3-Nonene	ND		mg/kg	97.6	11.6	10
cis-3-Nonene	ND		mg/kg	97.6	18.3	10
Nonane (C9)	2810		mg/kg	97.6	15.2	10
Styrene	ND		mg/kg	97.6	9.86	10
o-Xylene	146		mg/kg	97.6	10.2	10
2-Nonene	ND		mg/kg	244	12.4	10
Isopropylcyclohexane	ND		mg/kg	97.6	10.4	10
Isopropylbenzene	152		mg/kg	97.6	9.13	10
3,3-Dimethyloctane	188		mg/kg	97.6	9.86	10
n-Propylbenzene	438		mg/kg	97.6	8.64	10
2-Methylnonane	1830		mg/kg	97.6	13.8	10
3-Methylnonane	1940		mg/kg	97.6	13.6	10
1-Methyl-3-Ethylbenzene	721		mg/kg	97.6	15.4	10
1-Methyl-4-Ethylbenzene	525		mg/kg	97.6	13.8	10
1,3,5-Trimethylbenzene	970		mg/kg	97.6	11.2	10
1-Decene	ND		mg/kg	97.6	12.7	10
Isobutylcyclohexane	ND		mg/kg	97.6	7.96	10
1-Methyl-2-Ethylbenzene	706		mg/kg	97.6	8.30	10
Decane (C10)	13400	E	mg/kg	97.6	13.2	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D Date Collected: 09/12/22 13:35

Client ID: A3-010TW-PRN01-WK2 Date Received: 09/20/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
tert-Butylbenzene	27.7	J	mg/kg	97.6	10.3	10
1,2,4-Trimethylbenzene	2940		mg/kg	97.6	10.1	10
Isobutylbenzene	203		mg/kg	97.6	13.2	10
sec-Butylbenzene	492		mg/kg	97.6	12.6	10
1-Methyl-3-Isopropylbenzene	571		mg/kg	97.6	12.6	10
1-Methyl-4-Isopropylbenzene	518		mg/kg	97.6	10.4	10
1,2,3-Trimethylbenzene	1810		mg/kg	97.6	10.9	10
1-Methyl-2-Isopropylbenzene	139		mg/kg	97.6	10.6	10
Indane	269		mg/kg	97.6	6.00	10
1,3-Diethylbenzene	646		mg/kg	97.6	12.2	10
1-Methyl-3-N-Propylbenzene	1520		mg/kg	97.6	9.86	10
Indene	73.8	J	mg/kg	97.6	5.66	10
1-Methyl-4-N-Propylbenzene	897		mg/kg	97.6	12.2	10
n-Butylbenzene	824		mg/kg	97.6	9.62	10
1,2-Dimethyl-4-Ethylbenzene	1410		mg/kg	97.6	12.0	10
1,2-Diethylbenzene	415		mg/kg	97.6	14.4	10
1-Methyl-2-N-Propylbenzene	1450		mg/kg	97.6	12.2	10
1,4-Dimethyl-2-Ethylbenzene	1340		mg/kg	97.6	9.13	10
Undecane	24700	E	mg/kg	97.6	10.8	10
1,3-Dimethyl-4-Ethylbenzene	1560		mg/kg	97.6	9.47	10
1,3-Dimethyl-5-Ethylbenzene	2040		mg/kg	97.6	11.5	10
1,3-Dimethyl-2-Ethylbenzene	455		mg/kg	97.6	7.28	10
1,2-Dimethyl-3-Ethylbenzene	976		mg/kg	97.6	6.20	10
1,2,4,5-Tetramethylbenzene	1110		mg/kg	97.6	7.57	10
1,2,3,5-Tetramethylbenzene	1980		mg/kg	97.6	7.42	10
N-Pentylbenzene	491		mg/kg	97.6	12.2	10
1,2,3,4-Tetramethylbenzene	1660		mg/kg	97.6	10.4	10
1,3-Dimethyl-5-tert-Butylbenzene	ND		mg/kg	97.6	13.9	10
Dodecane (C12)	22700	E	mg/kg	244	32.1	10
1,3,5-Triethylbenzene	ND		mg/kg	97.6	18.6	10
Naphthalene	1860		mg/kg	97.6	40.8	10
Benzothiophene	ND		mg/kg	97.6	51.6	10
1,2,4-Triethylbenzene	ND		mg/kg	97.6	16.6	10
Hexylbenzene	593		mg/kg	97.6	18.8	10
MMT	ND		mg/kg	244	62.8	10
Tridecane	18000	E	mg/kg	244	68.0	10
2-Methylnaphthalene	3640		mg/kg	244	64.6	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1-Methylnaphthalene	2490		mg/kg	244	71.7	10
Tetradecane (C14)	11200	E	mg/kg	244	29.9	10
Pentadecane	2980		mg/kg	244	54.4	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	95		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	102		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D2 Date Collected: 09/12/22 14:10
Client ID: A3-040TW-PRN01-WK2 Date Received: 09/20/22
Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 22:53
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
Decane (C10)	21200		mg/kg	1920	260.	200
Undecane	48400		mg/kg	1920	213.	200
Dodecane (C12)	46400		mg/kg	4800	631.	200
Tridecane	34700		mg/kg	4800	1340	200
Tetradecane (C14)	22100		mg/kg	4800	588.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	94		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	102		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 19:20
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3-Methyl-1-butene	ND		mg/kg	96.1	14.3	10
Isopentane	ND		mg/kg	96.1	17.6	10
1-Pentene	ND		mg/kg	96.1	17.5	10
2-Methyl-1-Butene	ND		mg/kg	96.1	14.9	10
Pentane	ND		mg/kg	96.1	30.0	10
trans-2-Pentene	ND		mg/kg	96.1	13.0	10
Isoprene	ND		mg/kg	96.1	17.1	10
cis-2-Pentene	ND		mg/kg	96.1	15.5	10
Tertiary Butanol	ND		mg/kg	1200	156.	10
2,2-Dimethylbutane	ND		mg/kg	96.1	29.6	10
4-Methyl-1-pentene	ND		mg/kg	96.1	14.9	10
Cyclopentane	ND		mg/kg	96.1	24.9	10
2,3-Dimethylbutane	ND		mg/kg	96.1	39.7	10
2-Methylpentane	ND		mg/kg	96.1	26.0	10
Methyl tert butyl ether	ND		mg/kg	96.1	19.8	10
3-Methylpentane	ND		mg/kg	96.1	15.2	10
1-Hexene	ND		mg/kg	96.1	13.5	10
n-Hexane	ND		mg/kg	96.1	15.8	10
Isopropyl Ether	ND		mg/kg	96.1	11.6	10
trans-2-Hexene	ND		mg/kg	96.1	12.5	10
2-Methyl-2-pentene	ND		mg/kg	96.1	14.7	10
cis-2-Hexene	ND		mg/kg	96.1	13.0	10
Ethyl-Tert-Butyl-Ether	ND		mg/kg	96.1	14.6	10
2,2-Dimethylpentane	ND		mg/kg	96.1	12.9	10
Methylcyclopentane	ND		mg/kg	96.1	12.9	10
2,4-Dimethylpentane	ND		mg/kg	96.1	11.9	10
2,2,3-Trimethylbutane	ND		mg/kg	96.1	13.0	10
1,2-Dichloroethane	ND		mg/kg	96.1	14.2	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3,3-Dimethylpentane	ND		mg/kg	96.1	17.9	10
Cyclohexane	ND		mg/kg	96.1	11.9	10
2-Methylhexane	ND		mg/kg	96.1	15.1	10
Benzene	16.1	J	mg/kg	96.1	14.6	10
2,3-Dimethylpentane	ND		mg/kg	96.1	12.7	10
Thiophene	ND		mg/kg	96.1	13.6	10
1,1-Dimethylcyclopentane	ND		mg/kg	96.1	11.5	10
3-Methylhexane	ND		mg/kg	96.1	15.4	10
Tertiary-Amyl Methyl Ether	ND		mg/kg	96.1	11.8	10
3-Ethylpentane	ND		mg/kg	96.1	13.9	10
1-Heptene/1,2-DMCP (trans)	ND		mg/kg	192	28.1	10
Isooctane	ND		mg/kg	96.1	10.5	10
trans-3-Heptene	ND		mg/kg	96.1	14.9	10
Heptane	55.8	J	mg/kg	96.1	16.7	10
trans-2-Heptene	ND		mg/kg	96.1	12.3	10
cis-2-Heptene	ND		mg/kg	96.1	18.6	10
2,2-Dimethylhexane	ND		mg/kg	96.1	13.9	10
Methylcyclohexane	127		mg/kg	96.1	13.0	10
2,5-Dimethylhexane	ND		mg/kg	96.1	16.7	10
2,4-Dimethylhexane	12.5	J	mg/kg	96.1	11.7	10
Ethylcyclopentane	13.2	J	mg/kg	96.1	12.7	10
2,2,3-Trimethylpentane	ND		mg/kg	96.1	16.7	10
2,3,4-Trimethylpentane	ND		mg/kg	96.1	12.5	10
Xylene (Total)[1]	544		mg/kg	96.1	10.0	10
2,3,3-Trimethylpentane	ND		mg/kg	96.1	19.1	10
2,3-Dimethylhexane	ND		mg/kg	96.1	23.3	10
2-Methylheptane	144		mg/kg	96.1	16.2	10
4-Methylheptane	ND		mg/kg	96.1	16.5	10
3-Methylheptane	133		mg/kg	96.1	13.7	10
3-Ethylhexane	ND		mg/kg	96.1	17.2	10
Toluene	ND		mg/kg	96.1	13.0	10
2-Methylthiophene	ND		mg/kg	96.1	8.16	10
1,4-Dimethylcyclohexane (trans)	59.2	J	mg/kg	96.1	12.5	10
3-Methylthiophene	ND		mg/kg	96.1	11.2	10
1-Octene	ND		mg/kg	240	14.7	10
Octane	631		mg/kg	96.1	11.3	10
1,2-Dimethylcyclohexane (trans)	188		mg/kg	96.1	14.1	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1,2-Dibromoethane	ND		mg/kg	96.1	15.4	10
cis-2-Octene	ND		mg/kg	96.1	11.0	10
Isopropylcyclopentane	19.8	J	mg/kg	96.1	14.1	10
1,2-Dimethylcyclohexane (cis)	103		mg/kg	96.1	27.9	10
2,5-Dimethylheptane	179		mg/kg	96.1	16.1	10
3,5-Dimethylheptane	53.6	J	mg/kg	96.1	13.5	10
3,3-Dimethylheptane	20.9	J	mg/kg	96.1	11.6	10
1,1,4-Trimethylcyclohexane	ND		mg/kg	96.1	9.56	10
2,3-Dimethylheptane	342		mg/kg	96.1	11.0	10
3,4-Dimethylheptane	159		mg/kg	96.1	16.3	10
4-Methyloctane	378		mg/kg	96.1	16.0	10
2-Methyloctane	519		mg/kg	96.1	24.6	10
Ethylbenzene	64.1	J	mg/kg	96.1	10.4	10
2-Ethylthiophene	ND		mg/kg	96.1	8.45	10
3-Methyloctane	688		mg/kg	96.1	10.8	10
3,3-Diethylpentane	ND		mg/kg	96.1	11.2	10
p/m-Xylene	192		mg/kg	192	18.3	10
1-Nonene	ND		mg/kg	240	13.0	10
trans-3-Nonene	ND		mg/kg	96.1	11.4	10
cis-3-Nonene	ND		mg/kg	96.1	18.0	10
Nonane (C9)	4280		mg/kg	96.1	14.9	10
Styrene	ND		mg/kg	96.1	9.70	10
o-Xylene	352		mg/kg	96.1	10.0	10
2-Nonene	ND		mg/kg	240	12.2	10
Isopropylcyclohexane	ND		mg/kg	96.1	10.2	10
Isopropylbenzene	197		mg/kg	96.1	8.98	10
3,3-Dimethyloctane	152		mg/kg	96.1	9.70	10
n-Propylbenzene	454		mg/kg	96.1	8.50	10
2-Methylnonane	1980		mg/kg	96.1	13.6	10
3-Methylnonane	2040		mg/kg	96.1	13.4	10
1-Methyl-3-Ethylbenzene	641		mg/kg	96.1	15.2	10
1-Methyl-4-Ethylbenzene	706		mg/kg	96.1	13.5	10
1,3,5-Trimethylbenzene	1260		mg/kg	96.1	11.0	10
1-Decene	ND		mg/kg	96.1	12.5	10
Isobutylcyclohexane	ND		mg/kg	96.1	7.83	10
1-Methyl-2-Ethylbenzene	1080		mg/kg	96.1	8.16	10
Decane (C10)	16200	E	mg/kg	96.1	13.0	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
tert-Butylbenzene	31.7	J	mg/kg	96.1	10.1	10
1,2,4-Trimethylbenzene	3790		mg/kg	96.1	9.94	10
Isobutylbenzene	227		mg/kg	96.1	13.0	10
sec-Butylbenzene	556		mg/kg	96.1	12.4	10
1-Methyl-3-Isopropylbenzene	748		mg/kg	96.1	12.4	10
1-Methyl-4-Isopropylbenzene	605		mg/kg	96.1	10.2	10
1,2,3-Trimethylbenzene	2440		mg/kg	96.1	10.7	10
1-Methyl-2-Isopropylbenzene	151		mg/kg	96.1	10.4	10
Indane	208		mg/kg	96.1	5.91	10
1,3-Diethylbenzene	652		mg/kg	96.1	12.0	10
1-Methyl-3-N-Propylbenzene	1880		mg/kg	96.1	9.70	10
Indene	79.2	J	mg/kg	96.1	5.57	10
1-Methyl-4-N-Propylbenzene	1020		mg/kg	96.1	12.0	10
n-Butylbenzene	949		mg/kg	96.1	9.46	10
1,2-Dimethyl-4-Ethylbenzene	1600		mg/kg	96.1	11.8	10
1,2-Diethylbenzene	426		mg/kg	96.1	14.2	10
1-Methyl-2-N-Propylbenzene	1780		mg/kg	96.1	12.0	10
1,4-Dimethyl-2-Ethylbenzene	1550		mg/kg	96.1	8.98	10
Undecane	27200	E	mg/kg	96.1	10.7	10
1,3-Dimethyl-4-Ethylbenzene	1870		mg/kg	96.1	9.32	10
1,3-Dimethyl-5-Ethylbenzene	2070		mg/kg	96.1	11.3	10
1,3-Dimethyl-2-Ethylbenzene	464		mg/kg	96.1	7.16	10
1,2-Dimethyl-3-Ethylbenzene	1110		mg/kg	96.1	6.10	10
1,2,4,5-Tetramethylbenzene	1260		mg/kg	96.1	7.44	10
1,2,3,5-Tetramethylbenzene	2320		mg/kg	96.1	7.30	10
N-Pentylbenzene	599		mg/kg	96.1	12.0	10
1,2,3,4-Tetramethylbenzene	1810		mg/kg	96.1	10.3	10
1,3-Dimethyl-5-tert-Butylbenzene	ND		mg/kg	96.1	13.7	10
Dodecane (C12)	26400	E	mg/kg	240	31.6	10
1,3,5-Triethylbenzene	ND		mg/kg	96.1	18.2	10
Naphthalene	2370		mg/kg	96.1	40.1	10
Benzothiophene	ND		mg/kg	96.1	50.8	10
1,2,4-Triethylbenzene	ND		mg/kg	96.1	16.3	10
Hexylbenzene	654		mg/kg	96.1	18.5	10
MMT	ND		mg/kg	240	61.8	10
Tridecane	24700	E	mg/kg	240	66.9	10
2-Methylnaphthalene	4730		mg/kg	240	63.5	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1-Methylnaphthalene	3230		mg/kg	240	70.5	10
Tetradecane (C14)	16100	E	mg/kg	240	29.4	10
Pentadecane	2220		mg/kg	240	53.6	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	100		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	100		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
3-Methyl-1-butene	ND		mg/kg	10.0	1.48
Isopentane	ND		mg/kg	10.0	1.83
1-Pentene	ND		mg/kg	10.0	1.82
2-Methyl-1-Butene	ND		mg/kg	10.0	1.56
Pentane	ND		mg/kg	10.0	3.12
trans-2-Pentene	ND		mg/kg	10.0	1.35
Isoprene	ND		mg/kg	10.0	1.78
cis-2-Pentene	ND		mg/kg	10.0	1.61
Tertiary Butanol	ND		mg/kg	125	16.2
2,2-Dimethylbutane	ND		mg/kg	10.0	3.08
4-Methyl-1-pentene	ND		mg/kg	10.0	1.56
Cyclopentane	ND		mg/kg	10.0	2.60
2,3-Dimethylbutane	ND		mg/kg	10.0	4.13
2-Methylpentane	ND		mg/kg	10.0	2.71
Methyl tert butyl ether	ND		mg/kg	10.0	2.06
3-Methylpentane	ND		mg/kg	10.0	1.58
1-Hexene	ND		mg/kg	10.0	1.40
n-Hexane	ND		mg/kg	10.0	1.64
Isopropyl Ether	ND		mg/kg	10.0	1.21
trans-2-Hexene	ND		mg/kg	10.0	1.30
2-Methyl-2-pentene	ND		mg/kg	10.0	1.53
cis-2-Hexene	ND		mg/kg	10.0	1.36
Ethyl-Tert-Butyl-Ether	ND		mg/kg	10.0	1.52
2,2-Dimethylpentane	ND		mg/kg	10.0	1.34
Methylcyclopentane	ND		mg/kg	10.0	1.34
2,4-Dimethylpentane	ND		mg/kg	10.0	1.24
2,2,3-Trimethylbutane	ND		mg/kg	10.0	1.35
1,2-Dichloroethane	ND		mg/kg	10.0	1.48
3,3-Dimethylpentane	ND		mg/kg	10.0	1.86

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
Cyclohexane	ND		mg/kg	10.0	1.24
2-Methylhexane	ND		mg/kg	10.0	1.58
Benzene	1.76	J	mg/kg	10.0	1.52
2,3-Dimethylpentane	ND		mg/kg	10.0	1.32
Thiophene	ND		mg/kg	10.0	1.42
1,1-Dimethylcyclopentane	ND		mg/kg	10.0	1.20
3-Methylhexane	ND		mg/kg	10.0	1.60
Tertiary-Amyl Methyl Ether	ND		mg/kg	10.0	1.23
3-Ethylpentane	ND		mg/kg	10.0	1.44
1-Heptene/1,2-DMCP (trans)	ND		mg/kg	20.0	2.92
Isooctane	ND		mg/kg	10.0	1.09
trans-3-Heptene	ND		mg/kg	10.0	1.56
Heptane	ND		mg/kg	10.0	1.74
trans-2-Heptene	ND		mg/kg	10.0	1.28
cis-2-Heptene	ND		mg/kg	10.0	1.94
2,2-Dimethylhexane	ND		mg/kg	10.0	1.45
Methylcyclohexane	ND		mg/kg	10.0	1.35
2,5-Dimethylhexane	ND		mg/kg	10.0	1.74
2,4-Dimethylhexane	ND		mg/kg	10.0	1.22
Ethylcyclopentane	ND		mg/kg	10.0	1.32
2,2,3-Trimethylpentane	ND		mg/kg	10.0	1.74
2,3,4-Trimethylpentane	ND		mg/kg	10.0	1.30
Xylene (Total)[1]	ND		mg/kg	10.0	1.04
2,3,3-Trimethylpentane	ND		mg/kg	10.0	1.98
2,3-Dimethylhexane	ND		mg/kg	10.0	2.42
2-Methylheptane	ND		mg/kg	10.0	1.69
4-Methylheptane	ND		mg/kg	10.0	1.72
3-Methylheptane	ND		mg/kg	10.0	1.42
3-Ethylhexane	ND		mg/kg	10.0	1.79

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
Toluene	ND		mg/kg	10.0	1.36
2-Methylthiophene	ND		mg/kg	10.0	0.850
1,4-Dimethylcyclohexane (trans)	ND		mg/kg	10.0	1.30
3-Methylthiophene	ND		mg/kg	10.0	1.17
1-Octene	ND		mg/kg	25.0	1.54
Octane	ND		mg/kg	10.0	1.18
1,2-Dimethylcyclohexane (trans)	ND		mg/kg	10.0	1.47
1,2-Dibromoethane	ND		mg/kg	10.0	1.60
cis-2-Octene	ND		mg/kg	10.0	1.14
Isopropylcyclopentane	ND		mg/kg	10.0	1.46
1,2-Dimethylcyclohexane (cis)	ND		mg/kg	10.0	2.90
2,5-Dimethylheptane	ND		mg/kg	10.0	1.68
3,5-Dimethylheptane	ND		mg/kg	10.0	1.41
3,3-Dimethylheptane	ND		mg/kg	10.0	1.21
1,1,4-Trimethylcyclohexane	ND		mg/kg	10.0	0.995
2,3-Dimethylheptane	ND		mg/kg	10.0	1.14
3,4-Dimethylheptane	ND		mg/kg	10.0	1.70
4-Methyloctane	ND		mg/kg	10.0	1.67
2-Methyloctane	ND		mg/kg	10.0	2.56
Ethylbenzene	ND		mg/kg	10.0	1.08
2-Ethylthiophene	ND		mg/kg	10.0	0.880
3-Methyloctane	ND		mg/kg	10.0	1.12
3,3-Diethylpentane	ND		mg/kg	10.0	1.16
p/m-Xylene	ND		mg/kg	20.0	1.90
1-Nonene	ND		mg/kg	25.0	1.35
trans-3-Nonene	ND		mg/kg	10.0	1.18
cis-3-Nonene	ND		mg/kg	10.0	1.87
Nonane (C9)	ND		mg/kg	10.0	1.56
Styrene	ND		mg/kg	10.0	1.01

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
o-Xylene	ND		mg/kg	10.0	1.04
2-Nonene	ND		mg/kg	25.0	1.27
Isopropylcyclohexane	ND		mg/kg	10.0	1.06
Isopropylbenzene	ND		mg/kg	10.0	0.935
3,3-Dimethyloctane	ND		mg/kg	10.0	1.01
n-Propylbenzene	ND		mg/kg	10.0	0.885
2-Methylnonane	ND		mg/kg	10.0	1.42
3-Methylnonane	ND		mg/kg	10.0	1.40
1-Methyl-3-Ethylbenzene	ND		mg/kg	10.0	1.58
1-Methyl-4-Ethylbenzene	ND		mg/kg	10.0	1.41
1,3,5-Trimethylbenzene	ND		mg/kg	10.0	1.15
1-Decene	ND		mg/kg	10.0	1.30
Isobutylcyclohexane	ND		mg/kg	10.0	0.815
1-Methyl-2-Ethylbenzene	ND		mg/kg	10.0	0.850
Decane (C10)	1.39	J	mg/kg	10.0	1.36
tert-Butylbenzene	ND		mg/kg	10.0	1.06
1,2,4-Trimethylbenzene	ND		mg/kg	10.0	1.04
Isobutylbenzene	ND		mg/kg	10.0	1.35
sec-Butylbenzene	ND		mg/kg	10.0	1.30
1-Methyl-3-Isopropylbenzene	ND		mg/kg	10.0	1.29
1-Methyl-4-Isopropylbenzene	ND		mg/kg	10.0	1.06
1,2,3-Trimethylbenzene	ND		mg/kg	10.0	1.12
1-Methyl-2-Isopropylbenzene	ND		mg/kg	10.0	1.08
Indane	ND		mg/kg	10.0	0.615
1,3-Diethylbenzene	ND		mg/kg	10.0	1.24
1-Methyl-3-N-Propylbenzene	ND		mg/kg	10.0	1.01
Indene	ND		mg/kg	10.0	0.580
1-Methyl-4-N-Propylbenzene	ND		mg/kg	10.0	1.25
n-Butylbenzene	ND		mg/kg	10.0	0.985

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
1,2-Dimethyl-4-Ethylbenzene	ND		mg/kg	10.0	1.22
1,2-Diethylbenzene	ND		mg/kg	10.0	1.48
1-Methyl-2-N-Propylbenzene	ND		mg/kg	10.0	1.24
1,4-Dimethyl-2-Ethylbenzene	ND		mg/kg	10.0	0.935
Undecane	ND		mg/kg	10.0	1.11
1,3-Dimethyl-4-Ethylbenzene	ND		mg/kg	10.0	0.970
1,3-Dimethyl-5-Ethylbenzene	ND		mg/kg	10.0	1.18
1,3-Dimethyl-2-Ethylbenzene	ND		mg/kg	10.0	0.745
1,2-Dimethyl-3-Ethylbenzene	ND		mg/kg	10.0	0.635
1,2,4,5-Tetramethylbenzene	ND		mg/kg	10.0	0.775
1,2,3,5-Tetramethylbenzene	ND		mg/kg	10.0	0.760
N-Pentylbenzene	ND		mg/kg	10.0	1.24
1,2,3,4-Tetramethylbenzene	ND		mg/kg	10.0	1.07
1,3-Dimethyl-5-tert-Butylbenzene	ND		mg/kg	10.0	1.42
Dodecane (C12)	ND		mg/kg	25.0	3.28
1,3,5-Triethylbenzene	ND		mg/kg	10.0	1.90
Naphthalene	ND		mg/kg	10.0	4.18
Benzothiophene	ND		mg/kg	10.0	5.28
1,2,4-Triethylbenzene	ND		mg/kg	10.0	1.70
Hexylbenzene	ND		mg/kg	10.0	1.92
MMT	ND		mg/kg	25.0	6.43
Tridecane	ND		mg/kg	25.0	6.96
2-Methylnaphthalene	ND		mg/kg	25.0	6.61
1-Methylnaphthalene	ND		mg/kg	25.0	7.34
Tetradecane (C14)	ND		mg/kg	25.0	3.06
Pentadecane	ND		mg/kg	25.0	5.58

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	98		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	101		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106
Lab Number: L2250426
Report Date: 10/07/22

PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01-02 Batch: WG1692182-3 WG1692182-4

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
1-Pentene	107		107		50-130	0		30
Pentane	86		87		50-130	1		30
Tertiary Butanol	89		92		50-130	3		30
Cyclopentane	92		93		50-130	1		30
2-Methylpentane	91		93		50-130	2		30
Methyl tert butyl ether	81		78		50-130	4		30
3-Methylpentane	95		95		50-130	0		30
1-Hexene	101		100		50-130	1		30
n-Hexane	90		91		50-130	1		30
Isopropyl Ether	86		86		50-130	0		30
Ethyl-Tert-Butyl-Ether	75		76		50-130	1		30
Methylcyclopentane	102		103		50-130	1		30
2,4-Dimethylpentane	93		94		50-130	1		30
Cyclohexane	102		104		50-130	2		30
2-Methylhexane	94		94		50-130	0		30
Benzene	91		91		50-130	0		30
2,3-Dimethylpentane	93		97		50-130	4		30
3-Methylhexane	83		84		50-130	1		30
Tertiary-Amyl Methyl Ether	79		80		50-130	1		30
Isooctane	101		99		50-130	2		30
Heptane	102		102		50-130	0		30
Methylcyclohexane	96		94		50-130	2		30
2-Methylheptane	102		103		50-130	1		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106
Lab Number: L2250426
Report Date: 10/07/22

PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01-02 Batch: WG1692182-3 WG1692182-4

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
3-Methylheptane	100		100		50-130	0		30
Toluene	90		91		50-130	1		30
Octane	103		104		50-130	1		30
Ethylbenzene	93		94		50-130	1		30
p/m-Xylene	97		98		50-130	1		30
Nonane (C9)	97		96		50-130	1		30
o-Xylene	96		98		50-130	2		30
Isopropylbenzene	98		99		50-130	1		30
n-Propylbenzene	101		102		50-130	1		30
1-Methyl-3-Ethylbenzene	100		101		50-130	1		30
1-Methyl-4-Ethylbenzene	101		104		50-130	3		30
1,3,5-Trimethylbenzene	102		104		50-130	2		30
1-Decene	78		78		50-130	0		30
1-Methyl-2-Ethylbenzene	101		104		50-130	3		30
Decane (C10)	105		106		50-130	1		30
1,2,4-Trimethylbenzene	96		98		50-130	2		30
sec-Butylbenzene	106		109		50-130	3		30
1-Methyl-4-N-Propylbenzene	99		100		50-130	1		30
n-Butylbenzene	100		102		50-130	2		30
1,2-Diethylbenzene	99		100		50-130	1		30
Undecane	102		102		50-130	0		30
N-Pentylbenzene	100		101		50-130	1		30
Dodecane (C12)	121		122		50-130	1		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3

Project Number: CTO-22F0106

Lab Number: L2250426

Report Date: 10/07/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01-02 Batch: WG1692182-3 WG1692182-4								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Dibromofluoromethane	98		98		70-130
Toluene-d8	99		98		70-130
4-Bromofluorobenzene	103		103		70-130

PETROLEUM HYDROCARBONS

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/01/22 23:22
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	2930		mg/kg	193	57.3	1
n-Decane (C10)	15100		mg/kg	193	61.6	1
n-Undecane (C11)	39400	E	mg/kg	193	57.7	1
n-Dodecane (C12)	42500	E	mg/kg	193	42.1	1
n-Tridecane (C13)	34100		mg/kg	193	53.0	1
2,6,10-Trimethyldodecane (1380)	5210		mg/kg	193	29.1	1
n-Tetradecane (C14)	20000		mg/kg	193	29.1	1
2,6,10-Trimethyltridecane (1470)	4630		mg/kg	193	23.0	1
n-Pentadecane (C15)	7070		mg/kg	193	23.0	1
n-Hexadecane (C16)	1410		mg/kg	193	29.1	1
Norpristane (1650)	231		mg/kg	193	63.8	1
n-Heptadecane (C17)	290		mg/kg	193	63.8	1
Pristane	220		mg/kg	193	41.3	1
n-Octadecane (C18)	91.8	J	mg/kg	193	38.8	1
Phytane	72.6	J	mg/kg	193	24.3	1
n-Nonadecane (C19)	ND		mg/kg	193	49.7	1
n-Eicosane (C20)	ND		mg/kg	193	27.3	1
n-Heneicosane (C21)	ND		mg/kg	193	23.1	1
n-Docosane (C22)	ND		mg/kg	193	20.2	1
n-Tricosane (C23)	ND		mg/kg	193	24.6	1
n-Tetracosane (C24)	ND		mg/kg	193	32.3	1
n-Pentacosane (C25)	ND		mg/kg	193	102.	1
n-Hexacosane (C26)	ND		mg/kg	193	28.4	1
n-Heptacosane (C27)	ND		mg/kg	193	23.3	1
n-Octacosane (C28)	ND		mg/kg	193	41.4	1
n-Nonacosane (C29)	ND		mg/kg	193	129.	1
n-Triacontane (C30)	ND		mg/kg	193	22.2	1
n-Hentriacontane (C31)	ND		mg/kg	193	27.4	1

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 Date Collected: 09/12/22 13:35

Client ID: A3-010TW-PRN01-WK2 Date Received: 09/20/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	ND		mg/kg	193	24.3	1
n-Tritriacontane (C33)	ND		mg/kg	193	27.2	1
n-Tetratriacontane (C34)	ND		mg/kg	193	30.7	1
n-Pentatriacontane (C35)	ND		mg/kg	193	33.7	1
n-Hexatriacontane (C36)	ND		mg/kg	193	38.4	1
n-Heptatriacontane (C37)	ND		mg/kg	193	42.9	1
n-Octatriacontane (C38)	ND		mg/kg	193	45.0	1
n-Nonatriacontane (C39)	ND		mg/kg	193	62.7	1
n-Tetracontane (C40)	ND		mg/kg	193	62.7	1
C9-C44 Total Petroleu	1010000		mg/kg	6380	1400	1
C10-C28 DRO	958000		mg/kg	4060	836.	1
C28-C40 ORO	16400		mg/kg	2120	483.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	102		50-130
d50-Tetracosane	109		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/05/22 06:12
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Undecane (C11)	40900		mg/kg	966	288.	5
n-Dodecane (C12)	40700		mg/kg	966	210.	5
Total Saturated Hydrocarbons	173000	J	mg/kg	193	20.2	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	103		50-130
d50-Tetracosane	107		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/02/22 00:49
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	4530		mg/kg	197	58.4	1
n-Decane (C10)	20100		mg/kg	197	62.8	1
n-Undecane (C11)	45800	E	mg/kg	197	58.8	1
n-Dodecane (C12)	45500	E	mg/kg	197	42.9	1
n-Tridecane (C13)	35600		mg/kg	197	54.0	1
2,6,10-Trimethyldodecane (1380)	4640		mg/kg	197	29.6	1
n-Tetradecane (C14)	20100		mg/kg	197	29.6	1
2,6,10-Trimethyltridecane (1470)	4270		mg/kg	197	23.5	1
n-Pentadecane (C15)	7500		mg/kg	197	23.5	1
n-Hexadecane (C16)	1480		mg/kg	197	29.6	1
Norpristane (1650)	176	J	mg/kg	197	65.0	1
n-Heptadecane (C17)	314		mg/kg	197	65.0	1
Pristane	161	J	mg/kg	197	42.0	1
n-Octadecane (C18)	98.6	J	mg/kg	197	39.5	1
Phytane	34.0	J	mg/kg	197	24.7	1
n-Nonadecane (C19)	ND		mg/kg	197	50.6	1
n-Eicosane (C20)	ND		mg/kg	197	27.8	1
n-Heneicosane (C21)	ND		mg/kg	197	23.6	1
n-Docosane (C22)	ND		mg/kg	197	20.5	1
n-Tricosane (C23)	ND		mg/kg	197	25.0	1
n-Tetracosane (C24)	ND		mg/kg	197	32.9	1
n-Pentacosane (C25)	ND		mg/kg	197	104.	1
n-Hexacosane (C26)	ND		mg/kg	197	28.9	1
n-Heptacosane (C27)	ND		mg/kg	197	23.7	1
n-Octacosane (C28)	ND		mg/kg	197	42.2	1
n-Nonacosane (C29)	ND		mg/kg	197	131.	1
n-Triacontane (C30)	ND		mg/kg	197	22.6	1
n-Hentriacontane (C31)	ND		mg/kg	197	27.9	1

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 Date Collected: 09/12/22 14:10

Client ID: A3-040TW-PRN01-WK2 Date Received: 09/20/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	ND		mg/kg	197	24.8	1
n-Tritriacontane (C33)	ND		mg/kg	197	27.7	1
n-Tetratriacontane (C34)	ND		mg/kg	197	31.3	1
n-Pentatriacontane (C35)	ND		mg/kg	197	34.4	1
n-Hexatriacontane (C36)	ND		mg/kg	197	39.2	1
n-Heptatriacontane (C37)	ND		mg/kg	197	43.7	1
n-Octatriacontane (C38)	ND		mg/kg	197	45.9	1
n-Nonatriacontane (C39)	ND		mg/kg	197	63.9	1
n-Tetracontane (C40)	ND		mg/kg	197	63.9	1
C9-C44 Total Petroleu	973000		mg/kg	6500	1430	1
C10-C28 DRO	926000		mg/kg	4130	852.	1
C28-C40 ORO	9330		mg/kg	2160	492.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	99		50-130
d50-Tetracosane	106		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/05/22 07:39
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Undecane (C11)	47800		mg/kg	984	294.	5
n-Dodecane (C12)	43800		mg/kg	984	214.	5
Total Saturated Hydrocarbons	191000	J	mg/kg	197	20.5	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	101		50-130
d50-Tetracosane	106		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 10/01/22 05:57
Analyst: WR

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1693518-1					
n-Nonane (C9)	ND		mg/kg	200	59.3
n-Decane (C10)	ND		mg/kg	200	63.8
n-Undecane (C11)	ND		mg/kg	200	59.7
n-Dodecane (C12)	ND		mg/kg	200	43.6
n-Tridecane (C13)	ND		mg/kg	200	54.9
2,6,10-Trimethyldodecane (1380)	ND		mg/kg	200	30.1
n-Tetradecane (C14)	ND		mg/kg	200	30.1
2,6,10-Trimethyltridecane (1470)	ND		mg/kg	200	23.9
n-Pentadecane (C15)	ND		mg/kg	200	23.9
n-Hexadecane (C16)	ND		mg/kg	200	30.1
Norpristane (1650)	ND		mg/kg	200	66.0
n-Heptadecane (C17)	ND		mg/kg	200	66.0
Pristane	ND		mg/kg	200	42.7
n-Octadecane (C18)	ND		mg/kg	200	40.1
Phytane	ND		mg/kg	200	25.1
n-Nonadecane (C19)	ND		mg/kg	200	51.4
n-Eicosane (C20)	ND		mg/kg	200	28.3
n-Heneicosane (C21)	ND		mg/kg	200	23.9
n-Docosane (C22)	ND		mg/kg	200	20.9
n-Tricosane (C23)	ND		mg/kg	200	25.4
n-Tetracosane (C24)	ND		mg/kg	200	33.5
n-Pentacosane (C25)	ND		mg/kg	200	106.
n-Hexacosane (C26)	ND		mg/kg	200	29.4
n-Heptacosane (C27)	ND		mg/kg	200	24.1
n-Octacosane (C28)	ND		mg/kg	200	42.9
n-Nonacosane (C29)	ND		mg/kg	200	133.
n-Triacontane (C30)	ND		mg/kg	200	22.9
n-Hentriacontane (C31)	ND		mg/kg	200	28.3
n-Dotriacontane (C32)	ND		mg/kg	200	25.2

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 10/01/22 05:57
Analyst: WR

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1693518-1					
n-Tritriacontane (C33)	ND		mg/kg	200	28.1
n-Tetratriacontane (C34)	ND		mg/kg	200	31.8
n-Pentatriacontane (C35)	ND		mg/kg	200	34.9
n-Hexatriacontane (C36)	ND		mg/kg	200	39.8
n-Heptatriacontane (C37)	ND		mg/kg	200	44.4
n-Octatriacontane (C38)	ND		mg/kg	200	46.6
n-Nonatriacontane (C39)	ND		mg/kg	200	64.9
n-Tetracontane (C40)	ND		mg/kg	200	64.9
C9-C44 Total Petroleu	ND		mg/kg	6600	1450
C10-C28 DRO	1010	J	mg/kg	4200	866.
C28-C40 ORO	ND		mg/kg	2200	500.
Total Saturated Hydrocarbons	ND		mg/kg	200	20.9

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	100		50-130
d50-Tetracosane	104		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106
Lab Number: L2250426
Report Date: 10/07/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01-02 Batch: WG1693518-2 WG1693518-3								
Nonane (C9)	92		93		50-130	1		30
n-Decane (C10)	94		95		50-130	1		30
n-Dodecane (C12)	98		99		50-130	1		30
n-Tetradecane (C14)	97		99		50-130	2		30
n-Hexadecane (C16)	102		107		50-130	5		30
n-Octadecane (C18)	104		106		50-130	2		30
n-Nonadecane (C19)	93		96		50-130	3		30
n-Eicosane (C20)	96		99		50-130	3		30
n-Docosane (C22)	101		104		50-130	3		30
n-Tetracosane (C24)	105		108		50-130	3		30
n-Hexacosane (C26)	103		106		50-130	3		30
n-Octacosane (C28)	97		100		50-130	3		30
n-Triacontane (C30)	104		106		50-130	2		30
n-Hexatriacontane (C36)	95		97		50-130	2		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	102		103		50-130
d50-Tetracosane	105		106		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106

Lab Number: L2250426
Report Date: 10/07/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
NA	Present/Intact

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2250426-01A	Vial Large Septa unpreserved (4oz)	NA	NA			Y	Present/Intact		A2-PIANO8260(365),A2-SHC(365)
L2250426-02A	Vial Large Septa unpreserved (4oz)	NA	NA			Y	Present/Intact		A2-PIANO8260(365),A2-SHC(365)

*Values in parentheses indicate holding time in days

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

COC# 09132022SIT-Alpha-01

CHAIN OF CUSTODY

ALPHA ANALYTICAL

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 9/20/22

ALPHA Job #: L2250426

Project Information

Project Name: Site Characterization/Adit 3

Project Location: RHBFSF-Adit 3

Project #: CTO-22F0106

Project Manager: [redacted] (b) (6)

ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ Rush (ONLY IF PRE-APPROVED)

Due Date: Time:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #: 02.30.01.

Regulatory Requirements/Report Limits

State/Fed Program Criteria

Client Information

Client: GSI-Rhodes for CTO22F0106 (AECOM)

Address: 1001 Bishop Street, Ste 1600

Honolulu, Hawaii

Phone: [redacted] (b) (6)

Fax:

Email: [redacted] (b) (6) @aecom.com

☐ These samples have been Previously analyzed by Alpha

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS

Saturated Hydrocarbon ANalysis — PIANO

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Saturated Hydrocarbon ANalysis	PIANO	Sample Specific Comments
	A3015TW-PRN01-WK2	9/12/22	1315	Product	[redacted] (b) (6)	☒	☒	Sample is wat/prod
50426.01	A3-010TW-PRN01-WK2	9/12/22	1335	Product		☒	☒	Sample is product
-02	A3-040TW-PRN01-WK2	9/12/22	1410	Product		☒	☒	Sample is product
	A3-010DSVMP-PRN01-WK2	9/12/222	1255	Product		☒	☒	Sample is wat/prod [redacted] (b) (6)

9/12/22 [redacted] (b) (6)

Container Type	-	-	-	-	-	-	-	-	-	-	-	-	
Preservative	-	-	-	-	-	-	-	-	-	-	-	-	

Relinquished By:	Date/Time	Received By:	Date/Time
[redacted] (b) (6)	9/12/22@1600	[redacted] (b) (6)	9/12/22 1600
	9/13/22 (5:)	Fedex	
Fedex		[redacted] (b) (6)	9/20/22

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

15:07

FORM NO: 01-01(I-NJ) (rev. 5-JAN-12)

ORIGIN ID:HIKA (808) 356-5351
[redacted] (b) (6)
AECOM
1001 BISHOP STREET
SUITE 1600
HONOLULU, HI 96813
UNITED STATES US

SHIP DATE: 13SEP22
ACTWGT: 20.00 LB
CAD: 5070931/INET4532
DIMS: 18x18x18 IN

BILL SENDER

TO [redacted] (b) (6)

ALPHA ANALYTICAL
320 FORBES BLVD.

MANSFIELD MA 02048
(508) 822-9300 REF:
INV:
PO: DEPT:

581J1/EC8C/FE2D

FedEx Express

FedEx
TRK# 0201 7779 2607 3445

THU - 15 SEP AA
PRIORITY OVERNIGHT
ADG

XE PYMA

02048
MA-US
BOS

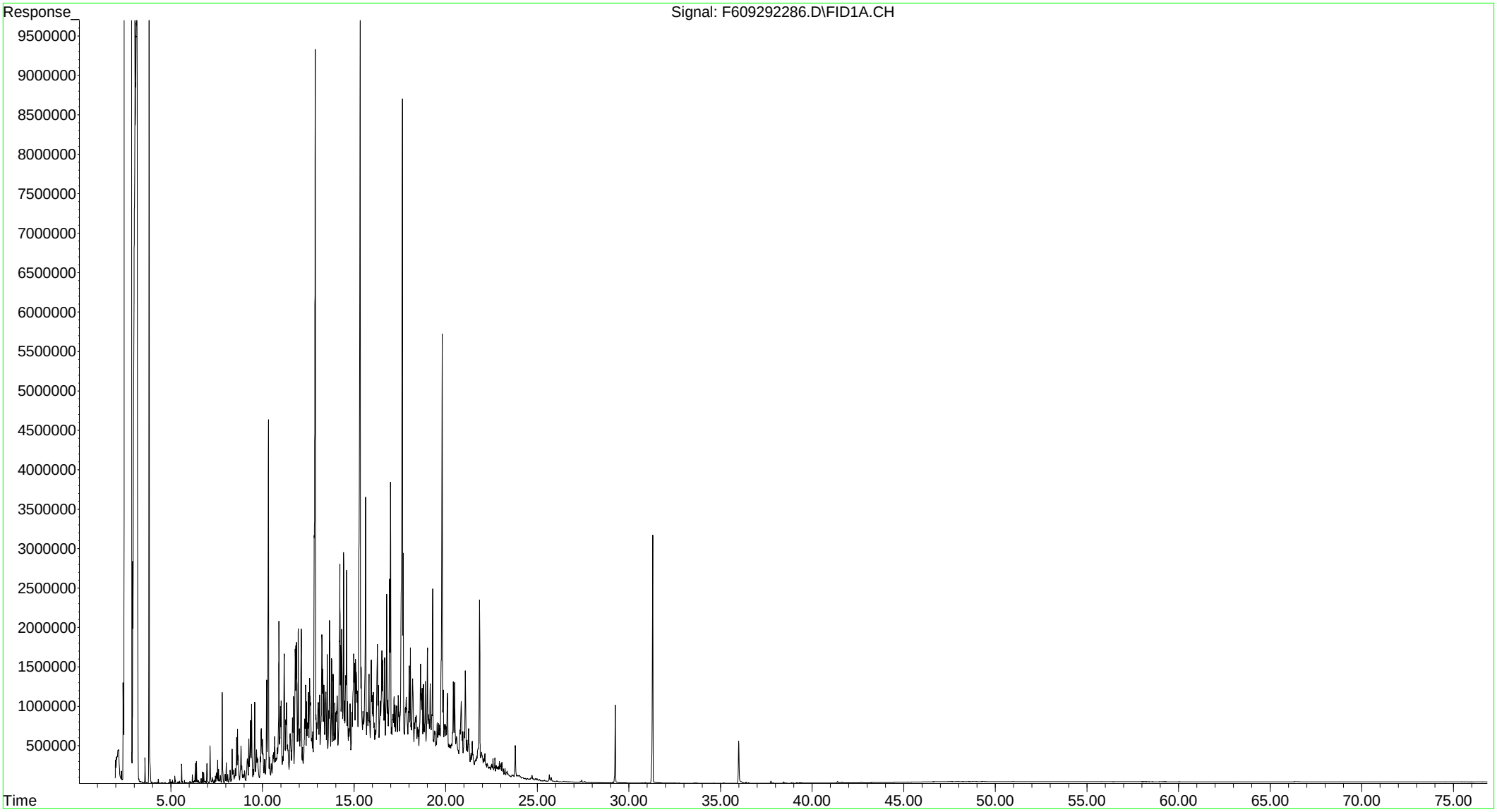
76313 14Sep2022 HNLA 581G1/EC8C/C088

After printing this label:
CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH
1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com. FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim. Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss. Maximum for items of extraordinary value is $1,000, e.g. jewelry, precious metals, negotiable instruments and other items listed in our Service Guide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

GC-FID Chromatogram

```
File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292286.D
Operator   : FID6:WR
Acquired   : 01 Oct 2022  11:22 pm using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: l2250426-01,42,,
Misc Info  : WG1693640,WG1693518,ICAL19333
Vial Number: 43
```



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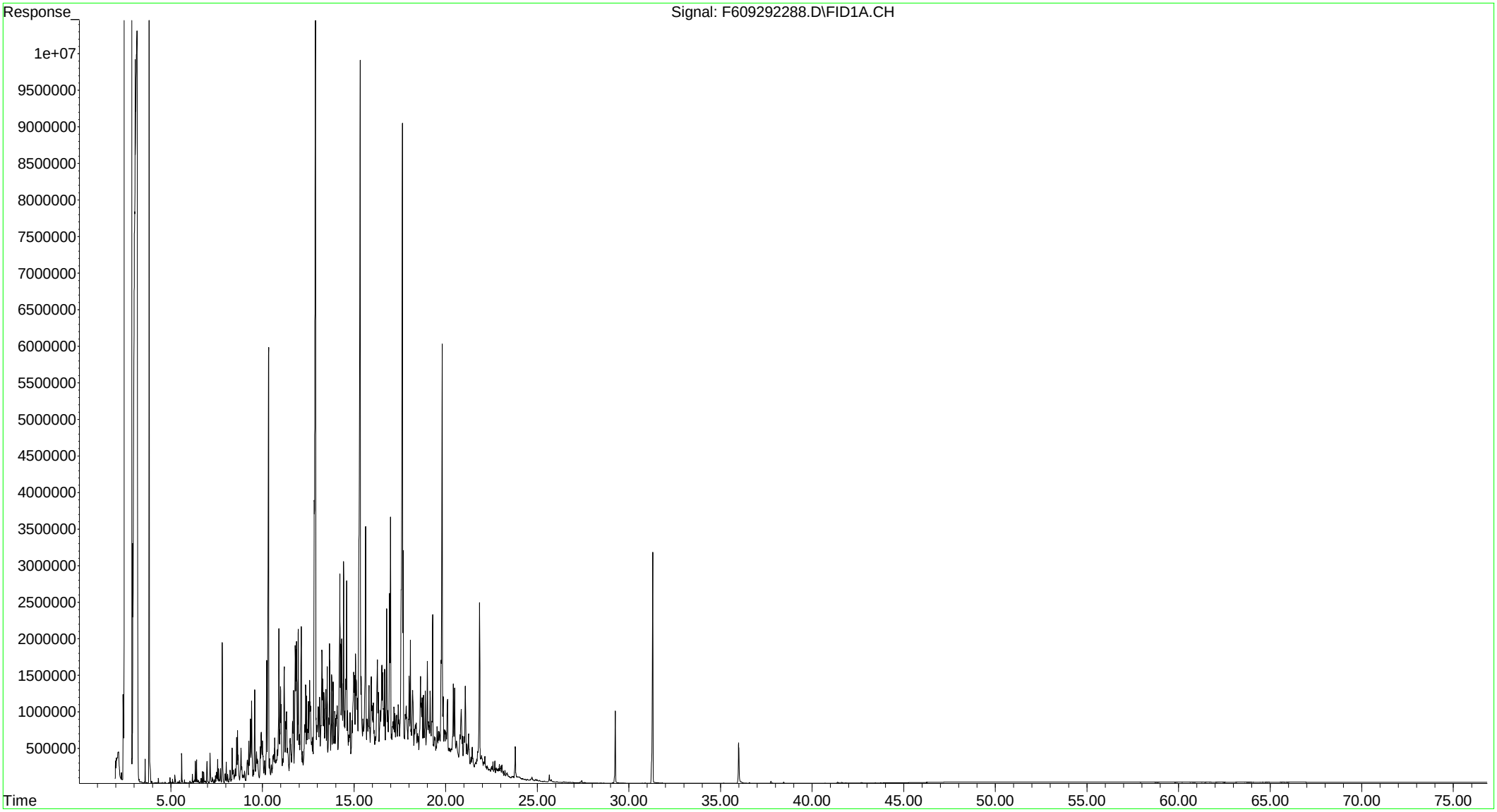
File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292288.D
Operator   : FID6:WR
Acquired   : 02 Oct 2022  12:49 am using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: l2250426-02,42,,
Misc Info  : WG1693640,WG1693518,ICAL19333
Vial Number: 44
```



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File        :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292262.D
Operator    : FID6:WR
Acquired    : 01 Oct 2022   5:57 am using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: WG1693518-1,42,,
Misc Info   : WG1693640,WG1693518,ICAL19333
Vial Number: 31
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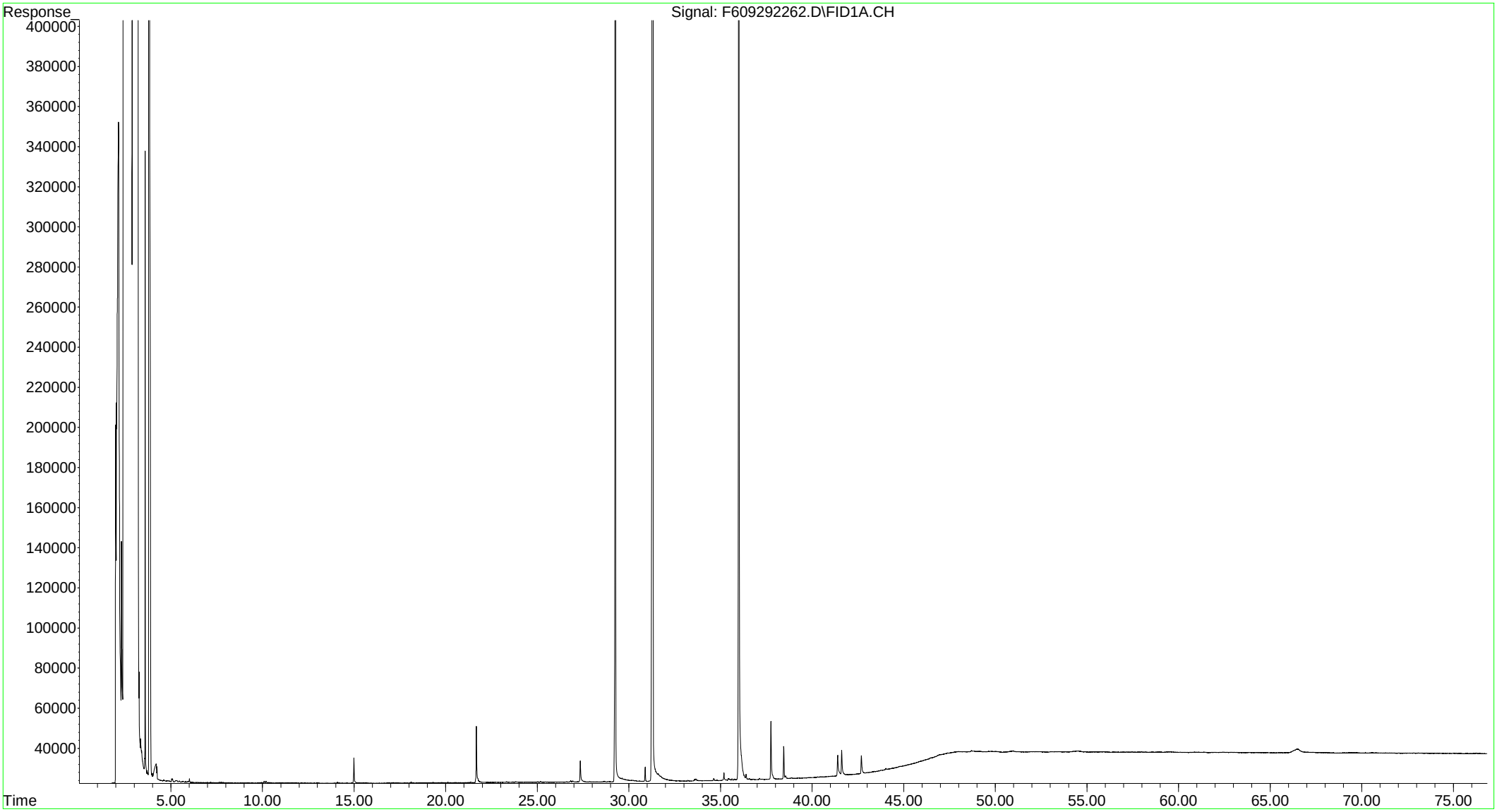

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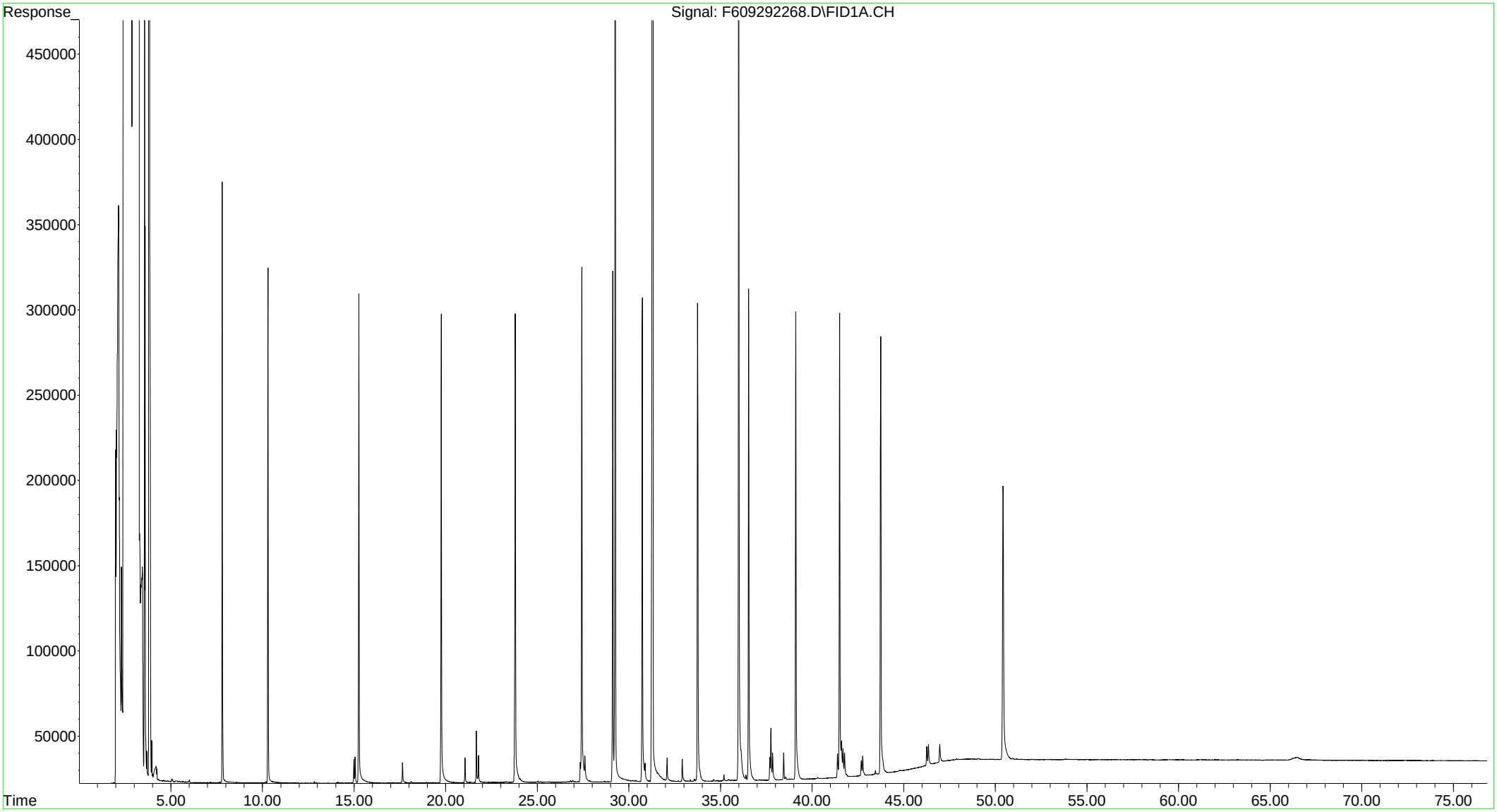
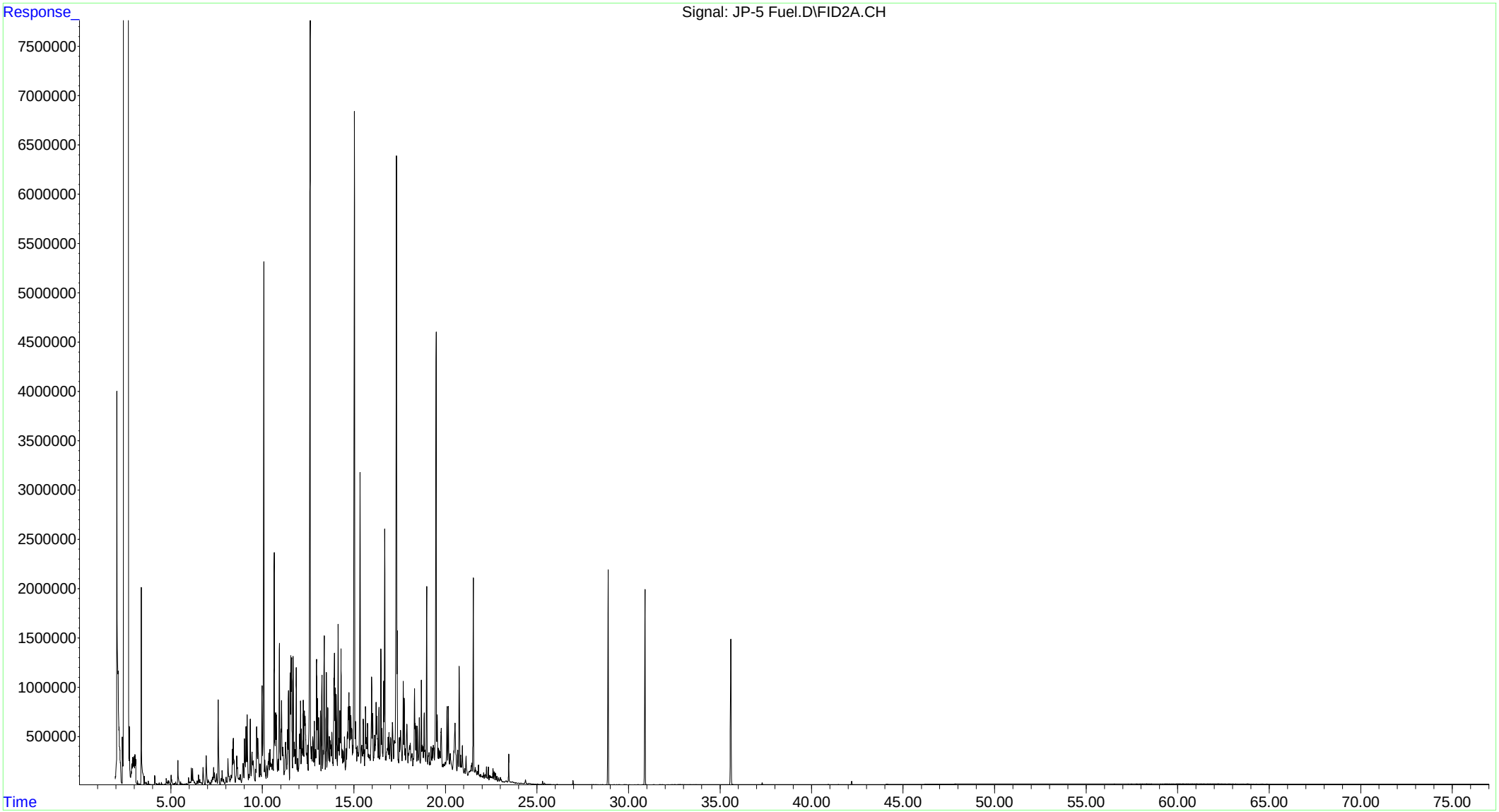
File        :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292268.D
Operator    : FID6:WR
Acquired    : 01 Oct 2022  10:18 am using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: WG1693518-2,42,,
Misc Info   : WG1693640,WG1693518,ICAL19333
Vial Number: 34
```

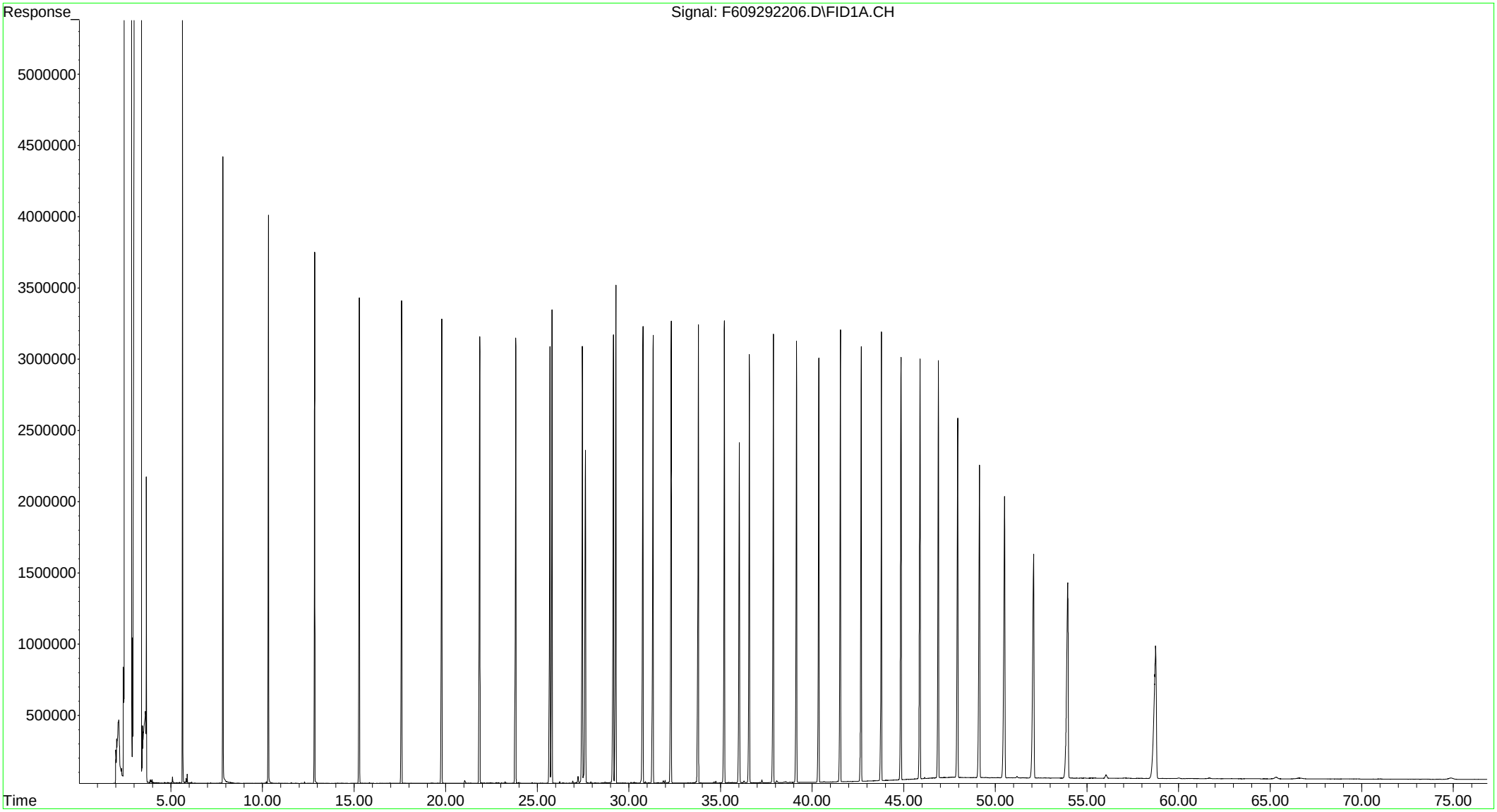


Petroleum Reference Standards

```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\JP-5 Fu
...         el.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 19 Nov 2011   4:22 pm using AcqMethod FRNC2AF.M
Sample    : JP-5 FUEL
Misc Info : F042710P
```



```
File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292206.D
Operator   : FID6:WR
Acquired   : 29 Sep 2022   1:18 pm using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: WG1693640-1
Misc Info  : WG1693640,FRBE91,ICAL19333
Vial Number: 3
```



Appendix C.2 Petroleum Forensics Technical Memorandum, September 19, 2022 Results, GSI

Preliminary/Confidential

GSI ENVIRONMENTAL

MEMORANDUM

TO: [redacted], P.G., P.M.P - AECOM

FROM: [redacted], PhD - GSI Environmental Inc.

RE: Analysis of Samples from Adit 3 (9/12/2022)

This memorandum summarizes analytical results from Alpha Analytical for the following samples:

Client ID	Laboratory ID	Sample Date	Date Received	Sample Matrix	Sample Location	Analyses Performed
A3-010TW-PRN01-WK2	L2250426-01	9/12/2022	9/20/2022	Product	Adit 3	SHC (EPA 8015) PIANO (EPA 8260)
A3-040TW-PRN01-WK2	L2250426-02	9/12/2022	9/20/2022	Product	Adit 3	SHC (EPA 8015) PIANO (EPA 8260)
A3015TW-PRN01-WK2	L2250292-01	9/12/2022	9/15/2022	Water	Adit 3	SHC (EPA 8015) PIANO (EPA 8260
A3-010DSVMP-PRN01-WK2	L2250292-02	9/12/2022	9/15/2022	Water / Sheen	Adit 3	SHC (EPA 8015)

Note: SHC = Saturated Hydrocarbon
PIANO = Paraffins, Isoparaffins, Aromatics, Naphthenes, and Olefins

Key observation: The composition of samples collected 9/12/2022 from Adit 3 are consistent with JP-5.

The laboratory report states that product and water samples contain material eluting in the low to mid weight ranges of the chromatograms which is similar to a JP-5 Jet Fuel / Kerosene type product. A detailed discussion of results follows. The lab reports are included in Appendix 1 and Appendix 2.

Product Samples

The product samples contain material consistent with JP-5 (Figure 1). The samples are not appreciably weathered by biodegradation but have lost the more soluble lighter aromatic hydrocarbons from contact with water. This is indicated by the relative proportions of BTEXNs in these samples when compared to the Sump Product Sample (ERH 1967) collected 11/24/2021 (January 27, 2022 Memo). There are no significant differences in biodegradation. Table 1 and Figure 1 compare these two product samples with the Sump Product Sample from 11/24/2021 (ERH 1967). It is evident that the current product samples are consistent with the November 2021 samples.

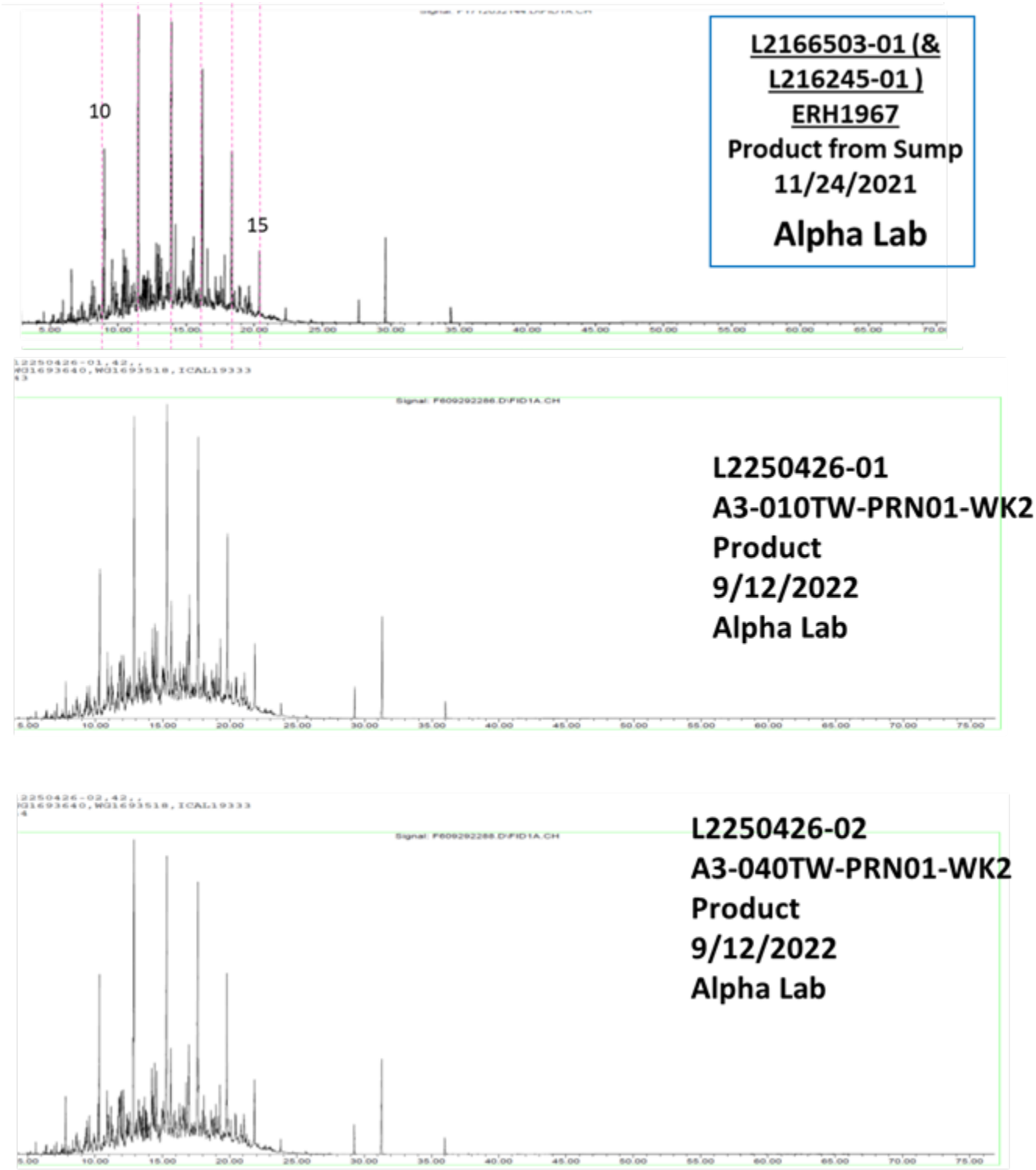


Figure 1. Chromatograms of JP-5 (reference), 11/24/2021 product samples (ERH1967), and 9/12/2022 product samples (A3-010TW-PRN01-WK2 and A3-040TW-PRN01-WK2).

Table 1. Analytical Results of Product Samples A3-010TW-PRN01-WK2 and A3-040TW-PRN01-WK2

Analyte	Alpha ID: L2250426-01 A3-010TW-PRN01-WK2 9/12/2022 Product mg/kg	Alpha ID: L2250426-02 A3-040TW-PRN01-WK2 9/12/2022 Product mg/kg	Alpha ID: L2166503-01 ERH 1967 11/24/2021 Sump Product mg/kg	Alpha ID: L216245-01 ERH 1967 11/24/2021 Sump Product – Duplicate Analysis mg/kg
Volatiles (PIANO) Analysis				
Benzene	U (<97.6)	16.1 J (1.76 J in MB)	U <88	
Toluene	16.2 J	U (<96.1)	126	
Ethylbenzene	141	64.1 J	300	
Xylenes	594	544	2250	
1-Methylnaphthalene	2490	3230	3360	
2-Methylnaphthalene	3640	4730	5070	
Naphthalene	1860	2370	3070	
Sum of BTEXNs	8741	10938	14192	
SHC Analysis				
n-Decane (C10)	14200	21200	19200	18500
n-Dodecane (C12)	40700	43800	47800	45700
n-Tridecane (C13)	34100	35600	39400	38700
2,6,10-Trimethyldodecane (1380)	5210	4640	5600	5290
n-Tetradecane (C14)	20000	20100	20200	19700
2,6,10-Trimethyltridecane (1470)	4630	4270	4490	4700
n-Pentadecane (C15)	7070	7500	7320	7110
C9-C44 Total Petroleum Hydrocarbons	1010000	973000	899000	922000
C10-C28 DRO	958000	926000	870000	882000
C28-C40 ORO	16400	9330	ND	5390
Diagnostic Ratios				
Sum of BTEXNs/n-Tetradecane (C14) (Solubility Indicator)	0.44	0.54	0.70	
nC13/i-1380 (Biod. Indicator)	6.5	7.7	7.0	7.3
nC14/i-1470(Biod. Indicator)	4.3	4.7	4.5	4.2
i-1380/i-1470 (Source Indicator)	1.1	1.1	1.2	1.1

Note: ERH 1967 was analyzed twice by Alpha Analyitical.
J = estimated value
MB = method blank
U = non-detect

Water and Water/Sheen Samples

Both the water and the water/sheen samples from Adit 3 contain JP-5 (Figure 2).

Hydrocarbon analyses were run for both samples but only one sample could be analyzed for volatile compounds (PIANO analysis). Sample A3015TW-PRN01-WK2 had no visible sheen, and an aliquot was poured off to run the PIANO analysis. Sample A3-010DSVMP-PRN01-WK2 had a visible sheen, and the entire volume was extracted for the SHC and PIANO analyses was not performed (multilayer samples cannot be subsampled).

The water only sample (A3015TW-PRN01-WK2) had no detectable benzene, toluene, ethylbenzene, naphthalene, or 2-methylnaphthalene. The following COPCs were detected:

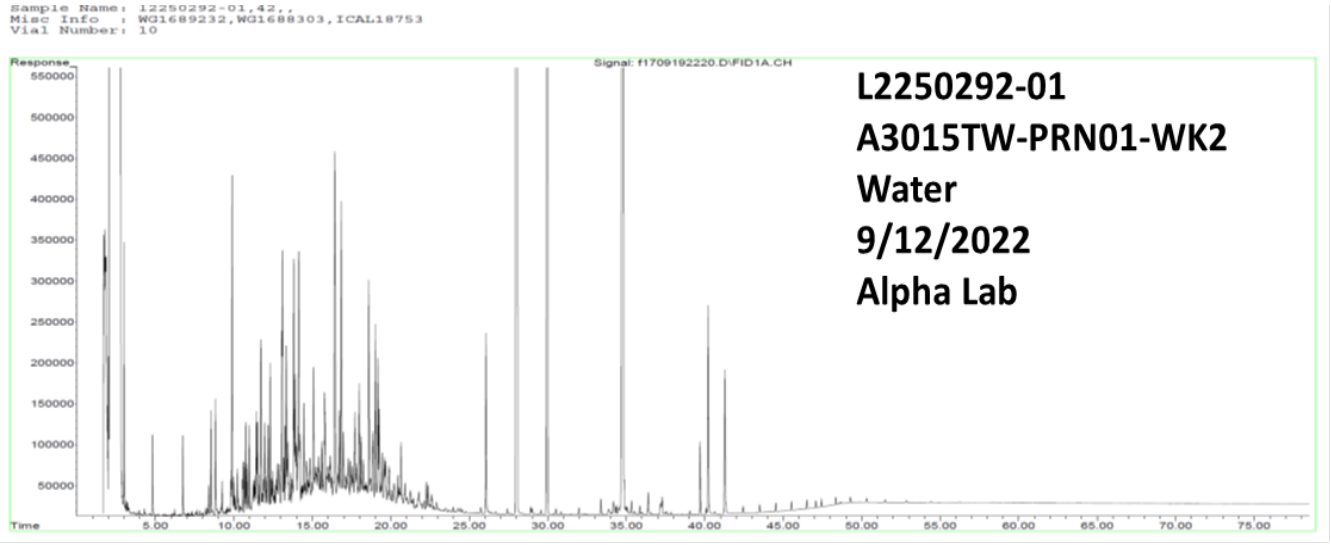
- 14 µg/L xylenes
- 4.3 µg/L 1-methylnaphthalene
- 4.6 mg/L TPH (10-28), which is approximately at the water solubility of jet fuels in water (~5 mg/L)

This sample (A3015TW-PRN01-WK2) has primarily dissolved components. The distribution of dissolved compounds indicate biodegradation as only xylenes and 1-methylnaphthalene are detected while the other naphthalenes are depleted.

As previously stated, sample A3-010DSVMP-PRN01-WK2 had a sheen and was not analyzed for volatiles as it could not be subsampled. TPH (10-28) was detected at 45.5 mg/L. The chromatograms do not indicate significant biodegradation.

In summary,

All samples collected 9/12/2022 from Adit 3 are consistent with the JP-5.



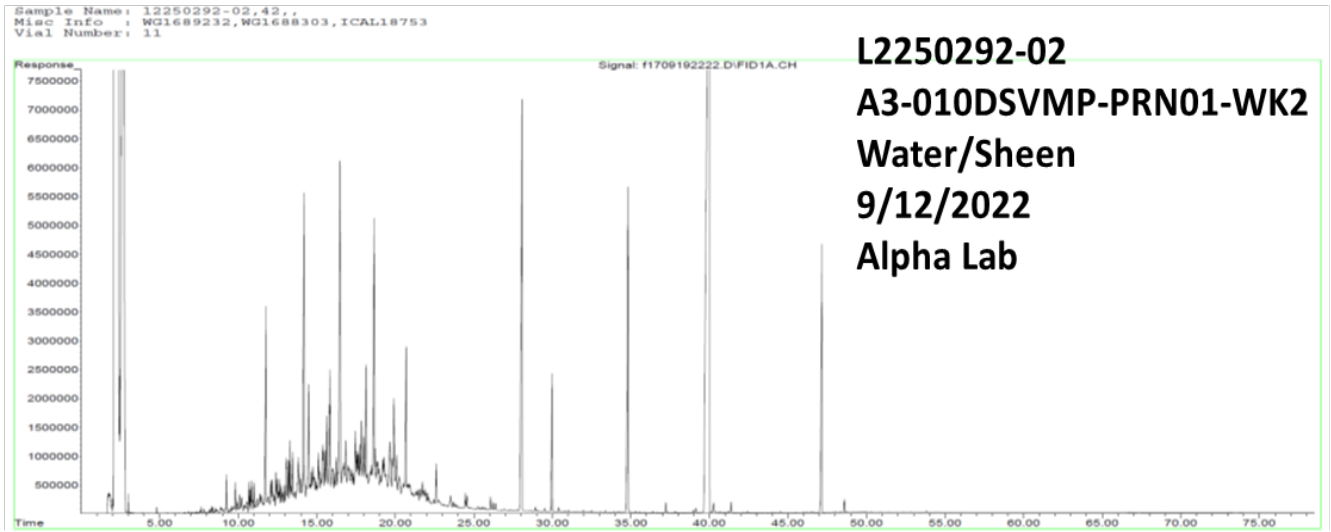


Figure 2. Chromatograms of water sample A3015TW-PRN01-WK2 and water/sheen sample A3-010DSVMP-PRN01-WK2 from 9/12/2022. Water sample is consitent with primarily dissolved components of JP-5 and water/sheen sample is consistent with JP-5.

Appendix 1: Alpha Lab Report L2250426 for Product Samples

ANALYTICAL REPORT

Lab Number:	L2250426
Client:	GSI Environmental Inc. 2211 Norfolk Suite 1000 Houston, TX 77098
ATTN:	[redacted] (b) (6)
Phone:	[redacted] (b) (6)
Project Name:	SITE CHARACTERIZATION/ADIT 3
Project Number:	CTO-22F0106
Report Date:	10/07/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106

Lab Number: L2250426
Report Date: 10/07/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2250426-01	A3-010TW-PRN01-WK2	OIL	Not Specified	09/12/22 13:35	09/20/22
L2250426-02	A3-040TW-PRN01-WK2	OIL	Not Specified	09/12/22 14:10	09/20/22

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

PIANO Volatile Organics

L2250426-01D and -02D: The samples have elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the samples.

L2250426-01D2 and -02D2: The samples were re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range.

The WG1692182-5 Method Blank, associated with L2250426-01D2, -01D, -02D2, and -02D, has concentrations below the reporting limits and "J" qualified. Associated field sample results are "B" qualified if the concentrations are less than 10x the concentrations in the blank.

Saturated Hydrocarbons

L2250426-01 and -02: The sample was extracted and then analyzed using a gas chromatograph equipped with a flame ionization detector (GC/FID). The temperature program and associated experimental conditions were optimized to obtain maximum resolution in an eighty minute chromatographic run representative of hydrocarbons in the n-Octane (C8) to n-Tetracontane (C40) range. Qualitative evaluation of the sample was conducted by reviewing the sample chromatogram in conjunction with a chromatogram of a normal alkane series generated with the same chromatographic conditions. Chromatograms of hydrocarbon reference materials obtained from our library of 82 reference standards were also utilized to provide the best possible sample match. Quantitative determination of the sample's hydrocarbon concentration was performed in accordance with EPA Method 8015M. The sample's total hydrocarbon concentration and all associated quality control data are included in the report.

The following qualitative information is based on a tentative interpretation of chromatographic pattern

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Case Narrative (continued)

recognition and boiling point ranges:

Total Petroleum Hydrocarbon Identification

L2250426-01 and -02 contain hydrocarbons eluting in the range of n-Octane (C8) to after the elution of n-Heptadecane (C17).

Based on the data generated, L2250426-01 and -02 contain material eluting in the low to mid weight ranges of the chromatogram which is similar to a JP-5 Jet Fuel / Kerosene type product.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

(b) (6)

Authorized Signature: [redacted]

Title: Technical Director/Representative

Date: 10/07/22

ORGANICS

VOLATILES

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D2 Date Collected: 09/12/22 13:35
Client ID: A3-010TW-PRN01-WK2 Date Received: 09/20/22
Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 21:42
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
Decane (C10)	14200		mg/kg	1950	265.	200
Undecane	38600		mg/kg	1950	217.	200
Dodecane (C12)	40600		mg/kg	4880	642.	200
Tridecane	30200		mg/kg	4880	1360	200
Tetradecane (C14)	19600		mg/kg	4880	598.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	92		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	100		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 18:09
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3-Methyl-1-butene	ND		mg/kg	97.6	14.5	10
Isopentane	ND		mg/kg	97.6	17.9	10
1-Pentene	ND		mg/kg	97.6	17.8	10
2-Methyl-1-Butene	ND		mg/kg	97.6	15.2	10
Pentane	ND		mg/kg	97.6	30.5	10
trans-2-Pentene	ND		mg/kg	97.6	13.2	10
Isoprene	ND		mg/kg	97.6	17.4	10
cis-2-Pentene	ND		mg/kg	97.6	15.7	10
Tertiary Butanol	ND		mg/kg	1220	158.	10
2,2-Dimethylbutane	ND		mg/kg	97.6	30.1	10
4-Methyl-1-pentene	ND		mg/kg	97.6	15.2	10
Cyclopentane	ND		mg/kg	97.6	25.3	10
2,3-Dimethylbutane	ND		mg/kg	97.6	40.3	10
2-Methylpentane	ND		mg/kg	97.6	26.5	10
Methyl tert butyl ether	ND		mg/kg	97.6	20.1	10
3-Methylpentane	ND		mg/kg	97.6	15.5	10
1-Hexene	ND		mg/kg	97.6	13.7	10
n-Hexane	ND		mg/kg	97.6	16.1	10
Isopropyl Ether	ND		mg/kg	97.6	11.8	10
trans-2-Hexene	ND		mg/kg	97.6	12.7	10
2-Methyl-2-pentene	ND		mg/kg	97.6	14.9	10
cis-2-Hexene	ND		mg/kg	97.6	13.2	10
Ethyl-Tert-Butyl-Ether	ND		mg/kg	97.6	14.8	10
2,2-Dimethylpentane	ND		mg/kg	97.6	13.1	10
Methylcyclopentane	ND		mg/kg	97.6	13.1	10
2,4-Dimethylpentane	ND		mg/kg	97.6	12.1	10
2,2,3-Trimethylbutane	ND		mg/kg	97.6	13.2	10
1,2-Dichloroethane	ND		mg/kg	97.6	14.4	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3,3-Dimethylpentane	ND		mg/kg	97.6	18.2	10
Cyclohexane	ND		mg/kg	97.6	12.1	10
2-Methylhexane	ND		mg/kg	97.6	15.4	10
Benzene	ND		mg/kg	97.6	14.9	10
2,3-Dimethylpentane	ND		mg/kg	97.6	12.9	10
Thiophene	ND		mg/kg	97.6	13.9	10
1,1-Dimethylcyclopentane	ND		mg/kg	97.6	11.7	10
3-Methylhexane	ND		mg/kg	97.6	15.6	10
Tertiary-Amyl Methyl Ether	ND		mg/kg	97.6	12.0	10
3-Ethylpentane	ND		mg/kg	97.6	14.1	10
1-Heptene/1,2-DMCP (trans)	ND		mg/kg	195	28.6	10
Isooctane	ND		mg/kg	97.6	10.6	10
trans-3-Heptene	ND		mg/kg	97.6	15.2	10
Heptane	25.2	J	mg/kg	97.6	17.0	10
trans-2-Heptene	ND		mg/kg	97.6	12.5	10
cis-2-Heptene	ND		mg/kg	97.6	18.9	10
2,2-Dimethylhexane	ND		mg/kg	97.6	14.2	10
Methylcyclohexane	81.1	J	mg/kg	97.6	13.2	10
2,5-Dimethylhexane	ND		mg/kg	97.6	17.0	10
2,4-Dimethylhexane	ND		mg/kg	97.6	11.9	10
Ethylcyclopentane	ND		mg/kg	97.6	12.9	10
2,2,3-Trimethylpentane	ND		mg/kg	97.6	16.9	10
2,3,4-Trimethylpentane	ND		mg/kg	97.6	12.7	10
Xylene (Total)[1]	594		mg/kg	97.6	10.2	10
2,3,3-Trimethylpentane	ND		mg/kg	97.6	19.4	10
2,3-Dimethylhexane	ND		mg/kg	97.6	23.7	10
2-Methylheptane	86.1	J	mg/kg	97.6	16.5	10
4-Methylheptane	ND		mg/kg	97.6	16.8	10
3-Methylheptane	93.4	J	mg/kg	97.6	13.9	10
3-Ethylhexane	ND		mg/kg	97.6	17.5	10
Toluene	16.2	J	mg/kg	97.6	13.2	10
2-Methylthiophene	ND		mg/kg	97.6	8.30	10
1,4-Dimethylcyclohexane (trans)	75.0	J	mg/kg	97.6	12.7	10
3-Methylthiophene	ND		mg/kg	97.6	11.4	10
1-Octene	ND		mg/kg	244	15.0	10
Octane	324		mg/kg	97.6	11.5	10
1,2-Dimethylcyclohexane (trans)	144		mg/kg	97.6	14.4	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1,2-Dibromoethane	ND		mg/kg	97.6	15.6	10
cis-2-Octene	ND		mg/kg	97.6	11.2	10
Isopropylcyclopentane	ND		mg/kg	97.6	14.3	10
1,2-Dimethylcyclohexane (cis)	73.7	J	mg/kg	97.6	28.4	10
2,5-Dimethylheptane	160		mg/kg	97.6	16.4	10
3,5-Dimethylheptane	42.3	J	mg/kg	97.6	13.8	10
3,3-Dimethylheptane	19.9	J	mg/kg	97.6	11.8	10
1,1,4-Trimethylcyclohexane	ND		mg/kg	97.6	9.72	10
2,3-Dimethylheptane	304		mg/kg	97.6	11.1	10
3,4-Dimethylheptane	149		mg/kg	97.6	16.6	10
4-Methyloctane	323		mg/kg	97.6	16.3	10
2-Methyloctane	338		mg/kg	97.6	25.0	10
Ethylbenzene	141		mg/kg	97.6	10.5	10
2-Ethylthiophene	ND		mg/kg	97.6	8.59	10
3-Methyloctane	554		mg/kg	97.6	10.9	10
3,3-Diethylpentane	ND		mg/kg	97.6	11.4	10
p/m-Xylene	448		mg/kg	195	18.6	10
1-Nonene	ND		mg/kg	244	13.2	10
trans-3-Nonene	ND		mg/kg	97.6	11.6	10
cis-3-Nonene	ND		mg/kg	97.6	18.3	10
Nonane (C9)	2810		mg/kg	97.6	15.2	10
Styrene	ND		mg/kg	97.6	9.86	10
o-Xylene	146		mg/kg	97.6	10.2	10
2-Nonene	ND		mg/kg	244	12.4	10
Isopropylcyclohexane	ND		mg/kg	97.6	10.4	10
Isopropylbenzene	152		mg/kg	97.6	9.13	10
3,3-Dimethyloctane	188		mg/kg	97.6	9.86	10
n-Propylbenzene	438		mg/kg	97.6	8.64	10
2-Methylnonane	1830		mg/kg	97.6	13.8	10
3-Methylnonane	1940		mg/kg	97.6	13.6	10
1-Methyl-3-Ethylbenzene	721		mg/kg	97.6	15.4	10
1-Methyl-4-Ethylbenzene	525		mg/kg	97.6	13.8	10
1,3,5-Trimethylbenzene	970		mg/kg	97.6	11.2	10
1-Decene	ND		mg/kg	97.6	12.7	10
Isobutylcyclohexane	ND		mg/kg	97.6	7.96	10
1-Methyl-2-Ethylbenzene	706		mg/kg	97.6	8.30	10
Decane (C10)	13400	E	mg/kg	97.6	13.2	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
tert-Butylbenzene	27.7	J	mg/kg	97.6	10.3	10
1,2,4-Trimethylbenzene	2940		mg/kg	97.6	10.1	10
Isobutylbenzene	203		mg/kg	97.6	13.2	10
sec-Butylbenzene	492		mg/kg	97.6	12.6	10
1-Methyl-3-Isopropylbenzene	571		mg/kg	97.6	12.6	10
1-Methyl-4-Isopropylbenzene	518		mg/kg	97.6	10.4	10
1,2,3-Trimethylbenzene	1810		mg/kg	97.6	10.9	10
1-Methyl-2-Isopropylbenzene	139		mg/kg	97.6	10.6	10
Indane	269		mg/kg	97.6	6.00	10
1,3-Diethylbenzene	646		mg/kg	97.6	12.2	10
1-Methyl-3-N-Propylbenzene	1520		mg/kg	97.6	9.86	10
Indene	73.8	J	mg/kg	97.6	5.66	10
1-Methyl-4-N-Propylbenzene	897		mg/kg	97.6	12.2	10
n-Butylbenzene	824		mg/kg	97.6	9.62	10
1,2-Dimethyl-4-Ethylbenzene	1410		mg/kg	97.6	12.0	10
1,2-Diethylbenzene	415		mg/kg	97.6	14.4	10
1-Methyl-2-N-Propylbenzene	1450		mg/kg	97.6	12.2	10
1,4-Dimethyl-2-Ethylbenzene	1340		mg/kg	97.6	9.13	10
Undecane	24700	E	mg/kg	97.6	10.8	10
1,3-Dimethyl-4-Ethylbenzene	1560		mg/kg	97.6	9.47	10
1,3-Dimethyl-5-Ethylbenzene	2040		mg/kg	97.6	11.5	10
1,3-Dimethyl-2-Ethylbenzene	455		mg/kg	97.6	7.28	10
1,2-Dimethyl-3-Ethylbenzene	976		mg/kg	97.6	6.20	10
1,2,4,5-Tetramethylbenzene	1110		mg/kg	97.6	7.57	10
1,2,3,5-Tetramethylbenzene	1980		mg/kg	97.6	7.42	10
N-Pentylbenzene	491		mg/kg	97.6	12.2	10
1,2,3,4-Tetramethylbenzene	1660		mg/kg	97.6	10.4	10
1,3-Dimethyl-5-tert-Butylbenzene	ND		mg/kg	97.6	13.9	10
Dodecane (C12)	22700	E	mg/kg	244	32.1	10
1,3,5-Triethylbenzene	ND		mg/kg	97.6	18.6	10
Naphthalene	1860		mg/kg	97.6	40.8	10
Benzothiophene	ND		mg/kg	97.6	51.6	10
1,2,4-Triethylbenzene	ND		mg/kg	97.6	16.6	10
Hexylbenzene	593		mg/kg	97.6	18.8	10
MMT	ND		mg/kg	244	62.8	10
Tridecane	18000	E	mg/kg	244	68.0	10
2-Methylnaphthalene	3640		mg/kg	244	64.6	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1-Methylnaphthalene	2490		mg/kg	244	71.7	10
Tetradecane (C14)	11200	E	mg/kg	244	29.9	10
Pentadecane	2980		mg/kg	244	54.4	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	95		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	102		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D2 Date Collected: 09/12/22 14:10
Client ID: A3-040TW-PRN01-WK2 Date Received: 09/20/22
Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 22:53
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
Decane (C10)	21200		mg/kg	1920	260.	200
Undecane	48400		mg/kg	1920	213.	200
Dodecane (C12)	46400		mg/kg	4800	631.	200
Tridecane	34700		mg/kg	4800	1340	200
Tetradecane (C14)	22100		mg/kg	4800	588.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	94		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	102		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 19:20
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3-Methyl-1-butene	ND		mg/kg	96.1	14.3	10
Isopentane	ND		mg/kg	96.1	17.6	10
1-Pentene	ND		mg/kg	96.1	17.5	10
2-Methyl-1-Butene	ND		mg/kg	96.1	14.9	10
Pentane	ND		mg/kg	96.1	30.0	10
trans-2-Pentene	ND		mg/kg	96.1	13.0	10
Isoprene	ND		mg/kg	96.1	17.1	10
cis-2-Pentene	ND		mg/kg	96.1	15.5	10
Tertiary Butanol	ND		mg/kg	1200	156.	10
2,2-Dimethylbutane	ND		mg/kg	96.1	29.6	10
4-Methyl-1-pentene	ND		mg/kg	96.1	14.9	10
Cyclopentane	ND		mg/kg	96.1	24.9	10
2,3-Dimethylbutane	ND		mg/kg	96.1	39.7	10
2-Methylpentane	ND		mg/kg	96.1	26.0	10
Methyl tert butyl ether	ND		mg/kg	96.1	19.8	10
3-Methylpentane	ND		mg/kg	96.1	15.2	10
1-Hexene	ND		mg/kg	96.1	13.5	10
n-Hexane	ND		mg/kg	96.1	15.8	10
Isopropyl Ether	ND		mg/kg	96.1	11.6	10
trans-2-Hexene	ND		mg/kg	96.1	12.5	10
2-Methyl-2-pentene	ND		mg/kg	96.1	14.7	10
cis-2-Hexene	ND		mg/kg	96.1	13.0	10
Ethyl-Tert-Butyl-Ether	ND		mg/kg	96.1	14.6	10
2,2-Dimethylpentane	ND		mg/kg	96.1	12.9	10
Methylcyclopentane	ND		mg/kg	96.1	12.9	10
2,4-Dimethylpentane	ND		mg/kg	96.1	11.9	10
2,2,3-Trimethylbutane	ND		mg/kg	96.1	13.0	10
1,2-Dichloroethane	ND		mg/kg	96.1	14.2	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3,3-Dimethylpentane	ND		mg/kg	96.1	17.9	10
Cyclohexane	ND		mg/kg	96.1	11.9	10
2-Methylhexane	ND		mg/kg	96.1	15.1	10
Benzene	16.1	J	mg/kg	96.1	14.6	10
2,3-Dimethylpentane	ND		mg/kg	96.1	12.7	10
Thiophene	ND		mg/kg	96.1	13.6	10
1,1-Dimethylcyclopentane	ND		mg/kg	96.1	11.5	10
3-Methylhexane	ND		mg/kg	96.1	15.4	10
Tertiary-Amyl Methyl Ether	ND		mg/kg	96.1	11.8	10
3-Ethylpentane	ND		mg/kg	96.1	13.9	10
1-Heptene/1,2-DMCP (trans)	ND		mg/kg	192	28.1	10
Isooctane	ND		mg/kg	96.1	10.5	10
trans-3-Heptene	ND		mg/kg	96.1	14.9	10
Heptane	55.8	J	mg/kg	96.1	16.7	10
trans-2-Heptene	ND		mg/kg	96.1	12.3	10
cis-2-Heptene	ND		mg/kg	96.1	18.6	10
2,2-Dimethylhexane	ND		mg/kg	96.1	13.9	10
Methylcyclohexane	127		mg/kg	96.1	13.0	10
2,5-Dimethylhexane	ND		mg/kg	96.1	16.7	10
2,4-Dimethylhexane	12.5	J	mg/kg	96.1	11.7	10
Ethylcyclopentane	13.2	J	mg/kg	96.1	12.7	10
2,2,3-Trimethylpentane	ND		mg/kg	96.1	16.7	10
2,3,4-Trimethylpentane	ND		mg/kg	96.1	12.5	10
Xylene (Total)[1]	544		mg/kg	96.1	10.0	10
2,3,3-Trimethylpentane	ND		mg/kg	96.1	19.1	10
2,3-Dimethylhexane	ND		mg/kg	96.1	23.3	10
2-Methylheptane	144		mg/kg	96.1	16.2	10
4-Methylheptane	ND		mg/kg	96.1	16.5	10
3-Methylheptane	133		mg/kg	96.1	13.7	10
3-Ethylhexane	ND		mg/kg	96.1	17.2	10
Toluene	ND		mg/kg	96.1	13.0	10
2-Methylthiophene	ND		mg/kg	96.1	8.16	10
1,4-Dimethylcyclohexane (trans)	59.2	J	mg/kg	96.1	12.5	10
3-Methylthiophene	ND		mg/kg	96.1	11.2	10
1-Octene	ND		mg/kg	240	14.7	10
Octane	631		mg/kg	96.1	11.3	10
1,2-Dimethylcyclohexane (trans)	188		mg/kg	96.1	14.1	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1,2-Dibromoethane	ND		mg/kg	96.1	15.4	10
cis-2-Octene	ND		mg/kg	96.1	11.0	10
Isopropylcyclopentane	19.8	J	mg/kg	96.1	14.1	10
1,2-Dimethylcyclohexane (cis)	103		mg/kg	96.1	27.9	10
2,5-Dimethylheptane	179		mg/kg	96.1	16.1	10
3,5-Dimethylheptane	53.6	J	mg/kg	96.1	13.5	10
3,3-Dimethylheptane	20.9	J	mg/kg	96.1	11.6	10
1,1,4-Trimethylcyclohexane	ND		mg/kg	96.1	9.56	10
2,3-Dimethylheptane	342		mg/kg	96.1	11.0	10
3,4-Dimethylheptane	159		mg/kg	96.1	16.3	10
4-Methyloctane	378		mg/kg	96.1	16.0	10
2-Methyloctane	519		mg/kg	96.1	24.6	10
Ethylbenzene	64.1	J	mg/kg	96.1	10.4	10
2-Ethylthiophene	ND		mg/kg	96.1	8.45	10
3-Methyloctane	688		mg/kg	96.1	10.8	10
3,3-Diethylpentane	ND		mg/kg	96.1	11.2	10
p/m-Xylene	192		mg/kg	192	18.3	10
1-Nonene	ND		mg/kg	240	13.0	10
trans-3-Nonene	ND		mg/kg	96.1	11.4	10
cis-3-Nonene	ND		mg/kg	96.1	18.0	10
Nonane (C9)	4280		mg/kg	96.1	14.9	10
Styrene	ND		mg/kg	96.1	9.70	10
o-Xylene	352		mg/kg	96.1	10.0	10
2-Nonene	ND		mg/kg	240	12.2	10
Isopropylcyclohexane	ND		mg/kg	96.1	10.2	10
Isopropylbenzene	197		mg/kg	96.1	8.98	10
3,3-Dimethyloctane	152		mg/kg	96.1	9.70	10
n-Propylbenzene	454		mg/kg	96.1	8.50	10
2-Methylnonane	1980		mg/kg	96.1	13.6	10
3-Methylnonane	2040		mg/kg	96.1	13.4	10
1-Methyl-3-Ethylbenzene	641		mg/kg	96.1	15.2	10
1-Methyl-4-Ethylbenzene	706		mg/kg	96.1	13.5	10
1,3,5-Trimethylbenzene	1260		mg/kg	96.1	11.0	10
1-Decene	ND		mg/kg	96.1	12.5	10
Isobutylcyclohexane	ND		mg/kg	96.1	7.83	10
1-Methyl-2-Ethylbenzene	1080		mg/kg	96.1	8.16	10
Decane (C10)	16200	E	mg/kg	96.1	13.0	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
tert-Butylbenzene	31.7	J	mg/kg	96.1	10.1	10
1,2,4-Trimethylbenzene	3790		mg/kg	96.1	9.94	10
Isobutylbenzene	227		mg/kg	96.1	13.0	10
sec-Butylbenzene	556		mg/kg	96.1	12.4	10
1-Methyl-3-Isopropylbenzene	748		mg/kg	96.1	12.4	10
1-Methyl-4-Isopropylbenzene	605		mg/kg	96.1	10.2	10
1,2,3-Trimethylbenzene	2440		mg/kg	96.1	10.7	10
1-Methyl-2-Isopropylbenzene	151		mg/kg	96.1	10.4	10
Indane	208		mg/kg	96.1	5.91	10
1,3-Diethylbenzene	652		mg/kg	96.1	12.0	10
1-Methyl-3-N-Propylbenzene	1880		mg/kg	96.1	9.70	10
Indene	79.2	J	mg/kg	96.1	5.57	10
1-Methyl-4-N-Propylbenzene	1020		mg/kg	96.1	12.0	10
n-Butylbenzene	949		mg/kg	96.1	9.46	10
1,2-Dimethyl-4-Ethylbenzene	1600		mg/kg	96.1	11.8	10
1,2-Diethylbenzene	426		mg/kg	96.1	14.2	10
1-Methyl-2-N-Propylbenzene	1780		mg/kg	96.1	12.0	10
1,4-Dimethyl-2-Ethylbenzene	1550		mg/kg	96.1	8.98	10
Undecane	27200	E	mg/kg	96.1	10.7	10
1,3-Dimethyl-4-Ethylbenzene	1870		mg/kg	96.1	9.32	10
1,3-Dimethyl-5-Ethylbenzene	2070		mg/kg	96.1	11.3	10
1,3-Dimethyl-2-Ethylbenzene	464		mg/kg	96.1	7.16	10
1,2-Dimethyl-3-Ethylbenzene	1110		mg/kg	96.1	6.10	10
1,2,4,5-Tetramethylbenzene	1260		mg/kg	96.1	7.44	10
1,2,3,5-Tetramethylbenzene	2320		mg/kg	96.1	7.30	10
N-Pentylbenzene	599		mg/kg	96.1	12.0	10
1,2,3,4-Tetramethylbenzene	1810		mg/kg	96.1	10.3	10
1,3-Dimethyl-5-tert-Butylbenzene	ND		mg/kg	96.1	13.7	10
Dodecane (C12)	26400	E	mg/kg	240	31.6	10
1,3,5-Triethylbenzene	ND		mg/kg	96.1	18.2	10
Naphthalene	2370		mg/kg	96.1	40.1	10
Benzothiophene	ND		mg/kg	96.1	50.8	10
1,2,4-Triethylbenzene	ND		mg/kg	96.1	16.3	10
Hexylbenzene	654		mg/kg	96.1	18.5	10
MMT	ND		mg/kg	240	61.8	10
Tridecane	24700	E	mg/kg	240	66.9	10
2-Methylnaphthalene	4730		mg/kg	240	63.5	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1-Methylnaphthalene	3230		mg/kg	240	70.5	10
Tetradecane (C14)	16100	E	mg/kg	240	29.4	10
Pentadecane	2220		mg/kg	240	53.6	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	100		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	100		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
3-Methyl-1-butene	ND		mg/kg	10.0	1.48
Isopentane	ND		mg/kg	10.0	1.83
1-Pentene	ND		mg/kg	10.0	1.82
2-Methyl-1-Butene	ND		mg/kg	10.0	1.56
Pentane	ND		mg/kg	10.0	3.12
trans-2-Pentene	ND		mg/kg	10.0	1.35
Isoprene	ND		mg/kg	10.0	1.78
cis-2-Pentene	ND		mg/kg	10.0	1.61
Tertiary Butanol	ND		mg/kg	125	16.2
2,2-Dimethylbutane	ND		mg/kg	10.0	3.08
4-Methyl-1-pentene	ND		mg/kg	10.0	1.56
Cyclopentane	ND		mg/kg	10.0	2.60
2,3-Dimethylbutane	ND		mg/kg	10.0	4.13
2-Methylpentane	ND		mg/kg	10.0	2.71
Methyl tert butyl ether	ND		mg/kg	10.0	2.06
3-Methylpentane	ND		mg/kg	10.0	1.58
1-Hexene	ND		mg/kg	10.0	1.40
n-Hexane	ND		mg/kg	10.0	1.64
Isopropyl Ether	ND		mg/kg	10.0	1.21
trans-2-Hexene	ND		mg/kg	10.0	1.30
2-Methyl-2-pentene	ND		mg/kg	10.0	1.53
cis-2-Hexene	ND		mg/kg	10.0	1.36
Ethyl-Tert-Butyl-Ether	ND		mg/kg	10.0	1.52
2,2-Dimethylpentane	ND		mg/kg	10.0	1.34
Methylcyclopentane	ND		mg/kg	10.0	1.34
2,4-Dimethylpentane	ND		mg/kg	10.0	1.24
2,2,3-Trimethylbutane	ND		mg/kg	10.0	1.35
1,2-Dichloroethane	ND		mg/kg	10.0	1.48
3,3-Dimethylpentane	ND		mg/kg	10.0	1.86

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
Cyclohexane	ND		mg/kg	10.0	1.24
2-Methylhexane	ND		mg/kg	10.0	1.58
Benzene	1.76	J	mg/kg	10.0	1.52
2,3-Dimethylpentane	ND		mg/kg	10.0	1.32
Thiophene	ND		mg/kg	10.0	1.42
1,1-Dimethylcyclopentane	ND		mg/kg	10.0	1.20
3-Methylhexane	ND		mg/kg	10.0	1.60
Tertiary-Amyl Methyl Ether	ND		mg/kg	10.0	1.23
3-Ethylpentane	ND		mg/kg	10.0	1.44
1-Heptene/1,2-DMCP (trans)	ND		mg/kg	20.0	2.92
Isooctane	ND		mg/kg	10.0	1.09
trans-3-Heptene	ND		mg/kg	10.0	1.56
Heptane	ND		mg/kg	10.0	1.74
trans-2-Heptene	ND		mg/kg	10.0	1.28
cis-2-Heptene	ND		mg/kg	10.0	1.94
2,2-Dimethylhexane	ND		mg/kg	10.0	1.45
Methylcyclohexane	ND		mg/kg	10.0	1.35
2,5-Dimethylhexane	ND		mg/kg	10.0	1.74
2,4-Dimethylhexane	ND		mg/kg	10.0	1.22
Ethylcyclopentane	ND		mg/kg	10.0	1.32
2,2,3-Trimethylpentane	ND		mg/kg	10.0	1.74
2,3,4-Trimethylpentane	ND		mg/kg	10.0	1.30
Xylene (Total)[1]	ND		mg/kg	10.0	1.04
2,3,3-Trimethylpentane	ND		mg/kg	10.0	1.98
2,3-Dimethylhexane	ND		mg/kg	10.0	2.42
2-Methylheptane	ND		mg/kg	10.0	1.69
4-Methylheptane	ND		mg/kg	10.0	1.72
3-Methylheptane	ND		mg/kg	10.0	1.42
3-Ethylhexane	ND		mg/kg	10.0	1.79

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
Toluene	ND		mg/kg	10.0	1.36
2-Methylthiophene	ND		mg/kg	10.0	0.850
1,4-Dimethylcyclohexane (trans)	ND		mg/kg	10.0	1.30
3-Methylthiophene	ND		mg/kg	10.0	1.17
1-Octene	ND		mg/kg	25.0	1.54
Octane	ND		mg/kg	10.0	1.18
1,2-Dimethylcyclohexane (trans)	ND		mg/kg	10.0	1.47
1,2-Dibromoethane	ND		mg/kg	10.0	1.60
cis-2-Octene	ND		mg/kg	10.0	1.14
Isopropylcyclopentane	ND		mg/kg	10.0	1.46
1,2-Dimethylcyclohexane (cis)	ND		mg/kg	10.0	2.90
2,5-Dimethylheptane	ND		mg/kg	10.0	1.68
3,5-Dimethylheptane	ND		mg/kg	10.0	1.41
3,3-Dimethylheptane	ND		mg/kg	10.0	1.21
1,1,4-Trimethylcyclohexane	ND		mg/kg	10.0	0.995
2,3-Dimethylheptane	ND		mg/kg	10.0	1.14
3,4-Dimethylheptane	ND		mg/kg	10.0	1.70
4-Methyloctane	ND		mg/kg	10.0	1.67
2-Methyloctane	ND		mg/kg	10.0	2.56
Ethylbenzene	ND		mg/kg	10.0	1.08
2-Ethylthiophene	ND		mg/kg	10.0	0.880
3-Methyloctane	ND		mg/kg	10.0	1.12
3,3-Diethylpentane	ND		mg/kg	10.0	1.16
p/m-Xylene	ND		mg/kg	20.0	1.90
1-Nonene	ND		mg/kg	25.0	1.35
trans-3-Nonene	ND		mg/kg	10.0	1.18
cis-3-Nonene	ND		mg/kg	10.0	1.87
Nonane (C9)	ND		mg/kg	10.0	1.56
Styrene	ND		mg/kg	10.0	1.01

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
o-Xylene	ND		mg/kg	10.0	1.04
2-Nonene	ND		mg/kg	25.0	1.27
Isopropylcyclohexane	ND		mg/kg	10.0	1.06
Isopropylbenzene	ND		mg/kg	10.0	0.935
3,3-Dimethyloctane	ND		mg/kg	10.0	1.01
n-Propylbenzene	ND		mg/kg	10.0	0.885
2-Methylnonane	ND		mg/kg	10.0	1.42
3-Methylnonane	ND		mg/kg	10.0	1.40
1-Methyl-3-Ethylbenzene	ND		mg/kg	10.0	1.58
1-Methyl-4-Ethylbenzene	ND		mg/kg	10.0	1.41
1,3,5-Trimethylbenzene	ND		mg/kg	10.0	1.15
1-Decene	ND		mg/kg	10.0	1.30
Isobutylcyclohexane	ND		mg/kg	10.0	0.815
1-Methyl-2-Ethylbenzene	ND		mg/kg	10.0	0.850
Decane (C10)	1.39	J	mg/kg	10.0	1.36
tert-Butylbenzene	ND		mg/kg	10.0	1.06
1,2,4-Trimethylbenzene	ND		mg/kg	10.0	1.04
Isobutylbenzene	ND		mg/kg	10.0	1.35
sec-Butylbenzene	ND		mg/kg	10.0	1.30
1-Methyl-3-Isopropylbenzene	ND		mg/kg	10.0	1.29
1-Methyl-4-Isopropylbenzene	ND		mg/kg	10.0	1.06
1,2,3-Trimethylbenzene	ND		mg/kg	10.0	1.12
1-Methyl-2-Isopropylbenzene	ND		mg/kg	10.0	1.08
Indane	ND		mg/kg	10.0	0.615
1,3-Diethylbenzene	ND		mg/kg	10.0	1.24
1-Methyl-3-N-Propylbenzene	ND		mg/kg	10.0	1.01
Indene	ND		mg/kg	10.0	0.580
1-Methyl-4-N-Propylbenzene	ND		mg/kg	10.0	1.25
n-Butylbenzene	ND		mg/kg	10.0	0.985

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
1,2-Dimethyl-4-Ethylbenzene	ND		mg/kg	10.0	1.22
1,2-Diethylbenzene	ND		mg/kg	10.0	1.48
1-Methyl-2-N-Propylbenzene	ND		mg/kg	10.0	1.24
1,4-Dimethyl-2-Ethylbenzene	ND		mg/kg	10.0	0.935
Undecane	ND		mg/kg	10.0	1.11
1,3-Dimethyl-4-Ethylbenzene	ND		mg/kg	10.0	0.970
1,3-Dimethyl-5-Ethylbenzene	ND		mg/kg	10.0	1.18
1,3-Dimethyl-2-Ethylbenzene	ND		mg/kg	10.0	0.745
1,2-Dimethyl-3-Ethylbenzene	ND		mg/kg	10.0	0.635
1,2,4,5-Tetramethylbenzene	ND		mg/kg	10.0	0.775
1,2,3,5-Tetramethylbenzene	ND		mg/kg	10.0	0.760
N-Pentylbenzene	ND		mg/kg	10.0	1.24
1,2,3,4-Tetramethylbenzene	ND		mg/kg	10.0	1.07
1,3-Dimethyl-5-tert-Butylbenzene	ND		mg/kg	10.0	1.42
Dodecane (C12)	ND		mg/kg	25.0	3.28
1,3,5-Triethylbenzene	ND		mg/kg	10.0	1.90
Naphthalene	ND		mg/kg	10.0	4.18
Benzothiophene	ND		mg/kg	10.0	5.28
1,2,4-Triethylbenzene	ND		mg/kg	10.0	1.70
Hexylbenzene	ND		mg/kg	10.0	1.92
MMT	ND		mg/kg	25.0	6.43
Tridecane	ND		mg/kg	25.0	6.96
2-Methylnaphthalene	ND		mg/kg	25.0	6.61
1-Methylnaphthalene	ND		mg/kg	25.0	7.34
Tetradecane (C14)	ND		mg/kg	25.0	3.06
Pentadecane	ND		mg/kg	25.0	5.58

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	98		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	101		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106
Lab Number: L2250426
Report Date: 10/07/22

PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01-02 Batch: WG1692182-3 WG1692182-4

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
1-Pentene	107		107		50-130	0		30
Pentane	86		87		50-130	1		30
Tertiary Butanol	89		92		50-130	3		30
Cyclopentane	92		93		50-130	1		30
2-Methylpentane	91		93		50-130	2		30
Methyl tert butyl ether	81		78		50-130	4		30
3-Methylpentane	95		95		50-130	0		30
1-Hexene	101		100		50-130	1		30
n-Hexane	90		91		50-130	1		30
Isopropyl Ether	86		86		50-130	0		30
Ethyl-Tert-Butyl-Ether	75		76		50-130	1		30
Methylcyclopentane	102		103		50-130	1		30
2,4-Dimethylpentane	93		94		50-130	1		30
Cyclohexane	102		104		50-130	2		30
2-Methylhexane	94		94		50-130	0		30
Benzene	91		91		50-130	0		30
2,3-Dimethylpentane	93		97		50-130	4		30
3-Methylhexane	83		84		50-130	1		30
Tertiary-Amyl Methyl Ether	79		80		50-130	1		30
Isooctane	101		99		50-130	2		30
Heptane	102		102		50-130	0		30
Methylcyclohexane	96		94		50-130	2		30
2-Methylheptane	102		103		50-130	1		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106
Lab Number: L2250426
Report Date: 10/07/22

PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01-02 Batch: WG1692182-3 WG1692182-4

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
3-Methylheptane	100		100		50-130	0		30
Toluene	90		91		50-130	1		30
Octane	103		104		50-130	1		30
Ethylbenzene	93		94		50-130	1		30
p/m-Xylene	97		98		50-130	1		30
Nonane (C9)	97		96		50-130	1		30
o-Xylene	96		98		50-130	2		30
Isopropylbenzene	98		99		50-130	1		30
n-Propylbenzene	101		102		50-130	1		30
1-Methyl-3-Ethylbenzene	100		101		50-130	1		30
1-Methyl-4-Ethylbenzene	101		104		50-130	3		30
1,3,5-Trimethylbenzene	102		104		50-130	2		30
1-Decene	78		78		50-130	0		30
1-Methyl-2-Ethylbenzene	101		104		50-130	3		30
Decane (C10)	105		106		50-130	1		30
1,2,4-Trimethylbenzene	96		98		50-130	2		30
sec-Butylbenzene	106		109		50-130	3		30
1-Methyl-4-N-Propylbenzene	99		100		50-130	1		30
n-Butylbenzene	100		102		50-130	2		30
1,2-Diethylbenzene	99		100		50-130	1		30
Undecane	102		102		50-130	0		30
N-Pentylbenzene	100		101		50-130	1		30
Dodecane (C12)	121		122		50-130	1		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3

Project Number: CTO-22F0106

Lab Number: L2250426

Report Date: 10/07/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01-02 Batch: WG1692182-3 WG1692182-4								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Dibromofluoromethane	98		98		70-130
Toluene-d8	99		98		70-130
4-Bromofluorobenzene	103		103		70-130

PETROLEUM HYDROCARBONS

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/01/22 23:22
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	2930		mg/kg	193	57.3	1
n-Decane (C10)	15100		mg/kg	193	61.6	1
n-Undecane (C11)	39400	E	mg/kg	193	57.7	1
n-Dodecane (C12)	42500	E	mg/kg	193	42.1	1
n-Tridecane (C13)	34100		mg/kg	193	53.0	1
2,6,10-Trimethyldodecane (1380)	5210		mg/kg	193	29.1	1
n-Tetradecane (C14)	20000		mg/kg	193	29.1	1
2,6,10-Trimethyltridecane (1470)	4630		mg/kg	193	23.0	1
n-Pentadecane (C15)	7070		mg/kg	193	23.0	1
n-Hexadecane (C16)	1410		mg/kg	193	29.1	1
Norpristane (1650)	231		mg/kg	193	63.8	1
n-Heptadecane (C17)	290		mg/kg	193	63.8	1
Pristane	220		mg/kg	193	41.3	1
n-Octadecane (C18)	91.8	J	mg/kg	193	38.8	1
Phytane	72.6	J	mg/kg	193	24.3	1
n-Nonadecane (C19)	ND		mg/kg	193	49.7	1
n-Eicosane (C20)	ND		mg/kg	193	27.3	1
n-Heneicosane (C21)	ND		mg/kg	193	23.1	1
n-Docosane (C22)	ND		mg/kg	193	20.2	1
n-Tricosane (C23)	ND		mg/kg	193	24.6	1
n-Tetracosane (C24)	ND		mg/kg	193	32.3	1
n-Pentacosane (C25)	ND		mg/kg	193	102.	1
n-Hexacosane (C26)	ND		mg/kg	193	28.4	1
n-Heptacosane (C27)	ND		mg/kg	193	23.3	1
n-Octacosane (C28)	ND		mg/kg	193	41.4	1
n-Nonacosane (C29)	ND		mg/kg	193	129.	1
n-Triacontane (C30)	ND		mg/kg	193	22.2	1
n-Hentriacontane (C31)	ND		mg/kg	193	27.4	1

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 Date Collected: 09/12/22 13:35

Client ID: A3-010TW-PRN01-WK2 Date Received: 09/20/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	ND		mg/kg	193	24.3	1
n-Tritriacontane (C33)	ND		mg/kg	193	27.2	1
n-Tetratriacontane (C34)	ND		mg/kg	193	30.7	1
n-Pentatriacontane (C35)	ND		mg/kg	193	33.7	1
n-Hexatriacontane (C36)	ND		mg/kg	193	38.4	1
n-Heptatriacontane (C37)	ND		mg/kg	193	42.9	1
n-Octatriacontane (C38)	ND		mg/kg	193	45.0	1
n-Nonatriacontane (C39)	ND		mg/kg	193	62.7	1
n-Tetracontane (C40)	ND		mg/kg	193	62.7	1
C9-C44 Total Petroleu	1010000		mg/kg	6380	1400	1
C10-C28 DRO	958000		mg/kg	4060	836.	1
C28-C40 ORO	16400		mg/kg	2120	483.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	102		50-130
d50-Tetracosane	109		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/05/22 06:12
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Undecane (C11)	40900		mg/kg	966	288.	5
n-Dodecane (C12)	40700		mg/kg	966	210.	5
Total Saturated Hydrocarbons	173000	J	mg/kg	193	20.2	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	103		50-130
d50-Tetracosane	107		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/02/22 00:49
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	4530		mg/kg	197	58.4	1
n-Decane (C10)	20100		mg/kg	197	62.8	1
n-Undecane (C11)	45800	E	mg/kg	197	58.8	1
n-Dodecane (C12)	45500	E	mg/kg	197	42.9	1
n-Tridecane (C13)	35600		mg/kg	197	54.0	1
2,6,10-Trimethyldodecane (1380)	4640		mg/kg	197	29.6	1
n-Tetradecane (C14)	20100		mg/kg	197	29.6	1
2,6,10-Trimethyltridecane (1470)	4270		mg/kg	197	23.5	1
n-Pentadecane (C15)	7500		mg/kg	197	23.5	1
n-Hexadecane (C16)	1480		mg/kg	197	29.6	1
Norpristane (1650)	176	J	mg/kg	197	65.0	1
n-Heptadecane (C17)	314		mg/kg	197	65.0	1
Pristane	161	J	mg/kg	197	42.0	1
n-Octadecane (C18)	98.6	J	mg/kg	197	39.5	1
Phytane	34.0	J	mg/kg	197	24.7	1
n-Nonadecane (C19)	ND		mg/kg	197	50.6	1
n-Eicosane (C20)	ND		mg/kg	197	27.8	1
n-Heneicosane (C21)	ND		mg/kg	197	23.6	1
n-Docosane (C22)	ND		mg/kg	197	20.5	1
n-Tricosane (C23)	ND		mg/kg	197	25.0	1
n-Tetracosane (C24)	ND		mg/kg	197	32.9	1
n-Pentacosane (C25)	ND		mg/kg	197	104.	1
n-Hexacosane (C26)	ND		mg/kg	197	28.9	1
n-Heptacosane (C27)	ND		mg/kg	197	23.7	1
n-Octacosane (C28)	ND		mg/kg	197	42.2	1
n-Nonacosane (C29)	ND		mg/kg	197	131.	1
n-Triacontane (C30)	ND		mg/kg	197	22.6	1
n-Hentriacontane (C31)	ND		mg/kg	197	27.9	1

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 Date Collected: 09/12/22 14:10

Client ID: A3-040TW-PRN01-WK2 Date Received: 09/20/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	ND		mg/kg	197	24.8	1
n-Tritriacontane (C33)	ND		mg/kg	197	27.7	1
n-Tetratriacontane (C34)	ND		mg/kg	197	31.3	1
n-Pentatriacontane (C35)	ND		mg/kg	197	34.4	1
n-Hexatriacontane (C36)	ND		mg/kg	197	39.2	1
n-Heptatriacontane (C37)	ND		mg/kg	197	43.7	1
n-Octatriacontane (C38)	ND		mg/kg	197	45.9	1
n-Nonatriacontane (C39)	ND		mg/kg	197	63.9	1
n-Tetracontane (C40)	ND		mg/kg	197	63.9	1
C9-C44 Total Petroleu	973000		mg/kg	6500	1430	1
C10-C28 DRO	926000		mg/kg	4130	852.	1
C28-C40 ORO	9330		mg/kg	2160	492.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	99		50-130
d50-Tetracosane	106		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/05/22 07:39
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Undecane (C11)	47800		mg/kg	984	294.	5
n-Dodecane (C12)	43800		mg/kg	984	214.	5
Total Saturated Hydrocarbons	191000	J	mg/kg	197	20.5	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	101		50-130
d50-Tetracosane	106		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 10/01/22 05:57
Analyst: WR

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1693518-1					
n-Nonane (C9)	ND		mg/kg	200	59.3
n-Decane (C10)	ND		mg/kg	200	63.8
n-Undecane (C11)	ND		mg/kg	200	59.7
n-Dodecane (C12)	ND		mg/kg	200	43.6
n-Tridecane (C13)	ND		mg/kg	200	54.9
2,6,10-Trimethyldodecane (1380)	ND		mg/kg	200	30.1
n-Tetradecane (C14)	ND		mg/kg	200	30.1
2,6,10-Trimethyltridecane (1470)	ND		mg/kg	200	23.9
n-Pentadecane (C15)	ND		mg/kg	200	23.9
n-Hexadecane (C16)	ND		mg/kg	200	30.1
Norpristane (1650)	ND		mg/kg	200	66.0
n-Heptadecane (C17)	ND		mg/kg	200	66.0
Pristane	ND		mg/kg	200	42.7
n-Octadecane (C18)	ND		mg/kg	200	40.1
Phytane	ND		mg/kg	200	25.1
n-Nonadecane (C19)	ND		mg/kg	200	51.4
n-Eicosane (C20)	ND		mg/kg	200	28.3
n-Heneicosane (C21)	ND		mg/kg	200	23.9
n-Docosane (C22)	ND		mg/kg	200	20.9
n-Tricosane (C23)	ND		mg/kg	200	25.4
n-Tetracosane (C24)	ND		mg/kg	200	33.5
n-Pentacosane (C25)	ND		mg/kg	200	106.
n-Hexacosane (C26)	ND		mg/kg	200	29.4
n-Heptacosane (C27)	ND		mg/kg	200	24.1
n-Octacosane (C28)	ND		mg/kg	200	42.9
n-Nonacosane (C29)	ND		mg/kg	200	133.
n-Triacontane (C30)	ND		mg/kg	200	22.9
n-Hentriacontane (C31)	ND		mg/kg	200	28.3
n-Dotriacontane (C32)	ND		mg/kg	200	25.2

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 10/01/22 05:57
Analyst: WR

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1693518-1					
n-Tritriacontane (C33)	ND		mg/kg	200	28.1
n-Tetratriacontane (C34)	ND		mg/kg	200	31.8
n-Pentatriacontane (C35)	ND		mg/kg	200	34.9
n-Hexatriacontane (C36)	ND		mg/kg	200	39.8
n-Heptatriacontane (C37)	ND		mg/kg	200	44.4
n-Octatriacontane (C38)	ND		mg/kg	200	46.6
n-Nonatriacontane (C39)	ND		mg/kg	200	64.9
n-Tetracontane (C40)	ND		mg/kg	200	64.9
C9-C44 Total Petroleu	ND		mg/kg	6600	1450
C10-C28 DRO	1010	J	mg/kg	4200	866.
C28-C40 ORO	ND		mg/kg	2200	500.
Total Saturated Hydrocarbons	ND		mg/kg	200	20.9

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	100		50-130
d50-Tetracosane	104		50-130

Lab Control Sample Analysis

Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3

Project Number: CTO-22F0106

Lab Number: L2250426

Report Date: 10/07/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01-02 Batch: WG1693518-2 WG1693518-3								
Nonane (C9)	92		93		50-130	1		30
n-Decane (C10)	94		95		50-130	1		30
n-Dodecane (C12)	98		99		50-130	1		30
n-Tetradecane (C14)	97		99		50-130	2		30
n-Hexadecane (C16)	102		107		50-130	5		30
n-Octadecane (C18)	104		106		50-130	2		30
n-Nonadecane (C19)	93		96		50-130	3		30
n-Eicosane (C20)	96		99		50-130	3		30
n-Docosane (C22)	101		104		50-130	3		30
n-Tetracosane (C24)	105		108		50-130	3		30
n-Hexacosane (C26)	103		106		50-130	3		30
n-Octacosane (C28)	97		100		50-130	3		30
n-Triacontane (C30)	104		106		50-130	2		30
n-Hexatriacontane (C36)	95		97		50-130	2		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	102		103		50-130
d50-Tetracosane	105		106		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106

Lab Number: L2250426
Report Date: 10/07/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
NA	Present/Intact

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2250426-01A	Vial Large Septa unpreserved (4oz)	NA	NA			Y	Present/Intact		A2-PIANO8260(365),A2-SHC(365)
L2250426-02A	Vial Large Septa unpreserved (4oz)	NA	NA			Y	Present/Intact		A2-PIANO8260(365),A2-SHC(365)

*Values in parentheses indicate holding time in days

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

COC# 09132022SIT-Alpha-01

CHAIN OF CUSTODY

ALPHA ANALYTICAL

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 9/20/22

ALPHA Job #: L2250426

Project Information

Project Name: Site Characterization/Adit 3

Project Location: RHBFSF-Adit 3

Project #: CTO-22F0106

Project Manager: [redacted] (b) (6)

ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ Rush (ONLY IF PRE-APPROVED)

Due Date: Time:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #: 02.30.01.

Regulatory Requirements/Report Limits

State/Fed Program Criteria

Client Information

Client: GSI-Rhodes for CTO22F0106 (AECOM)

Address: 1001 Bishop Street, Ste 1600

Honolulu, Hawaii

Phone: [redacted] (b) (6)

Fax:

Email: [redacted] (b) (6) @aecom.com

☐ These samples have been Previously analyzed by Alpha

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS

Saturated Hydrocarbon ANalysis: PIANO

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Saturated Hydrocarbon ANalysis	Sample Specific Comments
	A3015TW-PRN01-WK2	9/12/22	1315	Product	[redacted] (b) (6)	☒	Sample is wat/prod
50426.01	A3-010TW-PRN01-WK2	9/12/22	1335	Product		☒	Sample is product
-02	A3-040TW-PRN01-WK2	9/12/22	1410	Product		☒	Sample is product
	A3-010DSVMP-PRN01-WK2	9/12/222	1255	Product		☒	Sample is wat/prod

9/12/22 [redacted] (b) (6)

Container Type	-	-	-	-	-	-	-	-	-	-	-	-	
Preservative	-	-	-	-	-	-	-	-	-	-	-	-	

Relinquished By:	Date/Time	Received By:	Date/Time
[redacted] (b) (6)	9/12/22@1600	[redacted] (b) (6)	9/12/22 1600
	9/13/22 (1:34)	FedEx	
FedEx		[redacted] (b) (6)	9/20/22

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

15:07

FORM NO: 01-01(I-NJ) (rev. 5-JAN-12)

ORIGIN ID:HIKA (808) 356-5351
[redacted] (b) (6)
AECOM
1001 BISHOP STREET
SUITE 1600
HONOLULU, HI 96813
UNITED STATES US

SHIP DATE: 13SEP22
ACTWGT: 20.00 LB
CAD: 5070931/INET4532
DIMS: 18x18x18 IN

BILL SENDER

TO [redacted] (b) (6)

ALPHA ANALYTICAL
320 FORBES BLVD.

MANSFIELD MA 02048
(508) 822-9300 REF:
INV:
PO: DEPT:

581J1/EC8C/FE2D

FedEx. Express

FedEx.
TRK# 0201 7779 2607 3445

THU - 15 SEP AA
PRIORITY OVERNIGHT
ADG

XE PYMA

02048
MA-US
BOS

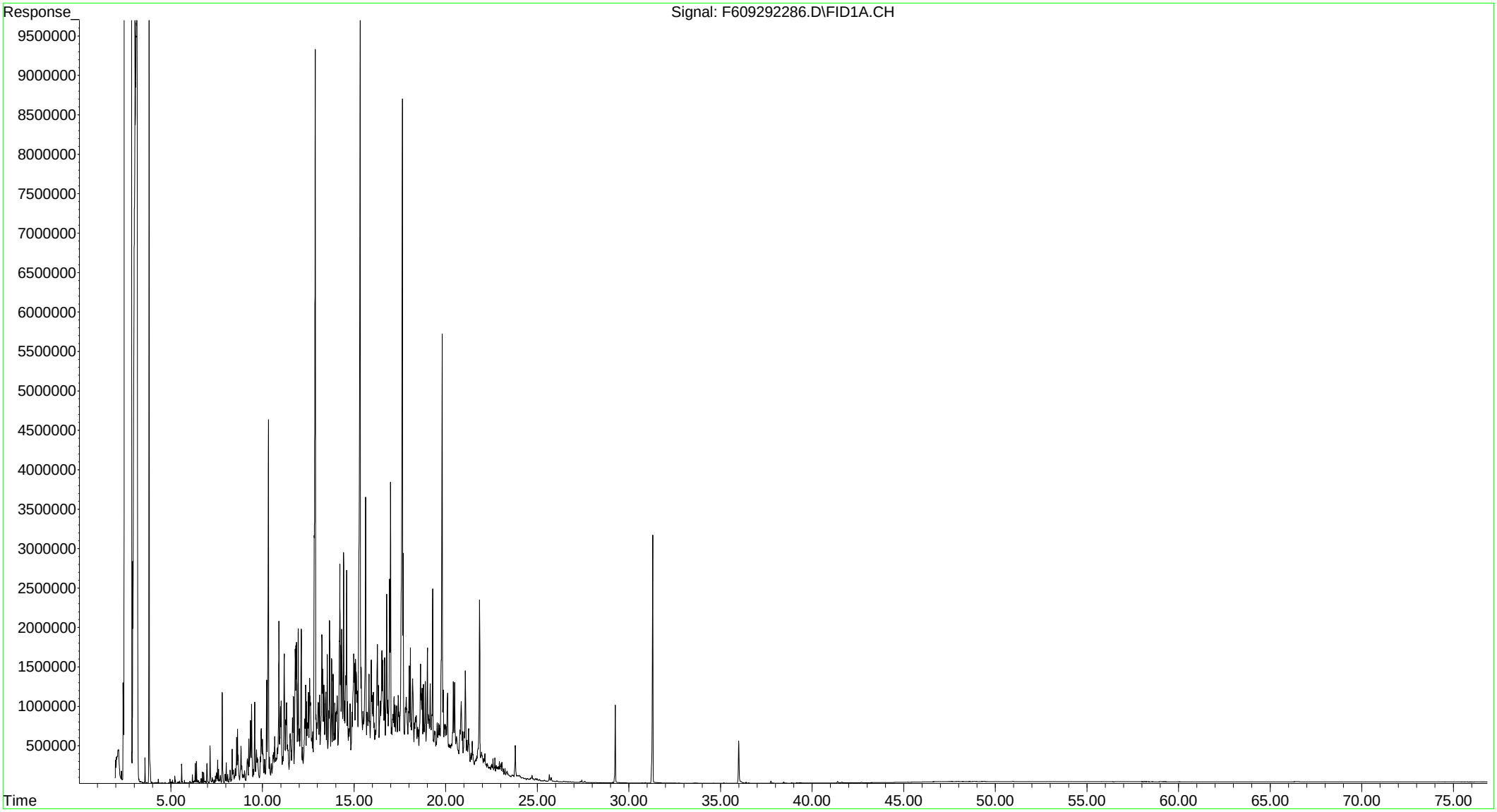
76313 14Sep2022 HNLA 581G1/EC8C/C088

After printing this label:
CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH
1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

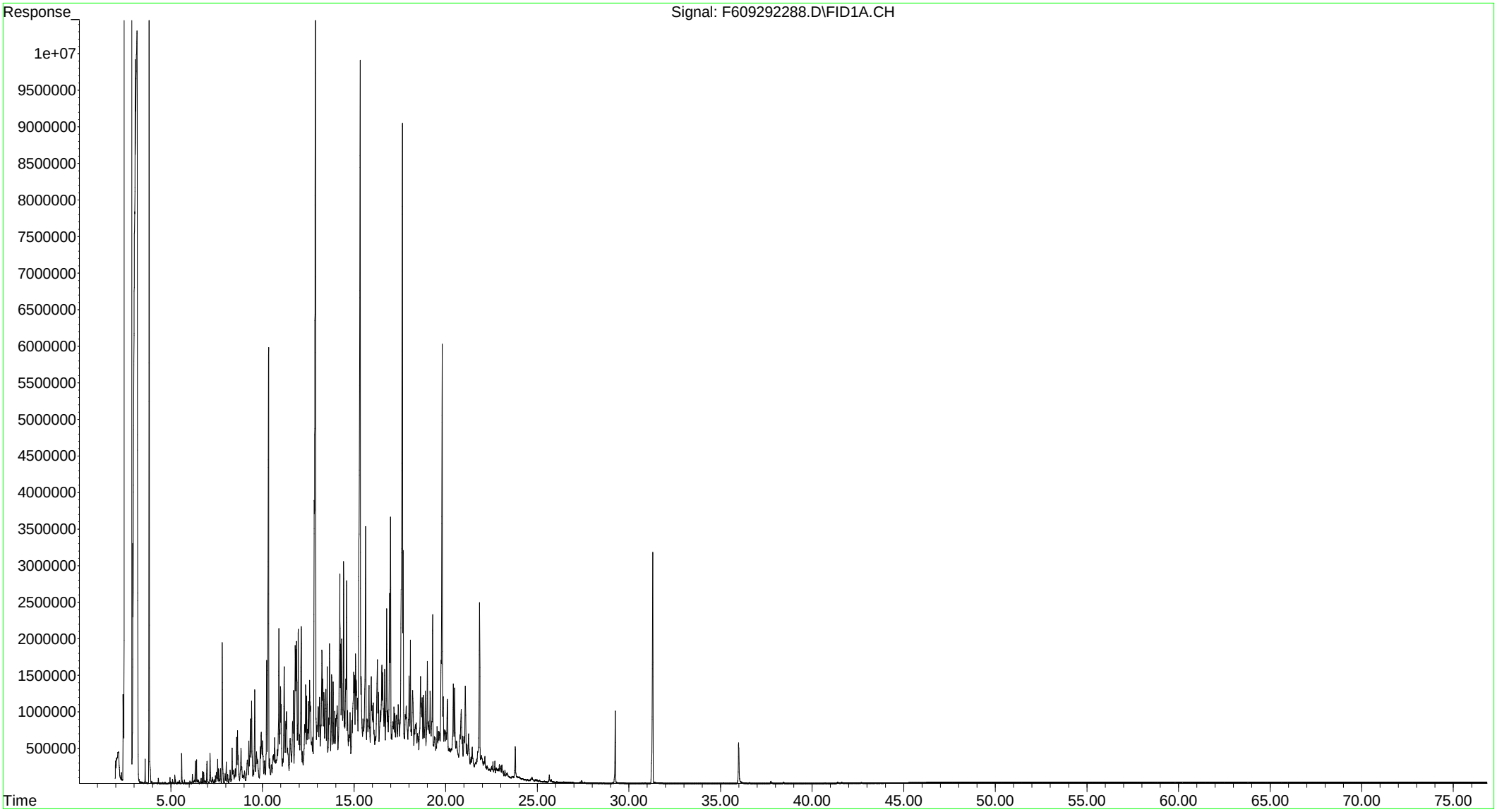
Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com. FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim. Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss. Maximum for items of extraordinary value is $1,000, e.g. jewelry, precious metals, negotiable instruments and other items listed in our Service Guide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

GC-FID Chromatogram

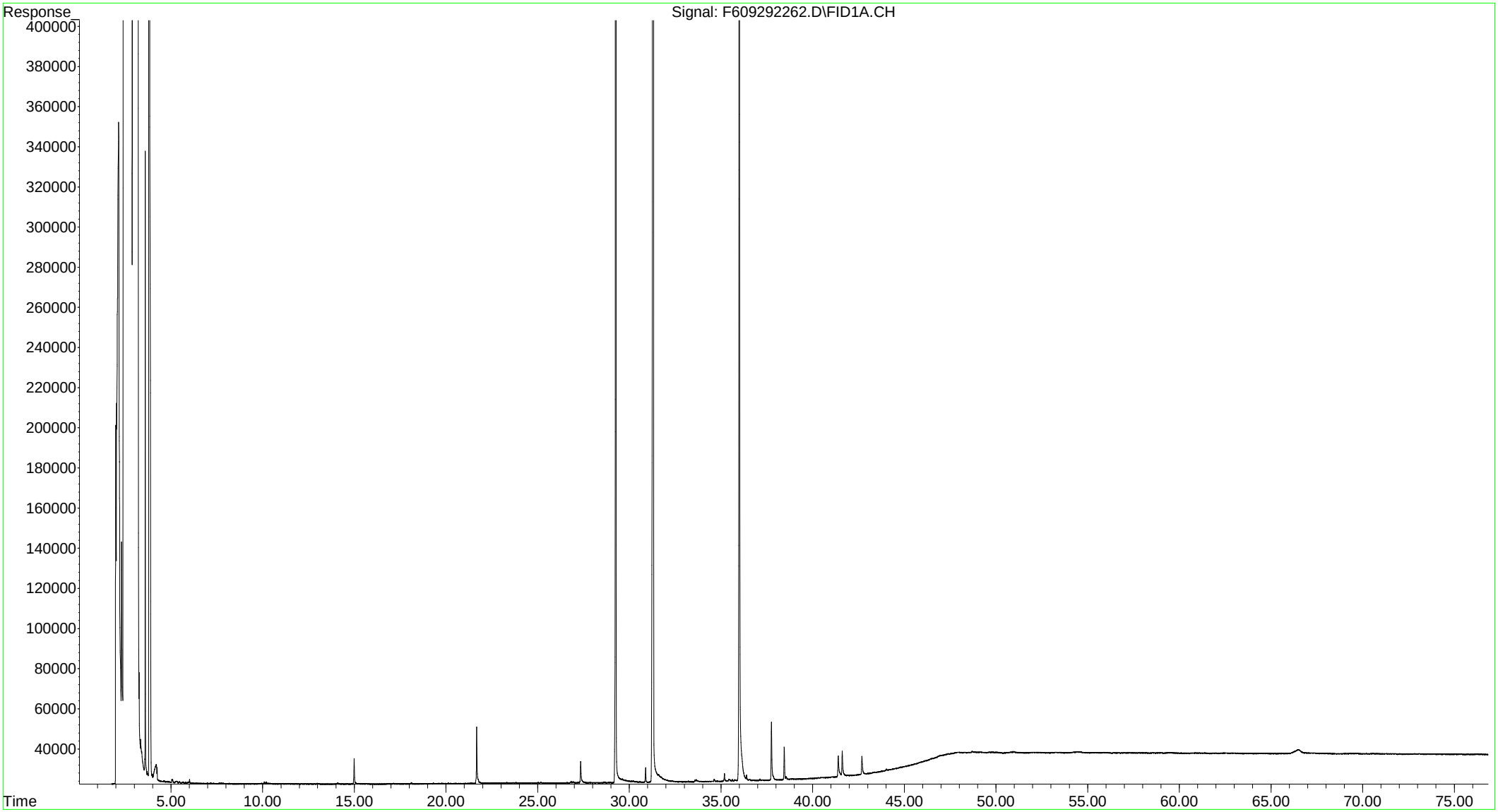
```
File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292286.D
Operator   : FID6:WR
Acquired   : 01 Oct 2022  11:22 pm using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: l2250426-01,42,,
Misc Info  : WG1693640,WG1693518,ICAL19333
Vial Number: 43
```



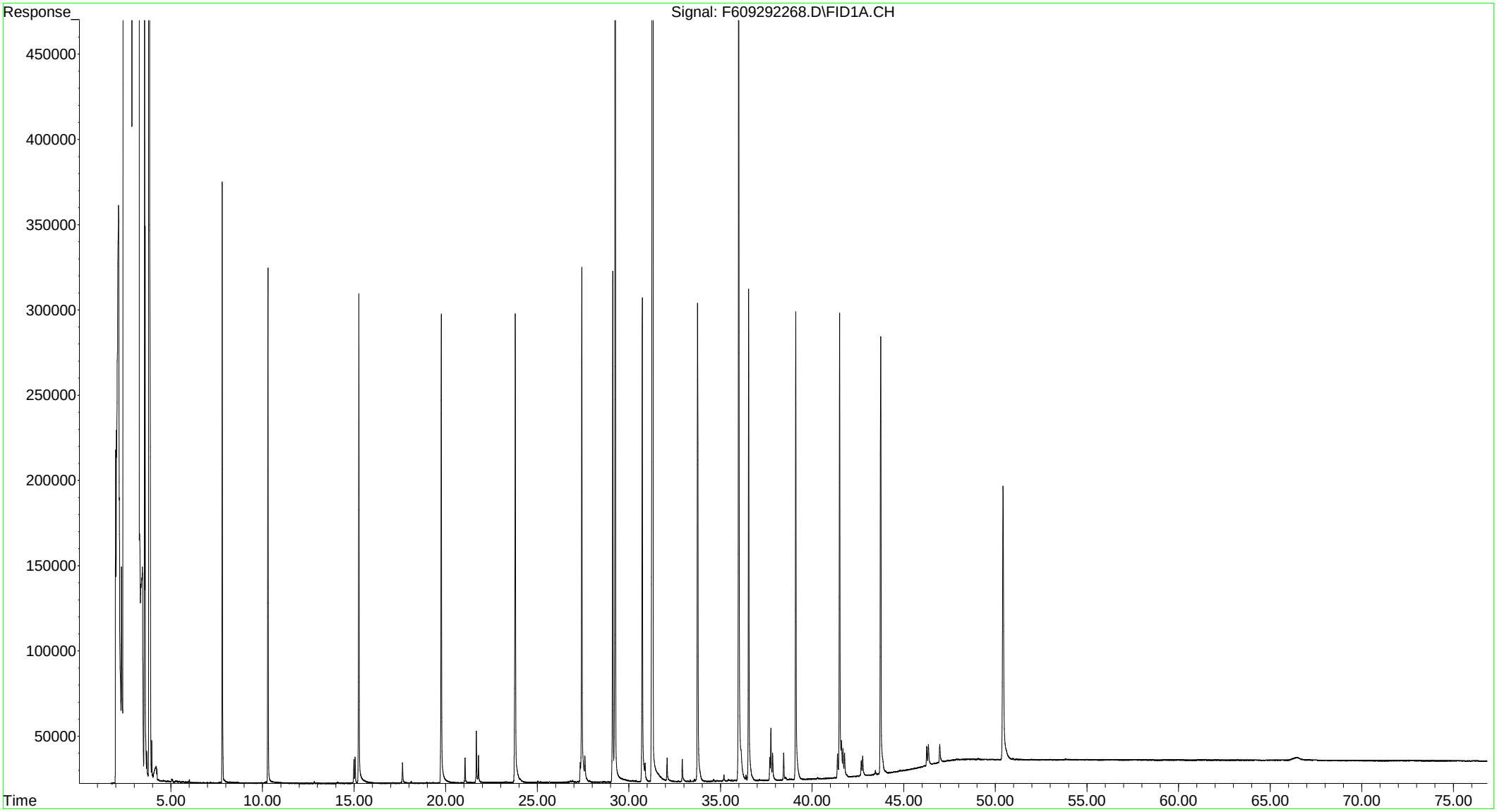
```
File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292288.D
Operator   : FID6:WR
Acquired   : 02 Oct 2022  12:49 am using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: l2250426-02,42,,
Misc Info  : WG1693640,WG1693518,ICAL19333
Vial Number: 44
```



```
File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292262.D
Operator   : FID6:WR
Acquired   : 01 Oct 2022   5:57 am using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: WG1693518-1,42,,
Misc Info  : WG1693640,WG1693518,ICAL19333
Vial Number: 31
```

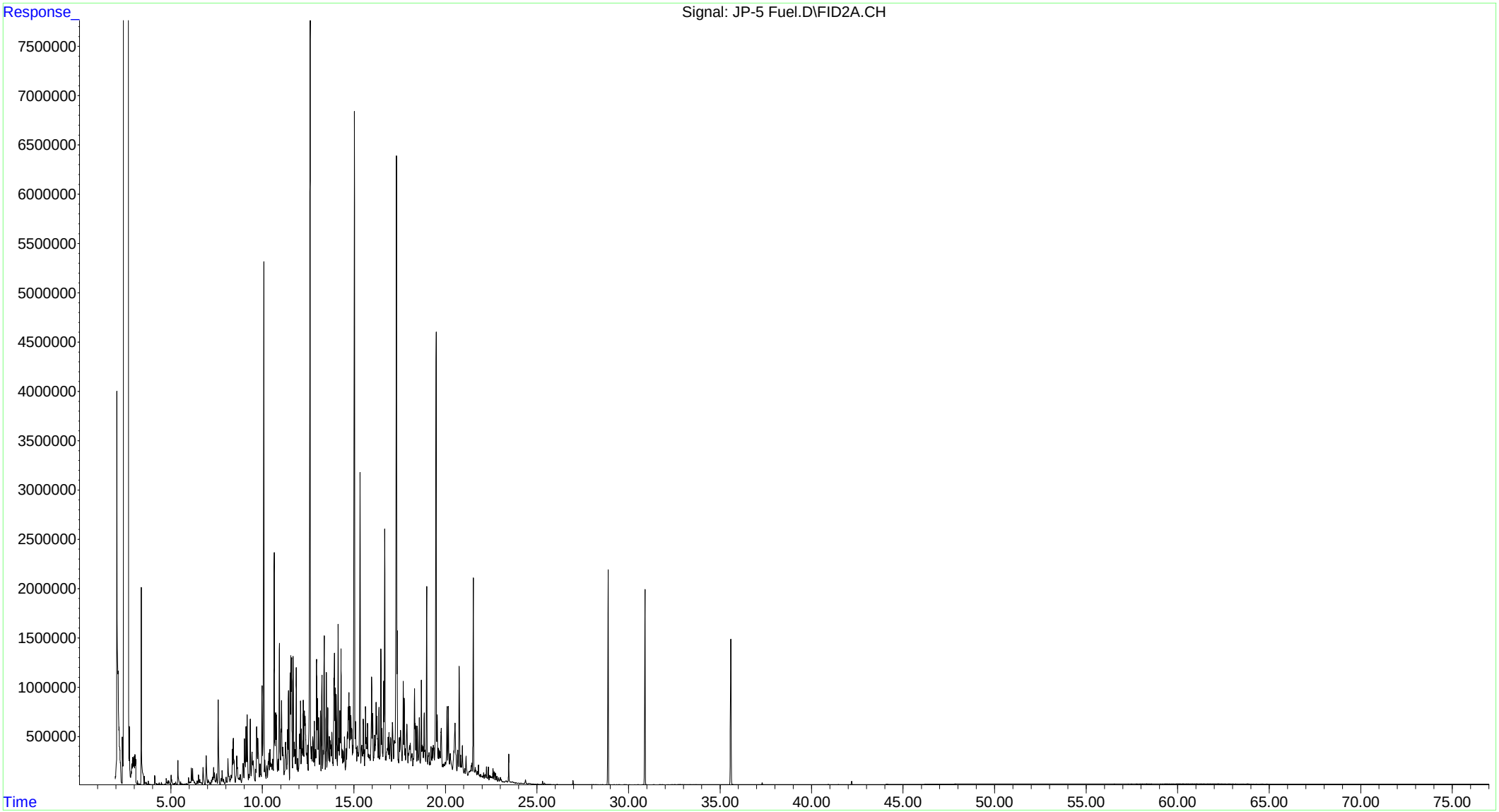


```
File        :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292268.D
Operator    : FID6:WR
Acquired    : 01 Oct 2022  10:18 am using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: WG1693518-2,42,,
Misc Info   : WG1693640,WG1693518,ICAL19333
Vial Number: 34
```



Petroleum Reference Standards

```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\JP-5 Fu
...         el.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 19 Nov 2011   4:22 pm using AcqMethod FRNC2AF.M
Sample    : JP-5 FUEL
Misc Info : F042710P
```



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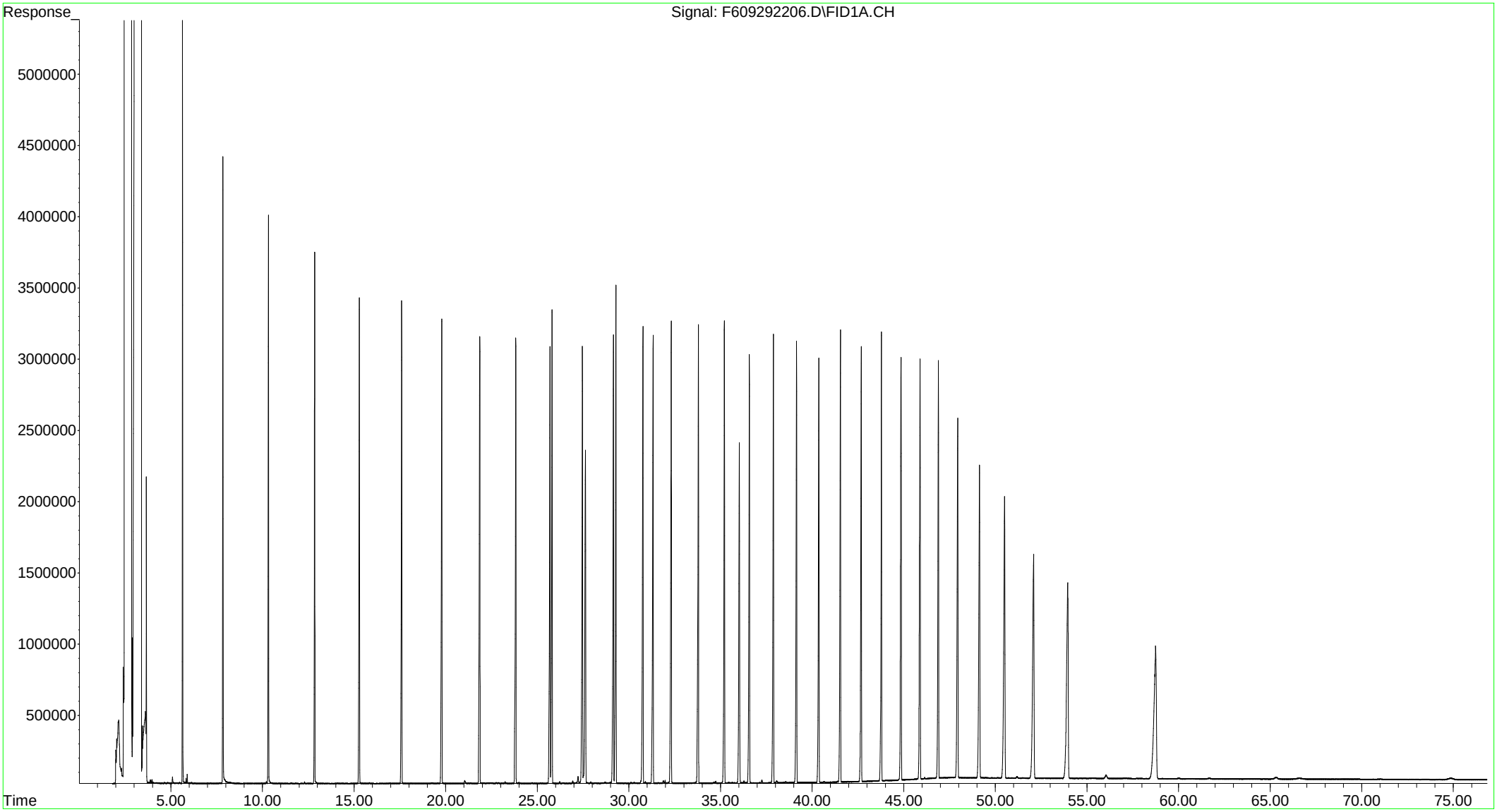
File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292206.D
Operator   : FID6:WR
Acquired   : 29 Sep 2022   1:18 pm using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: WG1693640-1
Misc Info  : WG1693640,FRBE91,ICAL19333
Vial Number: 3
```



Appendix 2: Alpha Lab Report L2250292 for Water, Water/Sheen Samples

ANALYTICAL REPORT

Lab Number:	L2250292
Client:	GSI Environmental Inc. 2211 Norfolk Suite 1000 Houston, TX 77098
ATTN:	[redacted] (b) (6)
Phone:	[redacted] (b) (6)
Project Name:	Not Specified
Project Number:	CTO-22F0106
Report Date:	10/04/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2250292-01	A3015TW-PRN01-WK2	WATER	Not Specified	09/12/22 13:15	09/15/22
L2250292-02	A3-010DSVMP-PRN01-WK2	WATER	Not Specified	09/12/22 12:55	09/15/22

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

PIANO Volatile Organics

The WG1691160-5 Method Blank, associated with L2250292-01, has concentrations below the reporting limits and "J" qualified. Associated field sample results are "B" qualified if the concentrations are less than 10x the concentrations in the blank.

Saturated Hydrocarbons

L2250292-01 and -02: The sample was extracted and then analyzed using a gas chromatograph equipped with a flame ionization detector (GC/FID). The temperature program and associated experimental conditions were optimized to obtain maximum resolution in an eighty minute chromatographic run representative of hydrocarbons in the n-Octane (C8) to n-Tetracontane (C40) range. Qualitative evaluation of the sample was conducted by reviewing the sample chromatogram in conjunction with a chromatogram of a normal alkane series generated with the same chromatographic conditions. Chromatograms of hydrocarbon reference materials obtained from our library of 82 reference standards were also utilized to provide the best possible sample match. Quantitative determination of the sample's hydrocarbon concentration was performed in accordance with EPA Method 8015M. The sample's total hydrocarbon concentration and all associated quality control data are included in the report.

The following qualitative information is based on a tentative interpretation of chromatographic pattern recognition and boiling point ranges:

Total Petroleum Hydrocarbon Identification

L2250292-01 and -02 contain hydrocarbons eluting in the range of n-Nonane (C9) to after the elution of n-Octadecane (C18).

Based on the data generated, L2250292-01 and -02 containsmaterial eluting in the low to mid weight ranges of the chromatogram which is similar to a JP-5 Jet Fuel / Kerosene type product.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

(b) (6)

Authorized Signature: [redacted]

Title: Technical Director/Representative

Date: 10/04/22

ORGANICS

VOLATILES

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8260B
Analytical Date: 09/23/22 10:22
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3-Methyl-1-butene	ND		ug/l	2.00	0.297	1
Isopentane	ND		ug/l	2.00	0.366	1
1-Pentene	ND		ug/l	2.00	0.365	1
2-Methyl-1-Butene	ND		ug/l	2.00	0.311	1
Pentane	ND		ug/l	2.00	0.624	1
trans-2-Pentene	ND		ug/l	2.00	0.270	1
Isoprene	ND		ug/l	2.00	0.357	1
cis-2-Pentene	ND		ug/l	2.00	0.322	1
Tertiary Butanol	ND		ug/l	25.0	3.24	1
2,2-Dimethylbutane	ND		ug/l	2.00	0.617	1
4-Methyl-1-pentene	ND		ug/l	2.00	0.311	1
Cyclopentane	ND		ug/l	2.00	0.519	1
2,3-Dimethylbutane	ND		ug/l	2.00	0.826	1
2-Methylpentane	ND		ug/l	2.00	0.542	1
Methyl tert butyl ether	ND		ug/l	2.00	0.412	1
3-Methylpentane	ND		ug/l	2.00	0.317	1
1-Hexene	ND		ug/l	2.00	0.281	1
n-Hexane	ND		ug/l	2.00	0.329	1
Isopropyl Ether	ND		ug/l	2.00	0.242	1
trans-2-Hexene	ND		ug/l	2.00	0.261	1
2-Methyl-2-pentene	ND		ug/l	2.00	0.306	1
cis-2-Hexene	ND		ug/l	2.00	0.271	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.00	0.303	1
2,2-Dimethylpentane	ND		ug/l	2.00	0.269	1
Methylcyclopentane	ND		ug/l	2.00	0.268	1
2,4-Dimethylpentane	ND		ug/l	2.00	0.247	1
2,2,3-Trimethylbutane	ND		ug/l	2.00	0.270	1
1,2-Dichloroethane	ND		ug/l	2.00	0.295	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3,3-Dimethylpentane	ND		ug/l	2.00	0.372	1
Cyclohexane	ND		ug/l	2.00	0.247	1
2-Methylhexane	ND		ug/l	2.00	0.315	1
Benzene	ND		ug/l	2.00	0.305	1
2,3-Dimethylpentane	ND		ug/l	2.00	0.265	1
Thiophene	ND		ug/l	2.00	0.284	1
1,1-Dimethylcyclopentane	ND		ug/l	2.00	0.240	1
3-Methylhexane	ND		ug/l	2.00	0.320	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.00	0.246	1
3-Ethylpentane	ND		ug/l	2.00	0.289	1
1-Heptene/1,2-DMCP (trans)	ND		ug/l	4.00	0.585	1
Isooctane	ND		ug/l	2.00	0.218	1
trans-3-Heptene	ND		ug/l	2.00	0.311	1
Heptane	ND		ug/l	2.00	0.348	1
trans-2-Heptene	ND		ug/l	2.00	0.256	1
cis-2-Heptene	ND		ug/l	2.00	0.387	1
2,2-Dimethylhexane	ND		ug/l	2.00	0.290	1
Methylcyclohexane	ND		ug/l	2.00	0.270	1
2,5-Dimethylhexane	ND		ug/l	2.00	0.348	1
2,4-Dimethylhexane	ND		ug/l	2.00	0.243	1
Ethylcyclopentane	ND		ug/l	2.00	0.265	1
2,2,3-Trimethylpentane	ND		ug/l	2.00	0.347	1
2,3,4-Trimethylpentane	ND		ug/l	2.00	0.261	1
2,3,3-Trimethylpentane	ND		ug/l	2.00	0.397	1
Xylene (Total)[1]	14.0		ug/l	2.00	0.209	1
2,3-Dimethylhexane	ND		ug/l	2.00	0.485	1
2-Methylheptane	ND		ug/l	2.00	0.338	1
4-Methylheptane	ND		ug/l	2.00	0.344	1
3-Methylheptane	ND		ug/l	2.00	0.385	1
3-Ethylhexane	ND		ug/l	2.00	0.358	1
Toluene	ND		ug/l	2.00	0.271	1
2-Methylthiophene	ND		ug/l	2.00	0.170	1
1,4-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.260	1
3-Methylthiophene	ND		ug/l	2.00	0.234	1
1-Octene	ND		ug/l	5.00	0.307	1
Octane	ND		ug/l	2.00	0.235	1
1,2-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.294	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1,2-Dibromoethane	ND		ug/l	2.00	0.320	1
cis-2-Octene	ND		ug/l	2.00	0.229	1
Isopropylcyclopentane	ND		ug/l	2.00	0.293	1
1,2-Dimethylcyclohexane (cis)	ND		ug/l	2.00	0.581	1
2,5-Dimethylheptane	ND		ug/l	2.00	0.335	1
3,5-Dimethylheptane	ND		ug/l	2.00	0.282	1
3,3-Dimethylheptane	ND		ug/l	2.00	0.242	1
1,1,4-Trimethylcyclohexane	ND		ug/l	2.00	0.199	1
2,3-Dimethylheptane	ND		ug/l	2.00	0.228	1
3,4-Dimethylheptane	ND		ug/l	2.00	0.340	1
4-Methyloctane	ND		ug/l	2.00	0.334	1
2-Methyloctane	ND		ug/l	2.00	0.512	1
Ethylbenzene	ND		ug/l	2.00	0.216	1
2-Ethylthiophene	ND		ug/l	2.00	0.176	1
3-Methyloctane	ND		ug/l	2.00	0.224	1
3,3-Diethylpentane	ND		ug/l	2.00	0.233	1
p/m-Xylene	ND		ug/l	4.00	0.381	1
1-Nonene	ND		ug/l	5.00	0.270	1
trans-3-Nonene	ND		ug/l	2.00	0.237	1
cis-3-Nonene	ND		ug/l	2.00	0.374	1
Nonane (C9)	ND		ug/l	2.00	0.311	1
Styrene	ND		ug/l	2.00	0.202	1
o-Xylene	14.0		ug/l	2.00	0.209	1
2-Nonene	ND		ug/l	5.00	0.254	1
Isopropylcyclohexane	ND		ug/l	2.00	0.212	1
Isopropylbenzene	ND		ug/l	2.00	0.187	1
3,3-Dimethyloctane	ND		ug/l	2.00	0.202	1
n-Propylbenzene	ND		ug/l	2.00	0.177	1
2-Methylnonane	ND		ug/l	2.00	0.283	1
3-Methylnonane	ND		ug/l	2.00	0.279	1
1-Methyl-3-Ethylbenzene	ND		ug/l	2.00	0.316	1
1-Methyl-4-Ethylbenzene	5.46		ug/l	2.00	0.282	1
1,3,5-Trimethylbenzene	24.0		ug/l	2.00	0.230	1
1-Decene	ND		ug/l	2.00	0.260	1
Isobutylcyclohexane	ND		ug/l	2.00	0.163	1
1-Methyl-2-Ethylbenzene	25.9		ug/l	2.00	0.170	1
Decane (C10)	ND		ug/l	2.00	0.271	1

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01 Date Collected: 09/12/22 13:15

Client ID: A3015TW-PRN01-WK2 Date Received: 09/15/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
tert-Butylbenzene	0.417	J	ug/l	2.00	0.211	1
1,2,4-Trimethylbenzene	ND		ug/l	2.00	0.207	1
Isobutylbenzene	ND		ug/l	2.00	0.270	1
sec-Butylbenzene	0.290	J	ug/l	2.00	0.259	1
1-Methyl-3-Isopropylbenzene	7.65		ug/l	2.00	0.258	1
1-Methyl-4-Isopropylbenzene	4.11		ug/l	2.00	0.212	1
1,2,3-Trimethylbenzene	87.3		ug/l	2.00	0.223	1
1-Methyl-2-Isopropylbenzene	2.52		ug/l	2.00	0.217	1
Indane	6.33		ug/l	2.00	0.123	1
1,3-Diethylbenzene	6.24		ug/l	2.00	0.249	1
1-Methyl-3-N-Propylbenzene	7.01		ug/l	2.00	0.202	1
Indene	0.689	J	ug/l	2.00	0.116	1
1-Methyl-4-N-Propylbenzene	2.91		ug/l	2.00	0.250	1
n-Butylbenzene	ND		ug/l	2.00	0.197	1
1,2-Dimethyl-4-Ethylbenzene	18.8		ug/l	2.00	0.245	1
1,2-Diethylbenzene	6.93		ug/l	2.00	0.296	1
1-Methyl-2-N-Propylbenzene	18.2		ug/l	2.00	0.249	1
1,4-Dimethyl-2-Ethylbenzene	1.44	J	ug/l	2.00	0.187	1
Undecane	0.999	J	ug/l	2.00	0.222	1
1,3-Dimethyl-4-Ethylbenzene	2.52		ug/l	2.00	0.194	1
1,3-Dimethyl-5-Ethylbenzene	19.4		ug/l	2.00	0.236	1
1,3-Dimethyl-2-Ethylbenzene	10.4		ug/l	2.00	0.149	1
1,2-Dimethyl-3-Ethylbenzene	22.9		ug/l	2.00	0.127	1
1,2,4,5-Tetramethylbenzene	15.9		ug/l	2.00	0.155	1
1,2,3,5-Tetramethylbenzene	41.8		ug/l	2.00	0.152	1
N-Pentylbenzene	ND		ug/l	2.00	0.249	1
1,2,3,4-Tetramethylbenzene	58.9		ug/l	2.00	0.214	1
1,3-Dimethyl-5-tert-Butylbenzene	ND		ug/l	2.00	0.285	1
Dodecane (C12)	2.61	J	ug/l	5.00	0.657	1
1,3,5-Triethylbenzene	ND		ug/l	2.00	0.380	1
Naphthalene	ND		ug/l	2.00	0.835	1
Benzothiophene	ND		ug/l	2.00	1.06	1
1,2,4-Triethylbenzene	ND		ug/l	2.00	0.340	1
Hexylbenzene	ND		ug/l	2.00	0.385	1
MMT	ND		ug/l	5.00	1.29	1
Tridecane	5.06		ug/l	5.00	1.39	1
2-Methylnaphthalene	ND		ug/l	5.00	1.32	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1-Methylnaphthalene	4.30	J	ug/l	5.00	1.47	1
Tetradecane (C14)	7.18		ug/l	5.00	0.612	1
Pentadecane	3.78	J	ug/l	5.00	1.12	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	108		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	99		70-130

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
3-Methyl-1-butene	ND		ug/l	2.00	0.297
Isopentane	ND		ug/l	2.00	0.366
1-Pentene	ND		ug/l	2.00	0.365
2-Methyl-1-Butene	ND		ug/l	2.00	0.311
Pentane	ND		ug/l	2.00	0.624
trans-2-Pentene	ND		ug/l	2.00	0.270
Isoprene	ND		ug/l	2.00	0.357
cis-2-Pentene	ND		ug/l	2.00	0.322
Tertiary Butanol	15.3	J	ug/l	25.0	3.24
2,2-Dimethylbutane	ND		ug/l	2.00	0.617
4-Methyl-1-pentene	ND		ug/l	2.00	0.311
Cyclopentane	ND		ug/l	2.00	0.519
2,3-Dimethylbutane	ND		ug/l	2.00	0.826
2-Methylpentane	ND		ug/l	2.00	0.542
Methyl tert butyl ether	ND		ug/l	2.00	0.412
3-Methylpentane	ND		ug/l	2.00	0.317
1-Hexene	ND		ug/l	2.00	0.281
n-Hexane	ND		ug/l	2.00	0.329
Isopropyl Ether	ND		ug/l	2.00	0.242
trans-2-Hexene	ND		ug/l	2.00	0.261
2-Methyl-2-pentene	ND		ug/l	2.00	0.306
cis-2-Hexene	ND		ug/l	2.00	0.271
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.00	0.303
2,2-Dimethylpentane	ND		ug/l	2.00	0.269
Methylcyclopentane	ND		ug/l	2.00	0.268
2,4-Dimethylpentane	ND		ug/l	2.00	0.247
2,2,3-Trimethylbutane	ND		ug/l	2.00	0.270
1,2-Dichloroethane	ND		ug/l	2.00	0.295
3,3-Dimethylpentane	ND		ug/l	2.00	0.372

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
Cyclohexane	ND		ug/l	2.00	0.247
2-Methylhexane	ND		ug/l	2.00	0.315
Benzene	ND		ug/l	2.00	0.305
2,3-Dimethylpentane	ND		ug/l	2.00	0.265
Thiophene	ND		ug/l	2.00	0.284
1,1-Dimethylcyclopentane	ND		ug/l	2.00	0.240
3-Methylhexane	ND		ug/l	2.00	0.320
Tertiary-Amyl Methyl Ether	ND		ug/l	2.00	0.246
3-Ethylpentane	ND		ug/l	2.00	0.289
1-Heptene/1,2-DMCP (trans)	ND		ug/l	4.00	0.585
Isooctane	ND		ug/l	2.00	0.218
trans-3-Heptene	ND		ug/l	2.00	0.311
Heptane	ND		ug/l	2.00	0.348
trans-2-Heptene	ND		ug/l	2.00	0.256
cis-2-Heptene	ND		ug/l	2.00	0.387
2,2-Dimethylhexane	ND		ug/l	2.00	0.290
Methylcyclohexane	ND		ug/l	2.00	0.270
2,5-Dimethylhexane	ND		ug/l	2.00	0.348
2,4-Dimethylhexane	ND		ug/l	2.00	0.243
Ethylcyclopentane	ND		ug/l	2.00	0.265
2,2,3-Trimethylpentane	ND		ug/l	2.00	0.347
2,3,4-Trimethylpentane	ND		ug/l	2.00	0.261
2,3,3-Trimethylpentane	ND		ug/l	2.00	0.397
Xylene (Total)[1]	ND		ug/l	2.00	0.209
2,3-Dimethylhexane	ND		ug/l	2.00	0.485
2-Methylheptane	ND		ug/l	2.00	0.338
4-Methylheptane	ND		ug/l	2.00	0.344
3-Methylheptane	ND		ug/l	2.00	0.385
3-Ethylhexane	ND		ug/l	2.00	0.358

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
Toluene	ND		ug/l	2.00	0.271
2-Methylthiophene	ND		ug/l	2.00	0.170
1,4-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.260
3-Methylthiophene	ND		ug/l	2.00	0.234
1-Octene	ND		ug/l	5.00	0.307
Octane	ND		ug/l	2.00	0.235
1,2-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.294
1,2-Dibromoethane	ND		ug/l	2.00	0.320
cis-2-Octene	ND		ug/l	2.00	0.229
Isopropylcyclopentane	ND		ug/l	2.00	0.293
1,2-Dimethylcyclohexane (cis)	ND		ug/l	2.00	0.581
2,5-Dimethylheptane	ND		ug/l	2.00	0.335
3,5-Dimethylheptane	ND		ug/l	2.00	0.282
3,3-Dimethylheptane	ND		ug/l	2.00	0.242
1,1,4-Trimethylcyclohexane	ND		ug/l	2.00	0.199
2,3-Dimethylheptane	ND		ug/l	2.00	0.228
3,4-Dimethylheptane	ND		ug/l	2.00	0.340
4-Methyloctane	ND		ug/l	2.00	0.334
2-Methyloctane	ND		ug/l	2.00	0.512
Ethylbenzene	ND		ug/l	2.00	0.216
2-Ethylthiophene	ND		ug/l	2.00	0.176
3-Methyloctane	ND		ug/l	2.00	0.224
3,3-Diethylpentane	ND		ug/l	2.00	0.233
p/m-Xylene	ND		ug/l	4.00	0.381
1-Nonene	ND		ug/l	5.00	0.270
trans-3-Nonene	ND		ug/l	2.00	0.237
cis-3-Nonene	ND		ug/l	2.00	0.374
Nonane (C9)	ND		ug/l	2.00	0.311
Styrene	ND		ug/l	2.00	0.202

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
o-Xylene	ND		ug/l	2.00	0.209
2-Nonene	ND		ug/l	5.00	0.254
Isopropylcyclohexane	ND		ug/l	2.00	0.212
Isopropylbenzene	ND		ug/l	2.00	0.187
3,3-Dimethyloctane	ND		ug/l	2.00	0.202
n-Propylbenzene	ND		ug/l	2.00	0.177
2-Methylnonane	ND		ug/l	2.00	0.283
3-Methylnonane	ND		ug/l	2.00	0.279
1-Methyl-3-Ethylbenzene	ND		ug/l	2.00	0.316
1-Methyl-4-Ethylbenzene	ND		ug/l	2.00	0.282
1,3,5-Trimethylbenzene	ND		ug/l	2.00	0.230
1-Decene	ND		ug/l	2.00	0.260
Isobutylcyclohexane	ND		ug/l	2.00	0.163
1-Methyl-2-Ethylbenzene	ND		ug/l	2.00	0.170
Decane (C10)	ND		ug/l	2.00	0.271
tert-Butylbenzene	ND		ug/l	2.00	0.211
1,2,4-Trimethylbenzene	ND		ug/l	2.00	0.207
Isobutylbenzene	ND		ug/l	2.00	0.270
sec-Butylbenzene	ND		ug/l	2.00	0.259
1-Methyl-3-Isopropylbenzene	ND		ug/l	2.00	0.258
1-Methyl-4-Isopropylbenzene	ND		ug/l	2.00	0.212
1,2,3-Trimethylbenzene	ND		ug/l	2.00	0.223
1-Methyl-2-Isopropylbenzene	ND		ug/l	2.00	0.217
Indane	ND		ug/l	2.00	0.123
1,3-Diethylbenzene	ND		ug/l	2.00	0.249
1-Methyl-3-N-Propylbenzene	ND		ug/l	2.00	0.202
Indene	ND		ug/l	2.00	0.116
1-Methyl-4-N-Propylbenzene	ND		ug/l	2.00	0.250
n-Butylbenzene	ND		ug/l	2.00	0.197

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
1,2-Dimethyl-4-Ethylbenzene	ND		ug/l	2.00	0.245
1,2-Diethylbenzene	ND		ug/l	2.00	0.296
1-Methyl-2-N-Propylbenzene	ND		ug/l	2.00	0.249
1,4-Dimethyl-2-Ethylbenzene	ND		ug/l	2.00	0.187
Undecane	ND		ug/l	2.00	0.222
1,3-Dimethyl-4-Ethylbenzene	ND		ug/l	2.00	0.194
1,3-Dimethyl-5-Ethylbenzene	ND		ug/l	2.00	0.236
1,3-Dimethyl-2-Ethylbenzene	ND		ug/l	2.00	0.149
1,2-Dimethyl-3-Ethylbenzene	ND		ug/l	2.00	0.127
1,2,4,5-Tetramethylbenzene	ND		ug/l	2.00	0.155
1,2,3,5-Tetramethylbenzene	ND		ug/l	2.00	0.152
N-Pentylbenzene	ND		ug/l	2.00	0.249
1,2,3,4-Tetramethylbenzene	ND		ug/l	2.00	0.214
1,3-Dimethyl-5-tert-Butylbenzene	ND		ug/l	2.00	0.285
Dodecane (C12)	ND		ug/l	5.00	0.657
1,3,5-Triethylbenzene	ND		ug/l	2.00	0.380
Naphthalene	ND		ug/l	2.00	0.835
Benzothiophene	ND		ug/l	2.00	1.06
1,2,4-Triethylbenzene	ND		ug/l	2.00	0.340
Hexylbenzene	ND		ug/l	2.00	0.385
MMT	ND		ug/l	5.00	1.29
Tridecane	ND		ug/l	5.00	1.39
2-Methylnaphthalene	ND		ug/l	5.00	1.32
1-Methylnaphthalene	ND		ug/l	5.00	1.47
Tetradecane (C14)	ND		ug/l	5.00	0.612
Pentadecane	ND		ug/l	5.00	1.12

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	107		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	97		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01 Batch: WG1691160-3 WG1691160-4								
1-Pentene	104		109		50-130	5		30
Pentane	85		90		50-130	6		30
Tertiary Butanol	91		88		50-130	3		30
Cyclopentane	90		96		50-130	6		30
2-Methylpentane	92		95		50-130	3		30
Methyl tert butyl ether	80		82		50-130	2		30
3-Methylpentane	96		99		50-130	3		30
1-Hexene	100		103		50-130	3		30
n-Hexane	90		94		50-130	4		30
Isopropyl Ether	85		87		50-130	2		30
Ethyl-Tert-Butyl-Ether	75		76		50-130	1		30
Methylcyclopentane	100		104		50-130	4		30
2,4-Dimethylpentane	92		97		50-130	5		30
Cyclohexane	101		105		50-130	4		30
2-Methylhexane	94		96		50-130	2		30
Benzene	90		92		50-130	2		30
2,3-Dimethylpentane	96		98		50-130	2		30
3-Methylhexane	86		86		50-130	0		30
Tertiary-Amyl Methyl Ether	79		80		50-130	1		30
Isooctane	100		102		50-130	2		30
Heptane	102		102		50-130	0		30
Methylcyclohexane	94		94		50-130	0		30
2-Methylheptane	100		102		50-130	2		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01 Batch: WG1691160-3 WG1691160-4								
3-Methylheptane	99		100		50-130	1		30
Toluene	90		92		50-130	2		30
Octane	102		102		50-130	0		30
Ethylbenzene	90		93		50-130	3		30
p/m-Xylene	96		98		50-130	2		30
Nonane (C9)	95		96		50-130	1		30
o-Xylene	96		98		50-130	2		30
Isopropylbenzene	98		100		50-130	2		30
n-Propylbenzene	100		103		50-130	3		30
1-Methyl-3-Ethylbenzene	98		100		50-130	2		30
1-Methyl-4-Ethylbenzene	102		104		50-130	2		30
1,3,5-Trimethylbenzene	100		104		50-130	4		30
1-Decene	78		80		50-130	3		30
1-Methyl-2-Ethylbenzene	100		103		50-130	3		30
Decane (C10)	106		110		50-130	4		30
1,2,4-Trimethylbenzene	96		97		50-130	1		30
sec-Butylbenzene	106		108		50-130	2		30
1-Methyl-4-N-Propylbenzene	98		100		50-130	2		30
n-Butylbenzene	100		103		50-130	3		30
1,2-Diethylbenzene	99		100		50-130	1		30
Undecane	102		106		50-130	4		30
N-Pentylbenzene	99		102		50-130	3		30
Dodecane (C12)	124		126		50-130	2		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: Not Specified

Project Number: CTO-22F0106

Lab Number: L2250292

Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01 Batch: WG1691160-3 WG1691160-4								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Dibromofluoromethane	102		102		70-130
Toluene-d8	102		101		70-130
4-Bromofluorobenzene	102		102		70-130

PETROLEUM HYDROCARBONS

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 09/20/22 00:11
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	ND		mg/l	0.014	0.004	1
n-Decane (C10)	0.010	J	mg/l	0.014	0.002	1
n-Undecane (C11)	0.050		mg/l	0.014	0.001	1
n-Dodecane (C12)	0.093		mg/l	0.014	0.002	1
n-Tridecane (C13)	0.156		mg/l	0.069	0.012	1
2,6,10-Trimethyldodecane (1380)	0.020		mg/l	0.014	0.001	1
n-Tetradecane (C14)	0.075		mg/l	0.014	0.001	1
2,6,10-Trimethyltridecane (1470)	0.013	J	mg/l	0.014	0.002	1
n-Pentadecane (C15)	0.021		mg/l	0.014	0.002	1
n-Hexadecane (C16)	0.007	J	mg/l	0.014	0.002	1
Norpristane (1650)	ND		mg/l	0.014	0.002	1
n-Heptadecane (C17)	0.002	J	mg/l	0.014	0.002	1
Pristane	ND		mg/l	0.014	0.002	1
n-Octadecane (C18)	0.002	J	mg/l	0.014	0.001	1
Phytane	ND		mg/l	0.014	0.001	1
n-Nonadecane (C19)	ND		mg/l	0.014	0.002	1
n-Eicosane (C20)	ND		mg/l	0.014	0.001	1
n-Heneicosane (C21)	ND		mg/l	0.014	0.001	1
n-Docosane (C22)	ND		mg/l	0.014	0.001	1
n-Tricosane (C23)	0.004	J	mg/l	0.014	0.001	1
n-Tetracosane (C24)	ND		mg/l	0.014	0.001	1
n-Pentacosane (C25)	ND		mg/l	0.069	0.008	1
n-Hexacosane (C26)	ND		mg/l	0.014	0.002	1
n-Heptacosane (C27)	ND		mg/l	0.014	0.001	1
n-Octacosane (C28)	0.070	C	mg/l	0.014	0.003	1
n-Nonacosane (C29)	0.003	J	mg/l	0.014	0.002	1
n-Triacontane (C30)	0.003	J	mg/l	0.014	0.002	1
n-Hentriacontane (C31)	0.003	J	mg/l	0.014	0.002	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	0.003	J	mg/l	0.014	0.002	1
n-Tritriacontane (C33)	0.003	J	mg/l	0.014	0.002	1
n-Tetratriacontane (C34)	0.003	J	mg/l	0.014	0.002	1
n-Pentatriacontane (C35)	0.003	J	mg/l	0.014	0.002	1
n-Hexatriacontane (C36)	0.002	J	mg/l	0.014	0.002	1
n-Heptatriacontane (C37)	ND		mg/l	0.014	0.003	1
n-Octatriacontane (C38)	ND		mg/l	0.014	0.003	1
n-Nonatriacontane (C39)	ND		mg/l	0.014	0.002	1
n-Tetracontane (C40)	ND		mg/l	0.014	0.002	1
C9-C44 Total Petroleu	4.20		mg/l	0.458	0.077	1
C10-C28 DRO	4.60		mg/l	0.292	0.050	1
C28-C40 ORO	ND		mg/l	0.153	0.023	1
Total Saturated Hydrocarbons	0.546	J	mg/l	0.014	0.001	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	89		50-130
d50-Tetracosane	91		50-130

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-02
Client ID: A3-010DSVMP-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 12:55
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 09/20/22 01:41
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	0.006	J	mg/l	0.008	0.003	1
n-Decane (C10)	0.104		mg/l	0.008	0.001	1
n-Undecane (C11)	0.674		mg/l	0.008	0.001	1
n-Dodecane (C12)	1.28		mg/l	0.008	0.001	1
n-Tridecane (C13)	1.45		mg/l	0.042	0.007	1
2,6,10-Trimethyldodecane (1380)	0.407		mg/l	0.008	0.001	1
n-Tetradecane (C14)	1.14		mg/l	0.008	0.001	1
2,6,10-Trimethyltridecane (1470)	0.377		mg/l	0.008	0.001	1
n-Pentadecane (C15)	0.537		mg/l	0.008	0.001	1
n-Hexadecane (C16)	0.139		mg/l	0.008	0.001	1
Norpristane (1650)	0.043		mg/l	0.008	0.001	1
n-Heptadecane (C17)	0.050		mg/l	0.008	0.001	1
Pristane	0.048		mg/l	0.008	0.001	1
n-Octadecane (C18)	0.025		mg/l	0.008	0.001	1
Phytane	0.028		mg/l	0.008	0.001	1
n-Nonadecane (C19)	ND		mg/l	0.008	0.001	1
n-Eicosane (C20)	0.009		mg/l	0.008	0.0005	1
n-Heneicosane (C21)	0.005	J	mg/l	0.008	0.001	1
n-Docosane (C22)	0.005	J	mg/l	0.008	0.0004	1
n-Tricosane (C23)	0.004	J	mg/l	0.008	0.001	1
n-Tetracosane (C24)	0.004	J	mg/l	0.008	0.001	1
n-Pentacosane (C25)	ND		mg/l	0.042	0.005	1
n-Hexacosane (C26)	0.003	J	mg/l	0.008	0.001	1
n-Heptacosane (C27)	ND		mg/l	0.008	0.001	1
n-Octacosane (C28)	0.044	C	mg/l	0.008	0.002	1
n-Nonacosane (C29)	0.031		mg/l	0.008	0.001	1
n-Triacontane (C30)	0.006	J	mg/l	0.008	0.001	1
n-Hentriacontane (C31)	ND		mg/l	0.008	0.001	1

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-02 Date Collected: 09/12/22 12:55

Client ID: A3-010DSVMP-PRN01-WK2 Date Received: 09/15/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	0.005	J	mg/l	0.008	0.001	1
n-Tritriacontane (C33)	0.002	J	mg/l	0.008	0.001	1
n-Tetratriacontane (C34)	0.003	J	mg/l	0.008	0.001	1
n-Pentatriacontane (C35)	ND		mg/l	0.008	0.001	1
n-Hexatriacontane (C36)	0.002	J	mg/l	0.008	0.001	1
n-Heptatriacontane (C37)	ND		mg/l	0.008	0.002	1
n-Octatriacontane (C38)	0.002	J	mg/l	0.008	0.002	1
n-Nonatriacontane (C39)	ND		mg/l	0.008	0.001	1
n-Tetracontane (C40)	ND		mg/l	0.008	0.001	1
C9-C44 Total Petroleu	46.4		mg/l	0.275	0.046	1
C10-C28 DRO	45.5		mg/l	0.175	0.030	1
C28-C40 ORO	12.3		mg/l	0.092	0.014	1
Total Saturated Hydrocarbons	6.43	J	mg/l	0.008	0.0004	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	88		50-130
d50-Tetracosane	88		50-130

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 09/19/22 18:10
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1688303-1					
n-Nonane (C9)	ND		mg/l	0.001	0.0003
n-Decane (C10)	ND		mg/l	0.001	0.0001
n-Undecane (C11)	ND		mg/l	0.001	0.0001
n-Dodecane (C12)	ND		mg/l	0.001	0.0001
n-Tridecane (C13)	ND		mg/l	0.005	0.001
2,6,10-Trimethyldodecane (1380)	ND		mg/l	0.001	0.0001
n-Tetradecane (C14)	ND		mg/l	0.001	0.0001
2,6,10-Trimethyltridecane (1470)	ND		mg/l	0.001	0.0001
n-Pentadecane (C15)	ND		mg/l	0.001	0.0001
n-Hexadecane (C16)	ND		mg/l	0.001	0.0001
Norpristane (1650)	ND		mg/l	0.001	0.0001
n-Heptadecane (C17)	ND		mg/l	0.001	0.0001
Pristane	ND		mg/l	0.001	0.0002
n-Octadecane (C18)	ND		mg/l	0.001	0.0001
Phytane	ND		mg/l	0.001	0.0001
n-Nonadecane (C19)	ND		mg/l	0.001	0.0002
n-Eicosane (C20)	ND		mg/l	0.001	0.0001
n-Heneicosane (C21)	ND		mg/l	0.001	0.0001
n-Docosane (C22)	ND		mg/l	0.001	0.00004
n-Tricosane (C23)	ND		mg/l	0.001	0.0001
n-Tetracosane (C24)	ND		mg/l	0.001	0.0001
n-Pentacosane (C25)	ND		mg/l	0.005	0.001
n-Hexacosane (C26)	ND		mg/l	0.001	0.0001
n-Heptacosane (C27)	ND		mg/l	0.001	0.0001
n-Octacosane (C28)	0.001	JC	mg/l	0.001	0.0002
n-Nonacosane (C29)	ND		mg/l	0.001	0.0001
n-Triacontane (C30)	ND		mg/l	0.001	0.0001
n-Hentriacontane (C31)	ND		mg/l	0.001	0.0001
n-Dotriacontane (C32)	ND		mg/l	0.001	0.0001

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 09/19/22 18:10
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1688303-1					
n-Tritriacontane (C33)	ND		mg/l	0.001	0.0001
n-Tetratriacontane (C34)	ND		mg/l	0.001	0.0002
n-Pentatriacontane (C35)	ND		mg/l	0.001	0.0002
n-Hexatriacontane (C36)	ND		mg/l	0.001	0.0001
n-Heptatriacontane (C37)	ND		mg/l	0.001	0.0002
n-Octatriacontane (C38)	ND		mg/l	0.001	0.0002
n-Nonatriacontane (C39)	ND		mg/l	0.001	0.0002
n-Tetracontane (C40)	ND		mg/l	0.001	0.0002
C9-C44 Total Petroleu	ND		mg/l	0.033	0.006
C10-C28 DRO	0.008	J	mg/l	0.021	0.004
C28-C40 ORO	ND		mg/l	0.011	0.002
Total Saturated Hydrocarbons	0.001	J	mg/l	0.001	0.00004

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	90		50-130
d50-Tetracosane	92		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01-02 Batch: WG1688303-2 WG1688303-3								
Nonane (C9)	76		72		50-130	5		30
n-Decane (C10)	85		81		50-130	5		30
n-Dodecane (C12)	90		88		50-130	2		30
n-Tetradecane (C14)	89		90		50-130	1		30
n-Hexadecane (C16)	93		94		50-130	1		30
n-Octadecane (C18)	94		96		50-130	2		30
n-Nonadecane (C19)	100		100		50-130	0		30
n-Eicosane (C20)	94		96		50-130	2		30
n-Docosane (C22)	95		95		50-130	0		30
n-Tetracosane (C24)	101		101		50-130	0		30
n-Hexacosane (C26)	96		97		50-130	1		30
n-Octacosane (C28)	100		101		50-130	1		30
n-Triacontane (C30)	95		96		50-130	1		30
n-Hexatriacontane (C36)	81		82		50-130	1		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	89		89		50-130
d50-Tetracosane	93		93		50-130

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2250292-01A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		A2-SHC(7)
L2250292-01X	Vial HCl preserved split	A	NA		3.2	Y	Absent		A2-PIANO8260(14)
L2250292-01Y	Vial HCl preserved split	A	NA		3.2	Y	Absent		-
L2250292-02A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		A2-SHC(7)

*Values in parentheses indicate holding time in days

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

COC# 09132022SIT-Alpha-02

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL

Date Rec'd in Lab: 9/15/22

ALPHA Job #: L2250292

Westborough, MA
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA
TEL: 508-822-9300
FAX: 508-822-3288

Project Information

Project Name: Site Characterization/Adit 3

Project Location: RHBFSF-Adit 3

Project #: CTO-22F0106

Project Manager: [redacted] (b) (6)

ALPHA Quote #:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #: 02.30.01.

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

Client Information

Client: GSI-Rhodes for CTO22F0106 (AECOM)

Address: 1001 Bishop Street, Ste 1600

Honolulu, Hawaii

Phone: [redacted] (b) (6)

Fax:

Email: [redacted] (b) (6) @aecom.com

☐ These samples have been Previously analyzed by Alpha

Turn-Around Time

☐ Standard ☐ Rush (ONLY IF PRE-APPROVED)

Due Date: Time:

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS

Saturated Hydrocarbon ANalysis — PIANO

[redacted] (b) (6) 9/13/22

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Saturated Hydrocarbon ANalysis	PIANO											Sample Specific Comments
50292-01	A3015TW-PRN01-WK2	9/12/22	1315	~~Product~~ WW water	[redacted] (b) (6)	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is wat/prod
	~~A3-010TW-PRN01-WK2~~	~~9/12/22~~	1335	~~Product~~		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is product
	~~A3-040TW-PRN01-WK2~~	~~9/12/22~~	1410	~~Product~~		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is product
-02	A3-010DSVMP-PRN01-WK2	9/12/222	1255	~~Product~~ WATER		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is wat/prod
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

9/12/22 [redacted] (b) (6)

Container Type	-	-	-	-	-	-	-	-	-	-	-	-
Preservative	-	-	-	-	-	-	-	-	-	-	-	-

[redacted] (b) (6) 9/15/22 10:08

Relinquished By:	Date/Time	Received By:	Date/Time
[redacted] (b) (6)	9/12/22 1600	[redacted] (b) (6)	9/12/22 1600
	9/13/22 1330		FEDEX
FEDEX	9/15/22 1000		9/15/22 1000

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

ORIGIN ID:HNLA (724) 504-2836
[redacted] (b) (6)
RECON
1001 BISHOP ST STE 1600

HONOLULU, HI 96813
UNITED STATES US

SHIP DATE: 13SEP22
ACTWGT: 38.75 LB
CAD: 6994244/SSFE2322
DIMS: 24x14x14 IN

BILL THIRD PARTY

TO ATTN: [redacted] (b) (6)
ALPHA ANALYTICAL
320 FORBES BLVD.

MANSFIELD MA 02048
(508) 822-9300
INV:
PO:
REF: 60674414.02.30.01
DEPT:

FedEx Express

TRK# 0201 2779 4907 3052

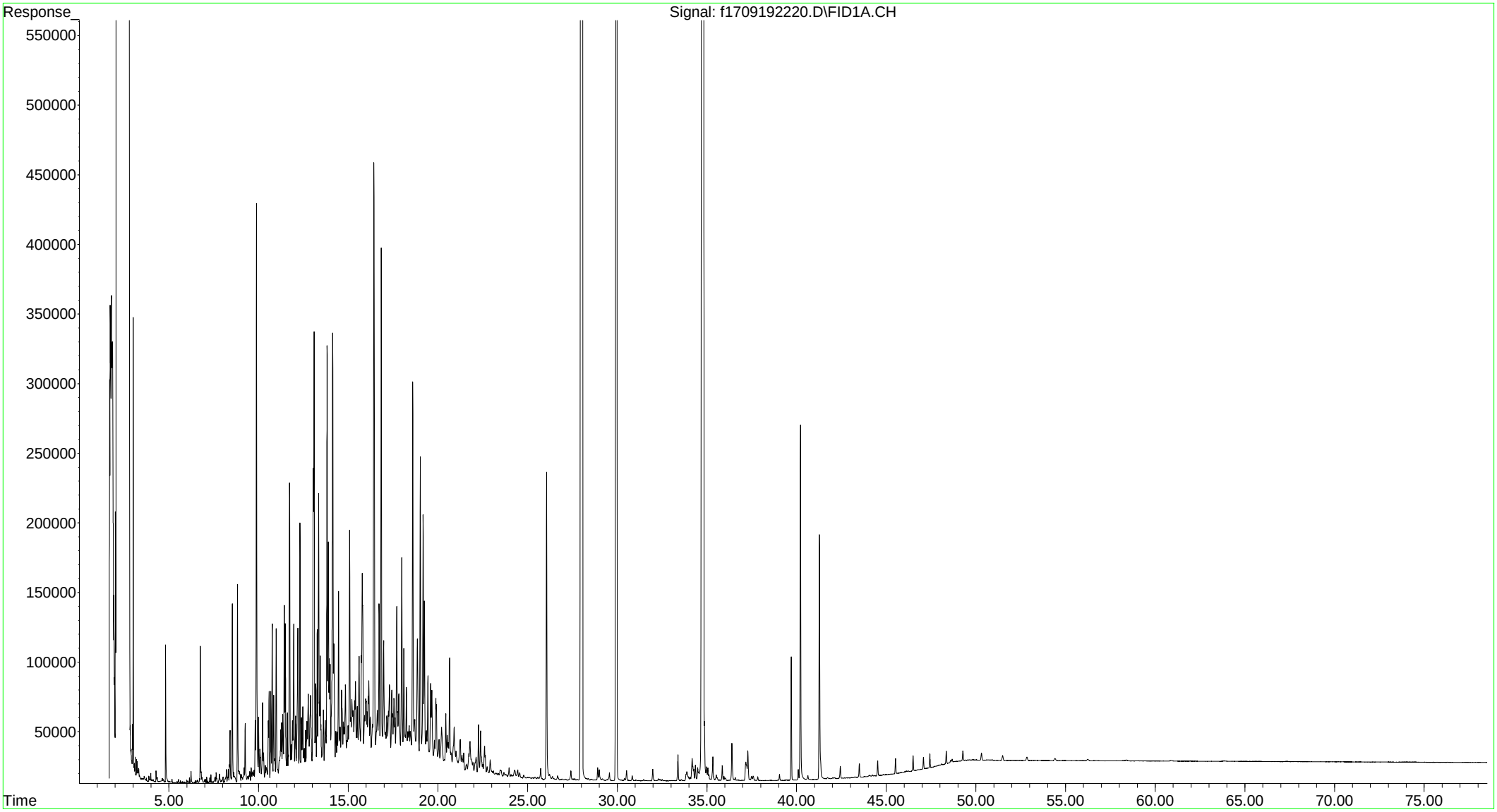
THU - 15 SEP 10:30A
PRIORITY OVERNIGHT
AHS
02048
MA-US BOS

XE PYMA

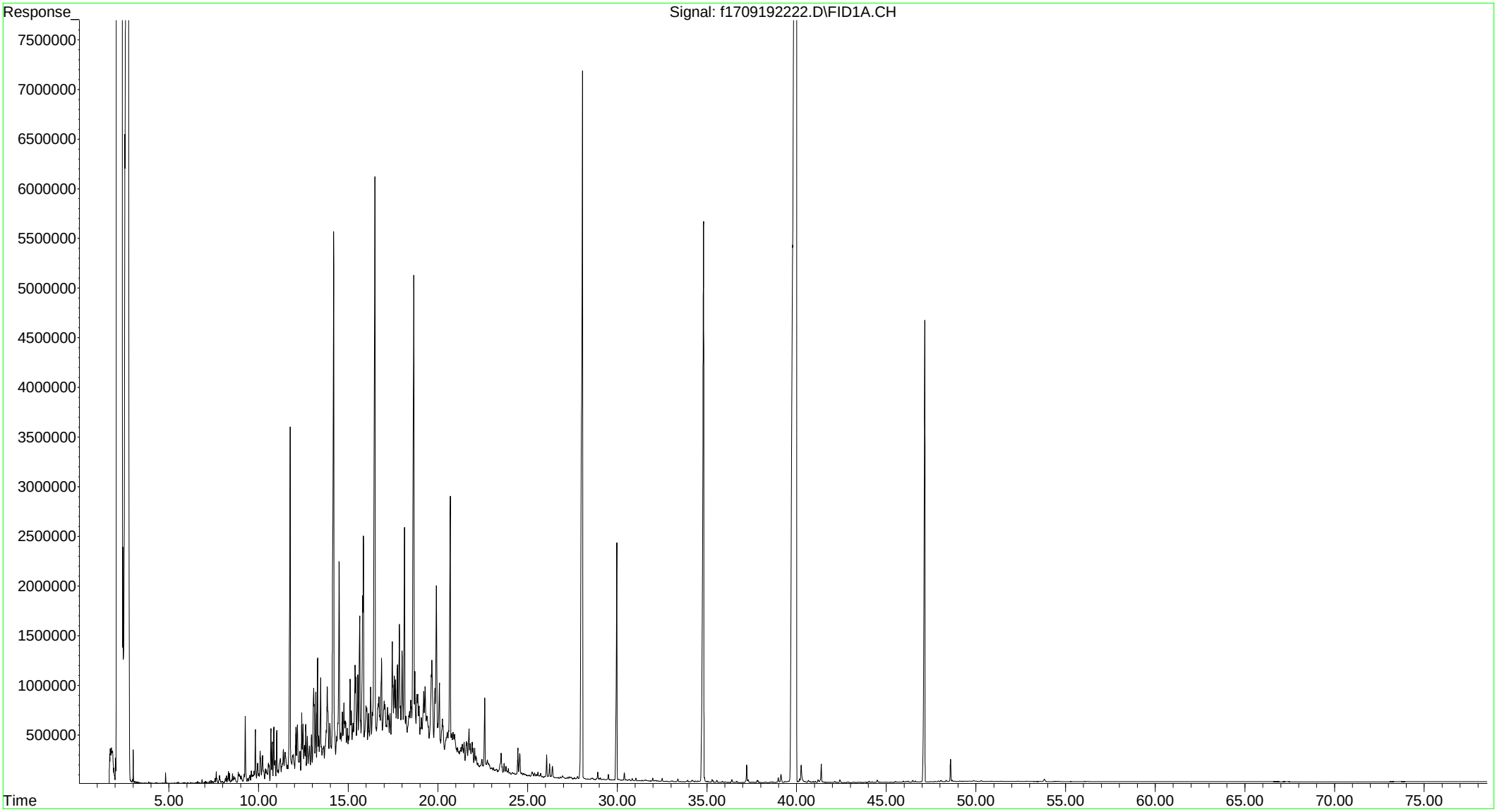
Part # 150287-435 RRDB EXP 06/23

GC-FID Chromatogram

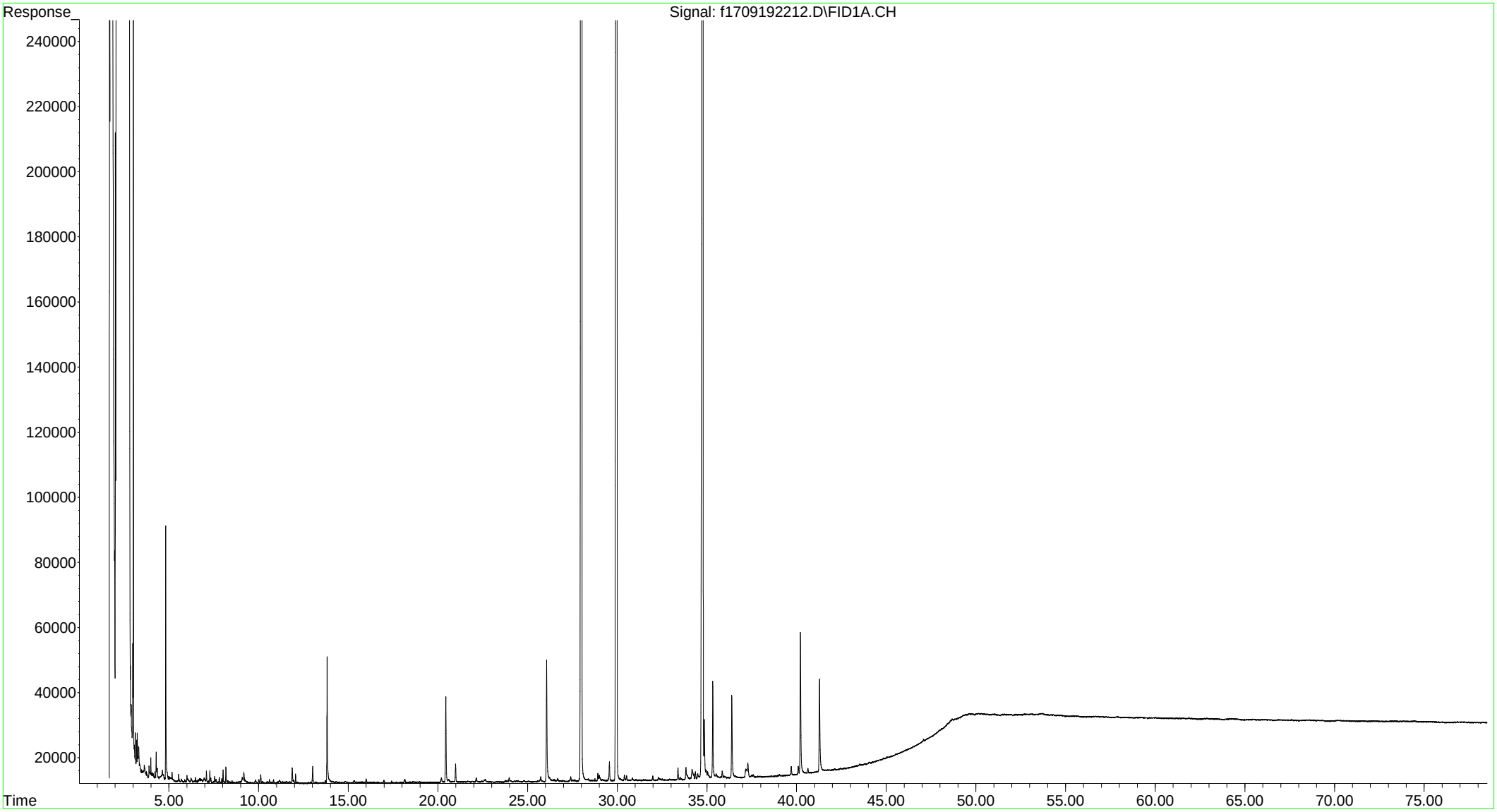
```
File        :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192220.D
Operator    : FID17:WR
Acquired    : 20 Sep 2022  12:11 am using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: l2250292-01,42,,
Misc Info   : WG1689232,WG1688303,ICAL18753
Vial Number: 10
```



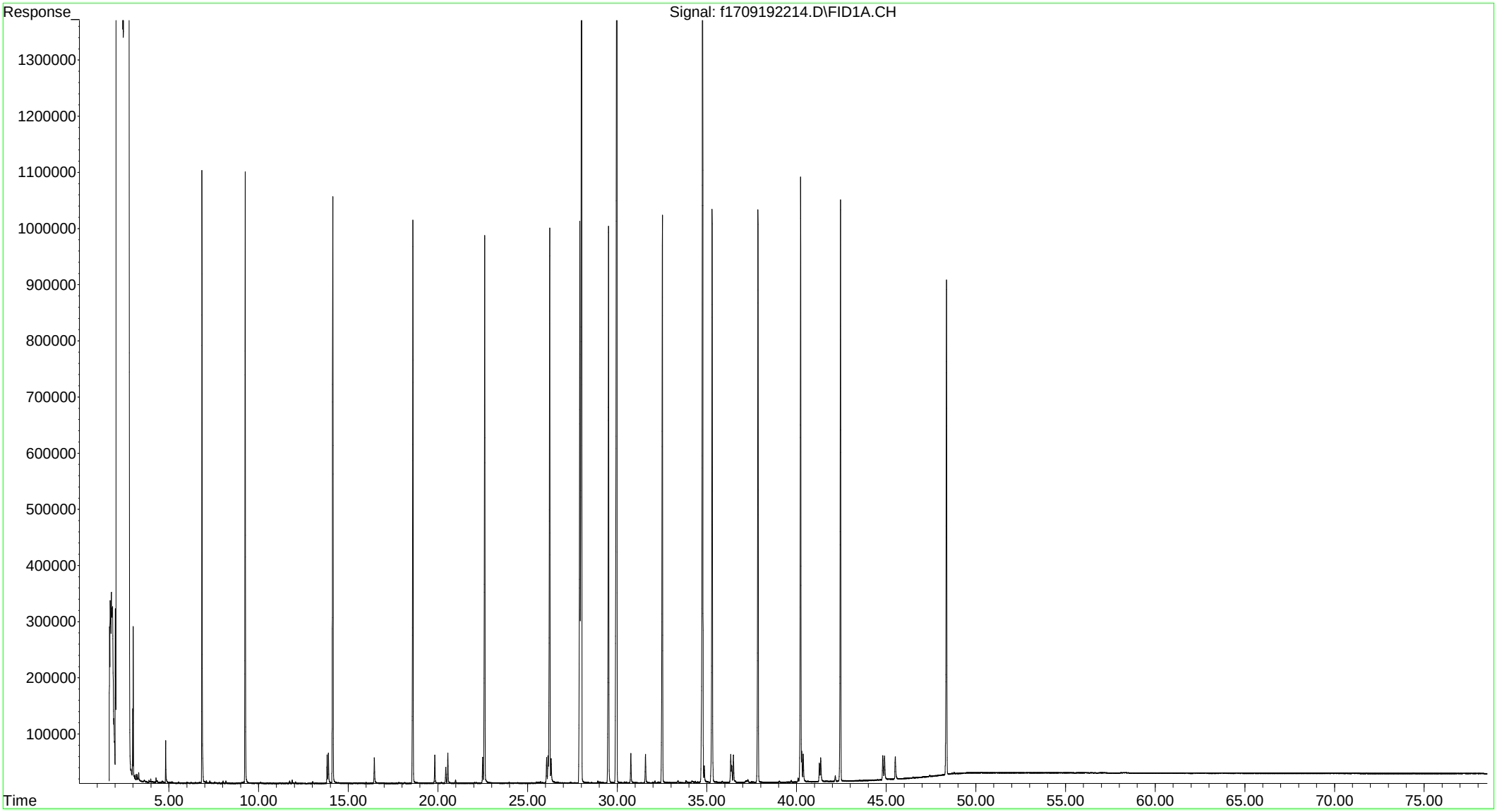
```
File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192222.D
Operator   : FID17:WR
Acquired   : 20 Sep 2022   1:41 am using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: l2250292-02,42,,
Misc Info  : WG1689232,WG1688303,ICAL18753
Vial Number: 11
```



```
File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192212.D
Operator   : FID17:WR
Acquired   : 19 Sep 2022   6:10 pm using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: WG1688303-1,42,,
Misc Info  : WG1689232,WG1688303,ICAL18753
Vial Number: 6
```

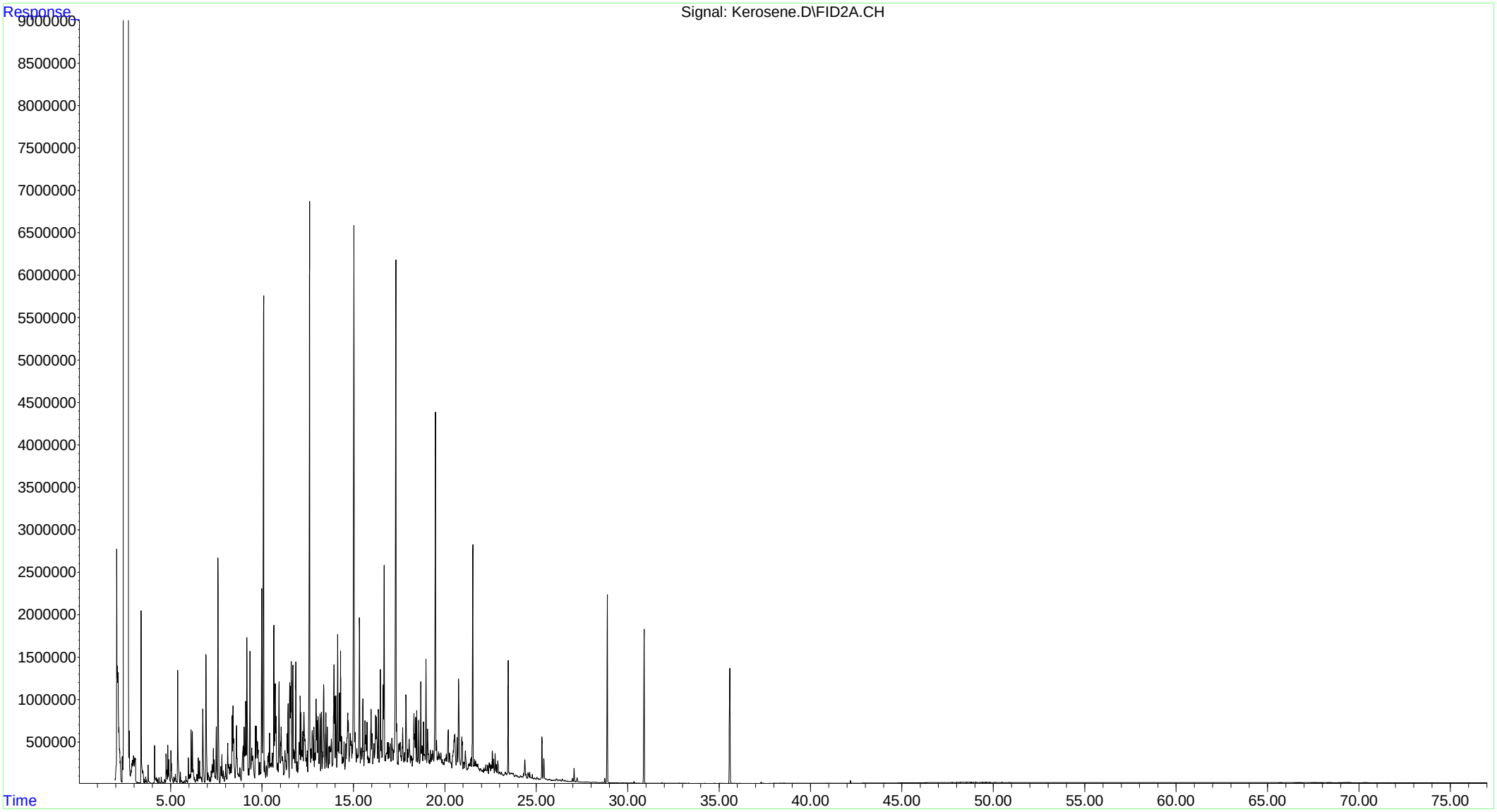


```
File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192214.D
Operator   : FID17:WR
Acquired   : 19 Sep 2022   7:40 pm using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: wg1688303-2,32,,
Misc Info  : WG1689232,WG1688303,ICAL18753
Vial Number: 7
```

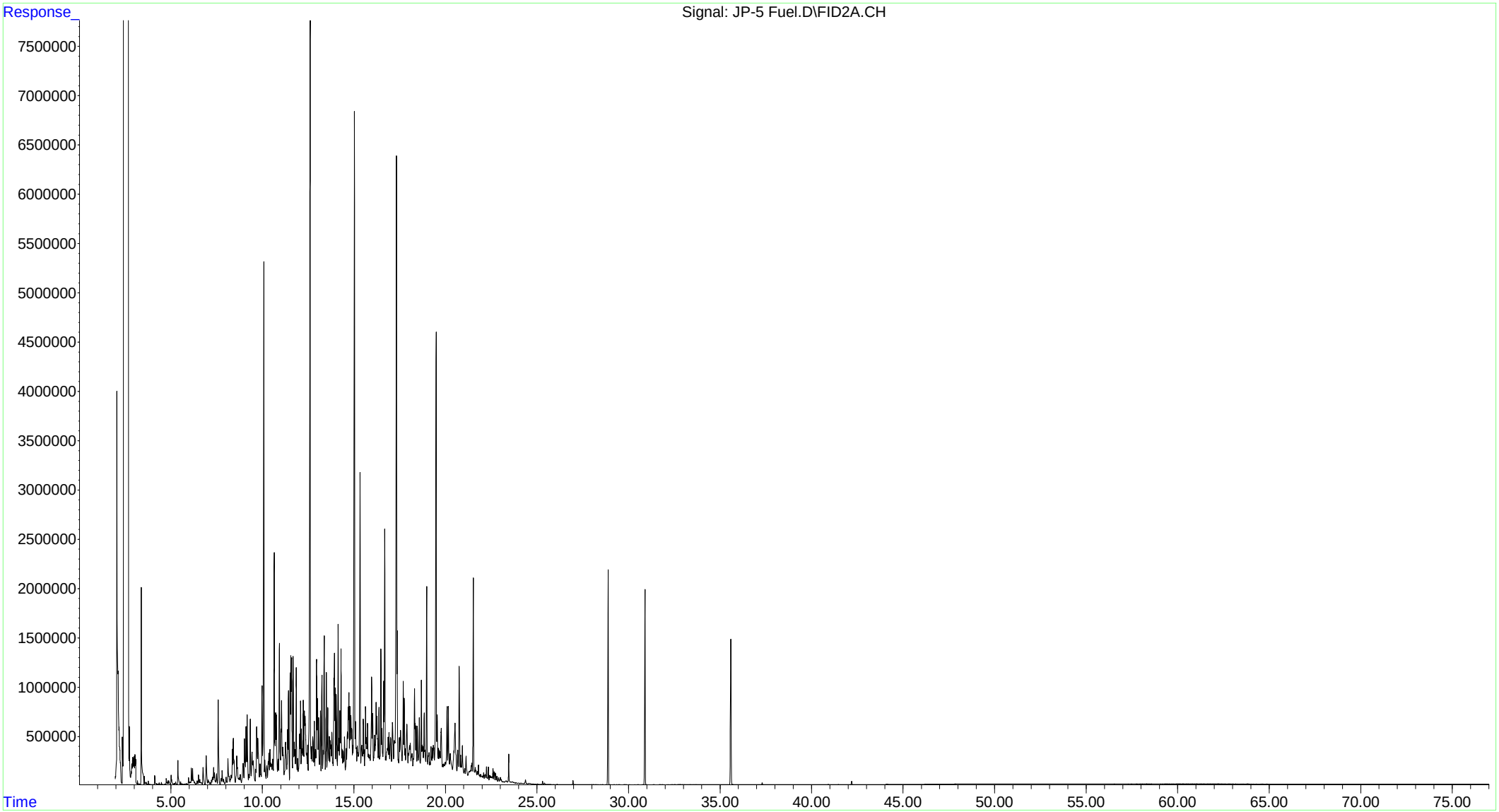


Petroleum Reference Standards

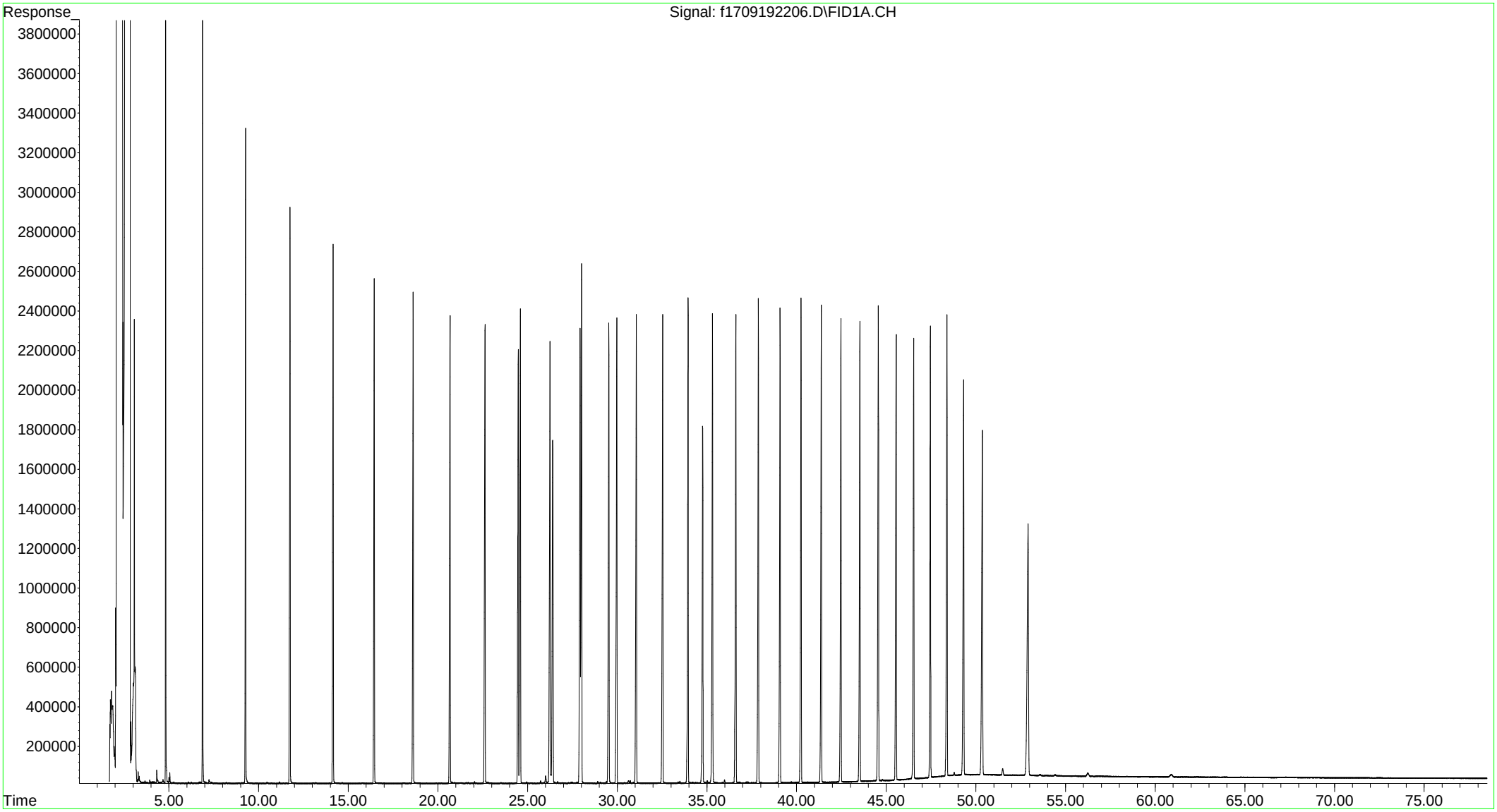
```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\Kerosen
...         e.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 21 Nov 2011   9:22 pm using AcqMethod FRNC2AF.M
Sample    : KEROSENE
Misc Info : 1X F042710G
```



```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\JP-5 Fu
...         el.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 19 Nov 2011   4:22 pm using AcqMethod FRNC2AF.M
Sample    : JP-5 FUEL
Misc Info : F042710P
```



```
File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192206.D
Operator   : FID17:WR
Acquired   : 19 Sep 2022   1:39 pm using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: WG1689232-1
Misc Info  : WG1689232,FRBE91,ICAL18753
Vial Number: 3
```



Appendix D – Level II Laboratory Sample Delivery Group Reports

Appendix D – Level II Laboratory Sample Delivery Group Reports

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3/23/2022
Ms. [redacted]
AECOM
1300 East 9th Street
Suite 500
Cleveland OH 4411

Project Name: Red Hill Site Characterization
Project #: 60674414
Workorder #: 2202482AR1

Dear Ms. [redacted]

The following report includes the data for the above referenced project for sample(s) received on 2/19/2022 at Eurofins Air Toxics LLC.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics LLC. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: [redacted] at [redacted] if you have any questions regarding the data in this report.

Regards,

[redacted]

Project Manager

eurofins | Air Toxics

WORK ORDER #: 2202482AR1

Work Order Summary

CLIENT:	Ms. [redacted] (b) (6) AECOM 1300 East 9th Street Suite 500 Cleveland, OH 4411	**BILL TO:**	Accounts Payable Austin AECOM PO Box 203970 Austin, TX 78720
PHONE:	[redacted] (b) (6)	**P.O. #**	142618
FAX:	216-622-2428	**PROJECT #**	60674414 Red Hill Site Characterization
DATE RECEIVED:	02/19/2022	**CONTACT:**	[redacted] (b) (6)
DATE COMPLETED:	03/07/2022		
DATE REISSUED:	03/23/2022		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	A3B-150-GSN01-000.0-021822	TO-15	5.5 "Hg	10 psi
01B	A3B-150-GSN01-000.0-021822	TO-15	5.5 "Hg	10 psi
01BB	A3B-150-GSN01-000.0-021822 Lab Dupli	TO-15	5.5 "Hg	10 psi
02A	A3250-GSN01-000.0-021822	TO-15	5.7 "Hg	10.1 psi
02B	A3250-GSN01-000.0-021822	TO-15	5.7 "Hg	10.1 psi
03A	2S075-GSN01-000.0-021822	TO-15	5.9 "Hg	10.1 psi
03B	2S075-GSN01-000.0-021822	TO-15	5.9 "Hg	10.1 psi
04A	2S075-GSFD01-000.0-021822	TO-15	5.9 "Hg	10 psi
04AA	2S075-GSFD01-000.0-021822 Lab Duplic	TO-15	5.9 "Hg	10 psi
04B	2S075-GSFD01-000.0-021822	TO-15	5.9 "Hg	10 psi
05A	Lab Blank	TO-15	NA	NA
05B	Lab Blank	TO-15	NA	NA
06A	CCV	TO-15	NA	NA
06B	CCV	TO-15	NA	NA
06C	CCV	TO-15	NA	NA
06D	CCV	TO-15	NA	NA
07A	LCS	TO-15	NA	NA
07AA	LCSD	TO-15	NA	NA
07B	LCS	TO-15	NA	NA
07BB	LCSD	TO-15	NA	NA

CERTIFIED BY: [redacted] (b) (6)

Technical Director

DATE: 03/23/22

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP - 209221, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP - T104704434-21-17, UT NELAP – CA009332021-13, VA NELAP - 10615, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005-015, Effective date: 10/18/2021, Expiration date: 10/17/2022.
Eurofins Air Toxics, LLC certifies that the test results contained in this report meet all requirements of the NELAC standards

This report shall not be reproduced, except in full, without the written approval of Eurofins Air Toxics, LLC.

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
DoD QSM - TO-15
AECOM
Workorder# 2202482AR1

Four 1 Liter Summa Canister (100% Certified) samples were received on February 19, 2022. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

Please note the following narratives are project specific therefore may or may not be applicable to the associated sample set:

1) A Limit of Detection (LOD) and Method Detection Limit (MDL) study are not maintained for Total Xylenes and non-standard compounds.

2) Total Xylenes concentration is calculated by summing the individual concentrations of m,p-Xylene and o-Xylene.

3) Although the Method Detection Limit values for non-standard compounds may be included in the final report, results were evaluated to the reporting limit per project requirement.

4) Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

A DoD QSM waiver has been established and approved between Eurofins Air Toxics and the client. A copy of the waiver is available upon request.

As per client project requirements, the laboratory has reported estimated values for target compound hits that are below the Reporting Limit but greater than the Method Detection Limit. Concentrations that are below the level at which the canister was certified may be false positives.

Ethanol and Acetone were manually integrated in the initial calibration.

Samples were analyzed in two analytical batches on MSD-P on 3/2/22 and MSD-14 on 3/4/22. The initial continuing calibration verification (CCV) for the batches are reported as lab fractions 06A and 06B and the ending CCV are reported as lab fractions 06C and 06D.

Dilution was performed on all samples due to matrix interference.

Per client's inquiry request, evaluation of the reported Trichloroethene (TCE) and Tetrachloroethene (PCE) results in samples A3B-150-GSN01-000.0-021822, A3250-GSN01-000.0-021822, 2S075-GSN01-000.0-021822 and 2S075-GSFD01-000.0-021822 from the 03/02/22 analytical batch indicated potential contamination during the high-level canister dilution procedure.
As a result, the workorder was reissued on 03/23/22 to report TCE and PCE results from the 03/04/22

analytical batch. Corrective Action Report #116 was initiated by the laboratory to further investigate this incident.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	A3B-150-GSN01-000.0-021822		
Lab ID:	2202482AR1-01A	**Date/Time Analyzed:**	3/3/22 12:29 AM
Date/Time Collected:	2/18/22 12:40 PM	**Dilution Factor:**	164
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030220r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,1-Trichloroethane	71-55-6	110	250	450	250 U
1,1,2,2-Tetrachloroethane	79-34-5	150	420	560	420 U
1,1,2-Trichloroethane	79-00-5	96	330	450	330 U
1,1-Dichloroethane	75-34-3	110	180	330	180 U
1,1-Dichloroethene	75-35-4	170	240	320	240 U
1,2,4-Trichlorobenzene	120-82-1	960	2100	2400	2100 U
1,2,4-Trimethylbenzene	95-63-6	170	300	1600	2600
1,2-Dibromoethane (EDB)	106-93-4	130	470	630	470 U
1,2-Dichlorobenzene	95-50-1	120	360	490	360 U
1,2-Dichloroethane	107-06-2	110	240	330	240 U
1,2-Dichloropropane	78-87-5	150	280	380	280 U
1,3,5-Trimethylbenzene	108-67-8	130	300	1600	2900
1,3-Butadiene	106-99-0	150	160	180	160 U
1,3-Dichlorobenzene	541-73-1	140	360	490	360 U
1,4-Dichlorobenzene	106-46-7	120	360	490	360 U
1,4-Dioxane	123-91-1	130	440	1200	440 U
2,2,4-Trimethylpentane	540-84-1	92	280	380	280 U
2-Butanone (Methyl Ethyl Ketone)	78-93-3	320	820	970	1600
2-Hexanone	591-78-6	640	1100	1300	1100 U
2-Propanol	67-63-0	280	520	810	520 U
3-Chloropropene	107-05-1	230	380	1000	380 U
4-Ethyltoluene	622-96-8	130	300	400	1400
4-Methyl-2-pentanone	108-10-1	99	250	340	250 U
Acetone	67-64-1	400	660	1900	1200 J

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

eurofins | Air Toxics

Client ID:	A3B-150-GSN01-000.0-021822		
Lab ID:	2202482AR1-01A	**Date/Time Analyzed:**	3/3/22 12:29 AM
Date/Time Collected:	2/18/22 12:40 PM	**Dilution Factor:**	164
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030220r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
alpha-Chlorotoluene	100-44-7	110	310	420	310 U
Benzene	71-43-2	92	190	260	190 U
Bromodichloromethane	75-27-4	150	310	550	310 U
Bromoform	75-25-2	150	630	850	630 U
Bromomethane	74-83-9	560	1100	3200	1100 U
Carbon Disulfide	75-15-0	370	870	1000	870 U
Carbon Tetrachloride	56-23-5	100	380	520	380 U
Chlorobenzene	108-90-7	57	210	380	58 J
Chloroethane	75-00-3	290	740	860	740 U
Chloroform	67-66-3	150	220	400	220 U
Chloromethane	74-87-3	370	580	1700	580 U
cis-1,2-Dichloroethene	156-59-2	140	240	320	240 U
cis-1,3-Dichloropropene	10061-01-5	110	280	370	280 U
Cumene	98-82-8	140	300	400	200 J
Cyclohexane	110-82-7	50	210	280	210 U
Dibromochloromethane	124-48-1	100	520	700	520 U
Ethanol	64-17-5	490	520	1500	520 U
Ethyl Benzene	100-41-4	99	260	360	260 U
Freon 11	75-69-4	130	340	460	340 U
Freon 113	76-13-1	140	460	630	460 U
Freon 114	76-14-2	200	420	570	420 U
Freon 12	75-71-8	160	300	400	300 U
Heptane	142-82-5	140	250	1300	250 U
Hexachlorobutadiene	87-68-3	1100	3000	3500	3000 U

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	A3B-150-GSN01-000.0-021822		
Lab ID:	2202482AR1-01A	**Date/Time Analyzed:**	3/3/22 12:29 AM
Date/Time Collected:	2/18/22 12:40 PM	**Dilution Factor:**	164
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030220r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	110-54-3	81	210	290	210 U
m,p-Xylene	108-38-3	100	260	360	470
Methyl tert-butyl ether	1634-04-4	150	440	1200	440 U
Methylene Chloride	75-09-2	430	970	2800	970 U
Naphthalene	91-20-3	110	170	860	170 U
o-Xylene	95-47-6	110	260	360	490
Propylbenzene	103-65-1	100	300	400	300 J
Styrene	100-42-5	130	260	350	260 U
Toluene	108-88-3	55	230	310	56 J
trans-1,2-Dichloroethene	156-60-5	160	240	320	240 U
trans-1,3-Dichloropropene	10061-02-6	90	280	370	280 U
Vinyl Chloride	75-01-4	150	160	210	160 U

U = The analyte was not detected above the MDL.
J = Estimated value.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	90
4-Bromofluorobenzene	460-00-4	81-117	99
Toluene-d8	2037-26-5	86-112	99

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	A3B-150-GSN01-000.0-021822		
Lab ID:	2202482AR1-01B	**Date/Time Analyzed:**	3/4/22 07:42 PM
Date/Time Collected:	2/18/22 12:40 PM	**Dilution Factor:**	4.12
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msd14.i / 14030424r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Tetrachloroethene	127-18-4	40	84	140	84 U
Tetrahydrofuran	109-99-9	21	36	61	36 U
Trichloroethene	79-01-6	46	66	110	66 U

U = The analyte was not detected above the MDL.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	86
4-Bromofluorobenzene	460-00-4	75-115	102
Toluene-d8	2037-26-5	85-115	101

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	A3B-150-GSN01-000.0-021822 Lab Dupl		
Lab ID:	2202482AR1-01BB	**Date/Time Analyzed:**	3/4/22 08:25 PM
Date/Time Collected:	2/18/22 12:40 PM	**Dilution Factor:**	4.12
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msd14.i / 14030425r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Tetrachloroethene	127-18-4	40	84	140	84 U
Tetrahydrofuran	109-99-9	21	36	61	36 U
Trichloroethene	79-01-6	46	66	110	66 U

U = The analyte was not detected above the MDL.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	84
4-Bromofluorobenzene	460-00-4	75-115	101
Toluene-d8	2037-26-5	85-115	96

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	A3250-GSN01-000.0-021822		
Lab ID:	2202482AR1-02A	**Date/Time Analyzed:**	3/3/22 12:58 AM
Date/Time Collected:	2/18/22 12:16 PM	**Dilution Factor:**	166
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030221r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,1-Trichloroethane	71-55-6	110	250	450	250 U
1,1,2,2-Tetrachloroethane	79-34-5	150	420	570	420 U
1,1,2-Trichloroethane	79-00-5	97	340	450	340 U
1,1-Dichloroethane	75-34-3	110	190	340	190 U
1,1-Dichloroethene	75-35-4	180	240	330	240 U
1,2,4-Trichlorobenzene	120-82-1	980	2100	2500	2100 U
1,2,4-Trimethylbenzene	95-63-6	180	300	1600	300 U
1,2-Dibromoethane (EDB)	106-93-4	130	470	640	470 U
1,2-Dichlorobenzene	95-50-1	120	370	500	370 U
1,2-Dichloroethane	107-06-2	110	250	340	250 U
1,2-Dichloropropane	78-87-5	150	280	380	280 U
1,3,5-Trimethylbenzene	108-67-8	130	300	1600	300 U
1,3-Butadiene	106-99-0	150	160	180	160 U
1,3-Dichlorobenzene	541-73-1	140	370	500	370 U
1,4-Dichlorobenzene	106-46-7	120	370	500	370 U
1,4-Dioxane	123-91-1	130	450	1200	450 U
2,2,4-Trimethylpentane	540-84-1	93	290	390	290 U
2-Butanone (Methyl Ethyl Ketone)	78-93-3	320	830	980	830 U
2-Hexanone	591-78-6	650	1200	1400	1200 U
2-Propanol	67-63-0	280	530	820	530 U
3-Chloropropene	107-05-1	230	390	1000	390 U
4-Ethyltoluene	622-96-8	140	300	410	300 U
4-Methyl-2-pentanone	108-10-1	100	250	340	250 U
Acetone	67-64-1	410	670	2000	670 U

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	A3250-GSN01-000.0-021822		
Lab ID:	2202482AR1-02A	**Date/Time Analyzed:**	3/3/22 12:58 AM
Date/Time Collected:	2/18/22 12:16 PM	**Dilution Factor:**	166
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030221r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
alpha-Chlorotoluene	100-44-7	110	320	430	320 U
Benzene	71-43-2	93	200	260	200 U
Bromodichloromethane	75-27-4	160	310	560	310 U
Bromoform	75-25-2	160	630	860	630 U
Bromomethane	74-83-9	570	1100	3200	1100 U
Carbon Disulfide	75-15-0	370	880	1000	880 U
Carbon Tetrachloride	56-23-5	100	390	520	390 U
Chlorobenzene	108-90-7	58	210	380	210 U
Chloroethane	75-00-3	300	740	880	740 U
Chloroform	67-66-3	150	230	400	230 U
Chloromethane	74-87-3	370	580	1700	580 U
cis-1,2-Dichloroethene	156-59-2	140	240	330	240 U
cis-1,3-Dichloropropene	10061-01-5	120	280	380	280 U
Cumene	98-82-8	150	300	410	300 U
Cyclohexane	110-82-7	50	210	280	210 U
Dibromochloromethane	124-48-1	100	520	710	520 U
Ethanol	64-17-5	490	530	1600	530 U
Ethyl Benzene	100-41-4	100	270	360	270 U
Freon 11	75-69-4	140	340	470	340 U
Freon 113	76-13-1	140	470	640	470 U
Freon 114	76-14-2	200	430	580	430 U
Freon 12	75-71-8	160	300	410	300 U
Heptane	142-82-5	140	250	1400	250 U
Hexachlorobutadiene	87-68-3	1100	3000	3500	3000 U

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	A3250-GSN01-000.0-021822		
Lab ID:	2202482AR1-02A	**Date/Time Analyzed:**	3/3/22 12:58 AM
Date/Time Collected:	2/18/22 12:16 PM	**Dilution Factor:**	166
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030221r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	110-54-3	82	220	290	220 U
m,p-Xylene	108-38-3	100	270	360	270 U
Methyl tert-butyl ether	1634-04-4	150	450	1200	450 U
Methylene Chloride	75-09-2	440	980	2900	980 U
Naphthalene	91-20-3	110	170	870	170 U
o-Xylene	95-47-6	110	270	360	270 U
Propylbenzene	103-65-1	100	300	410	300 U
Styrene	100-42-5	130	260	350	260 U
Toluene	108-88-3	56	230	310	230 U
trans-1,2-Dichloroethene	156-60-5	160	240	330	240 U
trans-1,3-Dichloropropene	10061-02-6	91	280	380	280 U
Vinyl Chloride	75-01-4	150	160	210	160 U

U = The analyte was not detected above the MDL.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	87
4-Bromofluorobenzene	460-00-4	81-117	97
Toluene-d8	2037-26-5	86-112	102

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	A3250-GSN01-000.0-021822		
Lab ID:	2202482AR1-02B	**Date/Time Analyzed:**	3/4/22 08:47 PM
Date/Time Collected:	2/18/22 12:16 PM	**Dilution Factor:**	4.16
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msd14.i / 14030426r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Tetrachloroethene	127-18-4	41	85	140	85 U
Tetrahydrofuran	109-99-9	21	37	61	37 U
Trichloroethene	79-01-6	46	67	110	67 U

U = The analyte was not detected above the MDL.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	82
4-Bromofluorobenzene	460-00-4	75-115	106
Toluene-d8	2037-26-5	85-115	102

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	2S075-GSN01-000.0-021822		
Lab ID:	2202482AR1-03A	**Date/Time Analyzed:**	3/3/22 01:27 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	168
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030222r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,1-Trichloroethane	71-55-6	110	260	460	260 U
1,1,2,2-Tetrachloroethane	79-34-5	150	430	580	430 U
1,1,2-Trichloroethane	79-00-5	99	340	460	340 U
1,1-Dichloroethane	75-34-3	110	190	340	190 U
1,1-Dichloroethene	75-35-4	180	250	330	250 U
1,2,4-Trichlorobenzene	120-82-1	990	2100	2500	2100 U
1,2,4-Trimethylbenzene	95-63-6	180	300	1600	18000
1,2-Dibromoethane (EDB)	106-93-4	140	480	640	480 U
1,2-Dichlorobenzene	95-50-1	120	370	500	370 U
1,2-Dichloroethane	107-06-2	110	250	340	250 U
1,2-Dichloropropane	78-87-5	150	290	390	290 U
1,3,5-Trimethylbenzene	108-67-8	130	300	1600	5100
1,3-Butadiene	106-99-0	150	170	180	170 U
1,3-Dichlorobenzene	541-73-1	140	370	500	370 U
1,4-Dichlorobenzene	106-46-7	120	370	500	370 U
1,4-Dioxane	123-91-1	130	450	1200	450 U
2,2,4-Trimethylpentane	540-84-1	94	290	390	290 U
2-Butanone (Methyl Ethyl Ketone)	78-93-3	320	840	990	1400
2-Hexanone	591-78-6	650	1200	1400	1200 U
2-Propanol	67-63-0	280	540	820	950
3-Chloropropene	107-05-1	240	390	1000	390 U
4-Ethyltoluene	622-96-8	140	300	410	8100
4-Methyl-2-pentanone	108-10-1	100	250	340	250 U
Acetone	67-64-1	410	680	2000	960 J

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	2S075-GSN01-000.0-021822		
Lab ID:	2202482AR1-03A	**Date/Time Analyzed:**	3/3/22 01:27 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	168
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030222r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
alpha-Chlorotoluene	100-44-7	110	320	430	320 U
Benzene	71-43-2	94	200	270	200 U
Bromodichloromethane	75-27-4	160	320	560	320 U
Bromoform	75-25-2	160	640	870	640 U
Bromomethane	74-83-9	580	1100	3300	1100 U
Carbon Disulfide	75-15-0	380	890	1000	890 U
Carbon Tetrachloride	56-23-5	100	390	530	390 U
Chlorobenzene	108-90-7	59	220	390	220 U
Chloroethane	75-00-3	300	750	890	750 U
Chloroform	67-66-3	150	230	410	230 U
Chloromethane	74-87-3	380	590	1700	590 U
cis-1,2-Dichloroethene	156-59-2	140	250	330	250 U
cis-1,3-Dichloropropene	10061-01-5	120	280	380	280 U
Cumene	98-82-8	150	300	410	510
Cyclohexane	110-82-7	51	210	290	210 U
Dibromochloromethane	124-48-1	100	530	720	530 U
Ethanol	64-17-5	500	540	1600	540 U
Ethyl Benzene	100-41-4	100	270	360	220 J
Freon 11	75-69-4	140	350	470	350 U
Freon 113	76-13-1	150	480	640	480 U
Freon 114	76-14-2	200	430	590	430 U
Freon 12	75-71-8	160	310	420	310 U
Heptane	142-82-5	150	250	1400	250 U
Hexachlorobutadiene	87-68-3	1100	3000	3600	3000 U

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	2S075-GSN01-000.0-021822		
Lab ID:	2202482AR1-03A	**Date/Time Analyzed:**	3/3/22 01:27 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	168
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030222r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	110-54-3	83	220	300	220 U
m,p-Xylene	108-38-3	110	270	360	1300
Methyl tert-butyl ether	1634-04-4	160	450	1200	450 U
Methylene Chloride	75-09-2	440	990	2900	990 U
Naphthalene	91-20-3	110	180	880	2500
o-Xylene	95-47-6	110	270	360	890
Propylbenzene	103-65-1	100	300	410	1800
Styrene	100-42-5	130	260	360	260 U
Toluene	108-88-3	57	230	320	84 J
trans-1,2-Dichloroethene	156-60-5	160	250	330	250 U
trans-1,3-Dichloropropene	10061-02-6	92	280	380	280 U
Vinyl Chloride	75-01-4	150	160	210	160 U

U = The analyte was not detected above the MDL.
J = Estimated value.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	87
4-Bromofluorobenzene	460-00-4	81-117	100
Toluene-d8	2037-26-5	86-112	100

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	2S075-GSN01-000.0-021822		
Lab ID:	2202482AR1-03B	**Date/Time Analyzed:**	3/4/22 09:10 PM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	4.20
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msd14.i / 14030427r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Tetrachloroethene	127-18-4	41	85	140	85 U
Tetrahydrofuran	109-99-9	21	37	62	37 U
Trichloroethene	79-01-6	47	68	110	68 U

U = The analyte was not detected above the MDL.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	81
4-Bromofluorobenzene	460-00-4	75-115	104
Toluene-d8	2037-26-5	85-115	96

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

eurofins | Air Toxics

Client ID:	2S075-GSFD01-000.0-021822		
Lab ID:	2202482AR1-04A	**Date/Time Analyzed:**	3/3/22 01:56 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	167
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030223r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,1-Trichloroethane	71-55-6	110	260	460	260 U
1,1,2,2-Tetrachloroethane	79-34-5	150	420	570	420 U
1,1,2-Trichloroethane	79-00-5	98	340	460	340 U
1,1-Dichloroethane	75-34-3	110	190	340	190 U
1,1-Dichloroethene	75-35-4	180	240	330	240 U
1,2,4-Trichlorobenzene	120-82-1	980	2100	2500	2100 U
1,2,4-Trimethylbenzene	95-63-6	180	300	1600	16000
1,2-Dibromoethane (EDB)	106-93-4	140	470	640	470 U
1,2-Dichlorobenzene	95-50-1	120	370	500	370 U
1,2-Dichloroethane	107-06-2	110	250	340	250 U
1,2-Dichloropropane	78-87-5	150	280	380	280 U
1,3,5-Trimethylbenzene	108-67-8	130	300	1600	4600
1,3-Butadiene	106-99-0	150	170	180	170 U
1,3-Dichlorobenzene	541-73-1	140	370	500	370 U
1,4-Dichlorobenzene	106-46-7	120	370	500	370 U
1,4-Dioxane	123-91-1	130	450	1200	450 U
2,2,4-Trimethylpentane	540-84-1	93	290	390	290 U
2-Butanone (Methyl Ethyl Ketone)	78-93-3	320	840	980	1300
2-Hexanone	591-78-6	650	1200	1400	1200 U
2-Propanol	67-63-0	280	530	820	280 J
3-Chloropropene	107-05-1	240	390	1000	390 U
4-Ethyltoluene	622-96-8	140	300	410	7500
4-Methyl-2-pentanone	108-10-1	100	250	340	250 U
Acetone	67-64-1	410	670	2000	420 J

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

eurofins | Air Toxics

Client ID:	2S075-GSFD01-000.0-021822		
Lab ID:	2202482AR1-04A	**Date/Time Analyzed:**	3/3/22 01:56 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	167
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030223r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
alpha-Chlorotoluene	100-44-7	110	320	430	320 U
Benzene	71-43-2	94	200	270	200 U
Bromodichloromethane	75-27-4	160	310	560	310 U
Bromoform	75-25-2	160	640	860	640 U
Bromomethane	74-83-9	580	1100	3200	1100 U
Carbon Disulfide	75-15-0	370	880	1000	880 U
Carbon Tetrachloride	56-23-5	100	390	520	390 U
Chlorobenzene	108-90-7	58	220	380	220 U
Chloroethane	75-00-3	300	750	880	750 U
Chloroform	67-66-3	150	230	410	230 U
Chloromethane	74-87-3	380	590	1700	590 U
cis-1,2-Dichloroethene	156-59-2	140	240	330	240 U
cis-1,3-Dichloropropene	10061-01-5	120	280	380	280 U
Cumene	98-82-8	150	300	410	480
Cyclohexane	110-82-7	51	210	290	210 U
Dibromochloromethane	124-48-1	100	530	710	530 U
Ethanol	64-17-5	500	530	1600	530 U
Ethyl Benzene	100-41-4	100	270	360	260 J
Freon 11	75-69-4	140	350	470	350 U
Freon 113	76-13-1	140	470	640	470 U
Freon 114	76-14-2	200	430	580	430 U
Freon 12	75-71-8	160	300	410	300 U
Heptane	142-82-5	140	250	1400	250 U
Hexachlorobutadiene	87-68-3	1100	3000	3600	3000 U

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	2S075-GSFD01-000.0-021822		
Lab ID:	2202482AR1-04A	**Date/Time Analyzed:**	3/3/22 01:56 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	167
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030223r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	110-54-3	82	220	290	220 U
m,p-Xylene	108-38-3	110	270	360	1400
Methyl tert-butyl ether	1634-04-4	150	450	1200	450 U
Methylene Chloride	75-09-2	440	990	2900	990 U
Naphthalene	91-20-3	110	180	880	1600
o-Xylene	95-47-6	110	270	360	910
Propylbenzene	103-65-1	100	300	410	1600
Styrene	100-42-5	130	260	360	260 U
Toluene	108-88-3	56	230	310	110 J
trans-1,2-Dichloroethene	156-60-5	160	240	330	240 U
trans-1,3-Dichloropropene	10061-02-6	92	280	380	280 U
Vinyl Chloride	75-01-4	150	160	210	160 U

U = The analyte was not detected above the MDL.
J = Estimated value.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	89
4-Bromofluorobenzene	460-00-4	81-117	99
Toluene-d8	2037-26-5	86-112	100

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	2S075-GSFD01-000.0-021822 Lab Duplic		
Lab ID:	2202482AR1-04AA	**Date/Time Analyzed:**	3/3/22 02:24 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	167
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030224r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,1-Trichloroethane	71-55-6	110	260	460	260 U
1,1,2,2-Tetrachloroethane	79-34-5	150	420	570	420 U
1,1,2-Trichloroethane	79-00-5	98	340	460	340 U
1,1-Dichloroethane	75-34-3	110	190	340	190 U
1,1-Dichloroethene	75-35-4	180	240	330	240 U
1,2,4-Trichlorobenzene	120-82-1	980	2100	2500	2100 U
1,2,4-Trimethylbenzene	95-63-6	180	300	1600	16000
1,2-Dibromoethane (EDB)	106-93-4	140	470	640	470 U
1,2-Dichlorobenzene	95-50-1	120	370	500	370 U
1,2-Dichloroethane	107-06-2	110	250	340	250 U
1,2-Dichloropropane	78-87-5	150	280	380	280 U
1,3,5-Trimethylbenzene	108-67-8	130	300	1600	4500
1,3-Butadiene	106-99-0	150	170	180	170 U
1,3-Dichlorobenzene	541-73-1	140	370	500	370 U
1,4-Dichlorobenzene	106-46-7	120	370	500	370 U
1,4-Dioxane	123-91-1	130	450	1200	450 U
2,2,4-Trimethylpentane	540-84-1	93	290	390	290 U
2-Butanone (Methyl Ethyl Ketone)	78-93-3	320	840	980	1300
2-Hexanone	591-78-6	650	1200	1400	1200 U
2-Propanol	67-63-0	280	530	820	280 J
3-Chloropropene	107-05-1	240	390	1000	390 U
4-Ethyltoluene	622-96-8	140	300	410	7400
4-Methyl-2-pentanone	108-10-1	100	250	340	250 U
Acetone	67-64-1	410	670	2000	420 J

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	2S075-GSFD01-000.0-021822 Lab Duplic		
Lab ID:	2202482AR1-04AA	**Date/Time Analyzed:**	3/3/22 02:24 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	167
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030224r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
alpha-Chlorotoluene	100-44-7	110	320	430	320 U
Benzene	71-43-2	94	200	270	200 U
Bromodichloromethane	75-27-4	160	310	560	310 U
Bromoform	75-25-2	160	640	860	640 U
Bromomethane	74-83-9	580	1100	3200	1100 U
Carbon Disulfide	75-15-0	370	880	1000	880 U
Carbon Tetrachloride	56-23-5	100	390	520	390 U
Chlorobenzene	108-90-7	58	220	380	220 U
Chloroethane	75-00-3	300	750	880	750 U
Chloroform	67-66-3	150	230	410	230 U
Chloromethane	74-87-3	380	590	1700	590 U
cis-1,2-Dichloroethene	156-59-2	140	240	330	240 U
cis-1,3-Dichloropropene	10061-01-5	120	280	380	280 U
Cumene	98-82-8	150	300	410	430
Cyclohexane	110-82-7	51	210	290	210 U
Dibromochloromethane	124-48-1	100	530	710	530 U
Ethanol	64-17-5	500	530	1600	530 U
Ethyl Benzene	100-41-4	100	270	360	240 J
Freon 11	75-69-4	140	350	470	350 U
Freon 113	76-13-1	140	470	640	470 U
Freon 114	76-14-2	200	430	580	430 U
Freon 12	75-71-8	160	300	410	300 U
Heptane	142-82-5	140	250	1400	250 U
Hexachlorobutadiene	87-68-3	1100	3000	3600	3000 U

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	2S075-GSFD01-000.0-021822 Lab Duplic		
Lab ID:	2202482AR1-04AA	**Date/Time Analyzed:**	3/3/22 02:24 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	167
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msdp.i / p030224r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	110-54-3	82	220	290	220 U
m,p-Xylene	108-38-3	110	270	360	1300
Methyl tert-butyl ether	1634-04-4	150	450	1200	450 U
Methylene Chloride	75-09-2	440	990	2900	990 U
Naphthalene	91-20-3	110	180	880	1700
o-Xylene	95-47-6	110	270	360	880
Propylbenzene	103-65-1	100	300	410	1500
Styrene	100-42-5	130	260	360	260 U
Toluene	108-88-3	56	230	310	110 J
trans-1,2-Dichloroethene	156-60-5	160	240	330	240 U
trans-1,3-Dichloropropene	10061-02-6	92	280	380	280 U
Vinyl Chloride	75-01-4	150	160	210	160 U

U = The analyte was not detected above the MDL.
J = Estimated value.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	88
4-Bromofluorobenzene	460-00-4	81-117	99
Toluene-d8	2037-26-5	86-112	102

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	2S075-GSFD01-000.0-021822		
Lab ID:	2202482AR1-04B	**Date/Time Analyzed:**	3/4/22 09:31 PM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	4.18
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	msd14.i / 14030428r1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Tetrachloroethene	127-18-4	41	85	140	85 U
Tetrahydrofuran	109-99-9	21	37	62	37 U
Trichloroethene	79-01-6	47	67	110	67 U

U = The analyte was not detected above the MDL.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	82
4-Bromofluorobenzene	460-00-4	75-115	102
Toluene-d8	2037-26-5	85-115	93

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	Lab Blank		
Lab ID:	2202482AR1-05A	**Date/Time Analyzed:**	3/2/22 04:25 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030208cr1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,1-Trichloroethane	71-55-6	0.68	1.5	2.7	1.5 U
1,1,2,2-Tetrachloroethane	79-34-5	0.89	2.5	3.4	2.5 U
1,1,2-Trichloroethane	79-00-5	0.59	2.0	2.7	2.0 U
1,1-Dichloroethane	75-34-3	0.68	1.1	2.0	1.1 U
1,1-Dichloroethene	75-35-4	1.0	1.5	2.0	1.5 U
1,2,4-Trichlorobenzene	120-82-1	5.9	13	15	13 U
1,2,4-Trimethylbenzene	95-63-6	1.0	1.8	9.8	1.8 U
1,2-Dibromoethane (EDB)	106-93-4	0.81	2.8	3.8	2.8 U
1,2-Dichlorobenzene	95-50-1	0.72	2.2	3.0	2.2 U
1,2-Dichloroethane	107-06-2	0.68	1.5	2.0	1.5 U
1,2-Dichloropropane	78-87-5	0.89	1.7	2.3	1.7 U
1,3,5-Trimethylbenzene	108-67-8	0.78	1.8	9.8	1.8 U
1,3-Butadiene	106-99-0	0.89	1.0	1.1	1.0 U
1,3-Dichlorobenzene	541-73-1	0.84	2.2	3.0	2.2 U
1,4-Dichlorobenzene	106-46-7	0.73	2.2	3.0	2.2 U
1,4-Dioxane	123-91-1	0.79	2.7	7.2	2.7 U
2,2,4-Trimethylpentane	540-84-1	0.56	1.7	2.3	1.7 U
2-Butanone (Methyl Ethyl Ketone)	78-93-3	1.9	5.0	5.9	5.0 U
2-Hexanone	591-78-6	3.9	7.0	8.2	7.0 U
2-Propanol	67-63-0	1.7	3.2	4.9	3.2 U
3-Chloropropene	107-05-1	1.4	2.3	6.3	2.3 U
4-Ethyltoluene	622-96-8	0.81	1.8	2.4	1.8 U
4-Methyl-2-pentanone	108-10-1	0.61	1.5	2.0	1.5 U
Acetone	67-64-1	2.5	4.0	12	4.0 U

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	Lab Blank		
Lab ID:	2202482AR1-05A	**Date/Time Analyzed:**	3/2/22 04:25 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030208cr1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
alpha-Chlorotoluene	100-44-7	0.66	1.9	2.6	1.9 U
Benzene	71-43-2	0.56	1.2	1.6	1.2 U
Bromodichloromethane	75-27-4	0.94	1.9	3.4	1.9 U
Bromoform	75-25-2	0.94	3.8	5.2	3.8 U
Bromomethane	74-83-9	3.4	6.6	19	6.6 U
Carbon Disulfide	75-15-0	2.2	5.3	6.2	5.3 U
Carbon Tetrachloride	56-23-5	0.62	2.3	3.1	2.3 U
Chlorobenzene	108-90-7	0.35	1.3	2.3	1.3 U
Chloroethane	75-00-3	1.8	4.5	5.3	4.5 U
Chloroform	67-66-3	0.92	1.4	2.4	1.4 U
Chloromethane	74-87-3	2.2	3.5	10	3.5 U
cis-1,2-Dichloroethene	156-59-2	0.84	1.5	2.0	1.5 U
cis-1,3-Dichloropropene	10061-01-5	0.70	1.7	2.3	1.7 U
Cumene	98-82-8	0.89	1.8	2.4	1.8 U
Cyclohexane	110-82-7	0.30	1.3	1.7	1.3 U
Dibromochloromethane	124-48-1	0.61	3.2	4.2	3.2 U
Ethanol	64-17-5	3.0	3.2	9.4	3.2 U
Ethyl Benzene	100-41-4	0.60	1.6	2.2	1.6 U
Freon 11	75-69-4	0.82	2.1	2.8	2.1 U
Freon 113	76-13-1	0.87	2.8	3.8	2.8 U
Freon 114	76-14-2	1.2	2.6	3.5	2.6 U
Freon 12	75-71-8	0.98	1.8	2.5	1.8 U
Heptane	142-82-5	0.87	1.5	8.2	1.5 U
Hexachlorobutadiene	87-68-3	6.7	18	21	18 U

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	Lab Blank		
Lab ID:	2202482AR1-05A	**Date/Time Analyzed:**	3/2/22 04:25 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030208cr1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	110-54-3	0.49	1.3	1.8	1.3 U
m,p-Xylene	108-38-3	0.64	1.6	2.2	1.6 U
Methyl tert-butyl ether	1634-04-4	0.92	2.7	7.2	2.7 U
Methylene Chloride	75-09-2	2.6	5.9	17	5.9 U
Naphthalene	91-20-3	0.66	1.0	5.2	1.0 U
o-Xylene	95-47-6	0.67	1.6	2.2	1.6 U
Propylbenzene	103-65-1	0.61	1.8	2.4	1.8 U
Styrene	100-42-5	0.77	1.6	2.1	1.6 U
Toluene	108-88-3	0.34	1.4	1.9	1.4 U
trans-1,2-Dichloroethene	156-60-5	0.95	1.5	2.0	1.5 U
trans-1,3-Dichloropropene	10061-02-6	0.55	1.7	2.3	1.7 U
Vinyl Chloride	75-01-4	0.92	0.94	1.3	0.94 U

U = The analyte was not detected above the MDL.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	89
4-Bromofluorobenzene	460-00-4	81-117	94
Toluene-d8	2037-26-5	86-112	103

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	Lab Blank		
Lab ID:	2202482AR1-05B	**Date/Time Analyzed:**	3/4/22 01:55 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msd14.i / 14030412er1

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Tetrachloroethene	127-18-4	9.8	20	34	20 U
Tetrahydrofuran	109-99-9	5.0	8.8	15	8.8 U
Trichloroethene	79-01-6	11	16	27	16 U

U = The analyte was not detected above the MDL.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	87
4-Bromofluorobenzene	460-00-4	75-115	89
Toluene-d8	2037-26-5	85-115	98

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	CCV		
Lab ID:	2202482AR1-06A	**Date/Time Analyzed:**	3/2/22 12:01 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030202a

Compound	CAS#	%Recovery
1,1,1-Trichloroethane	71-55-6	96
1,1,2,2-Tetrachloroethane	79-34-5	105
1,1,2-Trichloroethane	79-00-5	105
1,1-Dichloroethane	75-34-3	111
1,1-Dichloroethene	75-35-4	108
1,2,4-Trichlorobenzene	120-82-1	97
1,2,4-Trimethylbenzene	95-63-6	107
1,2-Dibromoethane (EDB)	106-93-4	110
1,2-Dichlorobenzene	95-50-1	97
1,2-Dichloroethane	107-06-2	91
1,2-Dichloropropane	78-87-5	107
1,3,5-Trimethylbenzene	108-67-8	104
1,3-Butadiene	106-99-0	122
1,3-Dichlorobenzene	541-73-1	99
1,4-Dichlorobenzene	106-46-7	100
1,4-Dioxane	123-91-1	112
2,2,4-Trimethylpentane	540-84-1	118
2-Butanone (Methyl Ethyl Ketone)	78-93-3	113
2-Hexanone	591-78-6	118
2-Propanol	67-63-0	110
3-Chloropropene	107-05-1	116
4-Ethyltoluene	622-96-8	106
4-Methyl-2-pentanone	108-10-1	111
Acetone	67-64-1	106

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	CCV		
Lab ID:	2202482AR1-06A	**Date/Time Analyzed:**	3/2/22 12:01 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030202a

Compound	CAS#	%Recovery
alpha-Chlorotoluene	100-44-7	107
Benzene	71-43-2	106
Bromodichloromethane	75-27-4	97
Bromoform	75-25-2	100
Bromomethane	74-83-9	90
Carbon Disulfide	75-15-0	102
Carbon Tetrachloride	56-23-5	97
Chlorobenzene	108-90-7	105
Chloroethane	75-00-3	110
Chloroform	67-66-3	103
Chloromethane	74-87-3	117
cis-1,2-Dichloroethene	156-59-2	113
cis-1,3-Dichloropropene	10061-01-5	110
Cumene	98-82-8	112
Cyclohexane	110-82-7	109
Dibromochloromethane	124-48-1	102
Ethanol	64-17-5	115
Ethyl Benzene	100-41-4	108
Freon 11	75-69-4	90
Freon 113	76-13-1	95
Freon 114	76-14-2	101
Freon 12	75-71-8	97
Heptane	142-82-5	114
Hexachlorobutadiene	87-68-3	94

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	CCV		
Lab ID:	2202482AR1-06A	**Date/Time Analyzed:**	3/2/22 12:01 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030202a

Compound	CAS#	%Recovery
Hexane	110-54-3	117
m,p-Xylene	108-38-3	112
Methyl tert-butyl ether	1634-04-4	108
Methylene Chloride	75-09-2	101
Naphthalene	91-20-3	106
o-Xylene	95-47-6	111
Propylbenzene	103-65-1	104
Styrene	100-42-5	117
Toluene	108-88-3	103
trans-1,2-Dichloroethene	156-60-5	112
trans-1,3-Dichloropropene	10061-02-6	108
Vinyl Chloride	75-01-4	117

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	92
4-Bromofluorobenzene	460-00-4	81-117	96
Toluene-d8	2037-26-5	86-112	99

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	CCV		
Lab ID:	2202482AR1-06B	**Date/Time Analyzed:**	3/4/22 11:39 AM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msd14.i / 14030407a

Compound	CAS#	%Recovery
Tetrachloroethene	127-18-4	100
Tetrahydrofuran	109-99-9	94
Trichloroethene	79-01-6	91

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	83
4-Bromofluorobenzene	460-00-4	75-115	99
Toluene-d8	2037-26-5	85-115	96

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	CCV		
Lab ID:	2202482AR1-06C	**Date/Time Analyzed:**	3/3/22 10:09 AM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030230a

Compound	CAS#	%Recovery
1,1,1-Trichloroethane	71-55-6	94
1,1,2,2-Tetrachloroethane	79-34-5	106
1,1,2-Trichloroethane	79-00-5	107
1,1-Dichloroethane	75-34-3	109
1,1-Dichloroethene	75-35-4	108
1,2,4-Trichlorobenzene	120-82-1	92
1,2,4-Trimethylbenzene	95-63-6	106
1,2-Dibromoethane (EDB)	106-93-4	110
1,2-Dichlorobenzene	95-50-1	98
1,2-Dichloroethane	107-06-2	91
1,2-Dichloropropane	78-87-5	108
1,3,5-Trimethylbenzene	108-67-8	105
1,3-Butadiene	106-99-0	121
1,3-Dichlorobenzene	541-73-1	100
1,4-Dichlorobenzene	106-46-7	100
1,4-Dioxane	123-91-1	113
2,2,4-Trimethylpentane	540-84-1	118
2-Butanone (Methyl Ethyl Ketone)	78-93-3	110
2-Hexanone	591-78-6	118
2-Propanol	67-63-0	105
3-Chloropropene	107-05-1	113
4-Ethyltoluene	622-96-8	106
4-Methyl-2-pentanone	108-10-1	112
Acetone	67-64-1	107

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	CCV		
Lab ID:	2202482AR1-06C	**Date/Time Analyzed:**	3/3/22 10:09 AM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030230a

Compound	CAS#	%Recovery
alpha-Chlorotoluene	100-44-7	107
Benzene	71-43-2	108
Bromodichloromethane	75-27-4	99
Bromoform	75-25-2	101
Bromomethane	74-83-9	94
Carbon Disulfide	75-15-0	104
Carbon Tetrachloride	56-23-5	91
Chlorobenzene	108-90-7	106
Chloroethane	75-00-3	108
Chloroform	67-66-3	103
Chloromethane	74-87-3	111
cis-1,2-Dichloroethene	156-59-2	111
cis-1,3-Dichloropropene	10061-01-5	112
Cumene	98-82-8	114
Cyclohexane	110-82-7	109
Dibromochloromethane	124-48-1	101
Ethanol	64-17-5	115
Ethyl Benzene	100-41-4	108
Freon 11	75-69-4	90
Freon 113	76-13-1	96
Freon 114	76-14-2	102
Freon 12	75-71-8	98
Heptane	142-82-5	119
Hexachlorobutadiene	87-68-3	90

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	CCV		
Lab ID:	2202482AR1-06C	**Date/Time Analyzed:**	3/3/22 10:09 AM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030230a

Compound	CAS#	%Recovery
Hexane	110-54-3	118
m,p-Xylene	108-38-3	112
Methyl tert-butyl ether	1634-04-4	107
Methylene Chloride	75-09-2	101
Naphthalene	91-20-3	100
o-Xylene	95-47-6	112
Propylbenzene	103-65-1	104
Styrene	100-42-5	117
Toluene	108-88-3	106
trans-1,2-Dichloroethene	156-60-5	109
trans-1,3-Dichloropropene	10061-02-6	108
Vinyl Chloride	75-01-4	118

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	89
4-Bromofluorobenzene	460-00-4	81-117	97
Toluene-d8	2037-26-5	86-112	101

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	CCV		
Lab ID:	2202482AR1-06D	**Date/Time Analyzed:**	3/4/22 11:39 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msd14.i / 14030433

Compound	CAS#	%Recovery
Tetrachloroethene	127-18-4	102
Tetrahydrofuran	109-99-9	93
Trichloroethene	79-01-6	91

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	91
4-Bromofluorobenzene	460-00-4	75-115	100
Toluene-d8	2037-26-5	85-115	96

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	LCS		
Lab ID:	2202482AR1-07A	**Date/Time Analyzed:**	3/2/22 12:29 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030203a

Compound	CAS#	%Recovery
1,1,1-Trichloroethane	71-55-6	97
1,1,2,2-Tetrachloroethane	79-34-5	106
1,1,2-Trichloroethane	79-00-5	112
1,1-Dichloroethane	75-34-3	113
1,1-Dichloroethene	75-35-4	110
1,2,4-Trichlorobenzene	120-82-1	108
1,2,4-Trimethylbenzene	95-63-6	108
1,2-Dibromoethane (EDB)	106-93-4	113
1,2-Dichlorobenzene	95-50-1	100
1,2-Dichloroethane	107-06-2	95
1,2-Dichloropropane	78-87-5	113
1,3,5-Trimethylbenzene	108-67-8	106
1,3-Butadiene	106-99-0	122
1,3-Dichlorobenzene	541-73-1	101
1,4-Dichlorobenzene	106-46-7	100
1,4-Dioxane	123-91-1	117
2,2,4-Trimethylpentane	540-84-1	119
2-Butanone (Methyl Ethyl Ketone)	78-93-3	111
2-Hexanone	591-78-6	120
2-Propanol	67-63-0	117
3-Chloropropene	107-05-1	116
4-Ethyltoluene	622-96-8	105
4-Methyl-2-pentanone	108-10-1	113
Acetone	67-64-1	108

* % Recovery is calculated using unrounded analytical results.

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	LCS		
Lab ID:	2202482AR1-07A	**Date/Time Analyzed:**	3/2/22 12:29 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030203a

Compound	CAS#	%Recovery
alpha-Chlorotoluene	100-44-7	108
Benzene	71-43-2	112
Bromodichloromethane	75-27-4	102
Bromoform	75-25-2	102
Bromomethane	74-83-9	91
Carbon Disulfide	75-15-0	107
Carbon Tetrachloride	56-23-5	97
Chlorobenzene	108-90-7	106
Chloroethane	75-00-3	112
Chloroform	67-66-3	103
Chloromethane	74-87-3	110
cis-1,2-Dichloroethene	156-59-2	115
cis-1,3-Dichloropropene	10061-01-5	118
Cumene	98-82-8	113
Cyclohexane	110-82-7	111
Dibromochloromethane	124-48-1	104
Ethanol	64-17-5	119
Ethyl Benzene	100-41-4	110
Freon 11	75-69-4	92
Freon 113	76-13-1	95
Freon 114	76-14-2	104
Freon 12	75-71-8	99
Heptane	142-82-5	123
Hexachlorobutadiene	87-68-3	106

* % Recovery is calculated using unrounded analytical results.

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

Client ID:	LCS		
Lab ID:	2202482AR1-07A	**Date/Time Analyzed:**	3/2/22 12:29 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030203a

Compound	CAS#	%Recovery
Hexane	110-54-3	116
m,p-Xylene	108-38-3	110
Methyl tert-butyl ether	1634-04-4	109
Methylene Chloride	75-09-2	103
Naphthalene	91-20-3	109
o-Xylene	95-47-6	112
Propylbenzene	103-65-1	104
Styrene	100-42-5	117
Toluene	108-88-3	108
trans-1,2-Dichloroethene	156-60-5	114
trans-1,3-Dichloropropene	10061-02-6	111
Vinyl Chloride	75-01-4	116

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	90
4-Bromofluorobenzene	460-00-4	81-117	95
Toluene-d8	2037-26-5	86-112	102

* % Recovery is calculated using unrounded analytical results.

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	LCSD		
Lab ID:	2202482AR1-07AA	**Date/Time Analyzed:**	3/2/22 12:57 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030204a

Compound	CAS#	%Recovery
1,1,1-Trichloroethane	71-55-6	98
1,1,2,2-Tetrachloroethane	79-34-5	108
1,1,2-Trichloroethane	79-00-5	114
1,1-Dichloroethane	75-34-3	112
1,1-Dichloroethene	75-35-4	111
1,2,4-Trichlorobenzene	120-82-1	118
1,2,4-Trimethylbenzene	95-63-6	110
1,2-Dibromoethane (EDB)	106-93-4	114
1,2-Dichlorobenzene	95-50-1	102
1,2-Dichloroethane	107-06-2	95
1,2-Dichloropropane	78-87-5	113
1,3,5-Trimethylbenzene	108-67-8	109
1,3-Butadiene	106-99-0	121
1,3-Dichlorobenzene	541-73-1	104
1,4-Dichlorobenzene	106-46-7	102
1,4-Dioxane	123-91-1	114
2,2,4-Trimethylpentane	540-84-1	120
2-Butanone (Methyl Ethyl Ketone)	78-93-3	112
2-Hexanone	591-78-6	122
2-Propanol	67-63-0	119
3-Chloropropene	107-05-1	116
4-Ethyltoluene	622-96-8	106
4-Methyl-2-pentanone	108-10-1	115
Acetone	67-64-1	106

* % Recovery is calculated using unrounded analytical results.

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	LCSD		
Lab ID:	2202482AR1-07AA	**Date/Time Analyzed:**	3/2/22 12:57 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030204a

Compound	CAS#	%Recovery
alpha-Chlorotoluene	100-44-7	112
Benzene	71-43-2	113
Bromodichloromethane	75-27-4	103
Bromoform	75-25-2	104
Bromomethane	74-83-9	91
Carbon Disulfide	75-15-0	107
Carbon Tetrachloride	56-23-5	99
Chlorobenzene	108-90-7	109
Chloroethane	75-00-3	110
Chloroform	67-66-3	105
Chloromethane	74-87-3	112
cis-1,2-Dichloroethene	156-59-2	118
cis-1,3-Dichloropropene	10061-01-5	119
Cumene	98-82-8	115
Cyclohexane	110-82-7	113
Dibromochloromethane	124-48-1	106
Ethanol	64-17-5	111
Ethyl Benzene	100-41-4	113
Freon 11	75-69-4	93
Freon 113	76-13-1	96
Freon 114	76-14-2	105
Freon 12	75-71-8	99
Heptane	142-82-5	120
Hexachlorobutadiene	87-68-3	112

* % Recovery is calculated using unrounded analytical results.

EPA METHOD TO-15 GC/MS FULL SCAN
Red Hill Site Characterization

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Client ID:	LCSD		
Lab ID:	2202482AR1-07AA	**Date/Time Analyzed:**	3/2/22 12:57 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msdp.i / p030204a

Compound	CAS#	%Recovery
Hexane	110-54-3	118
m,p-Xylene	108-38-3	112
Methyl tert-butyl ether	1634-04-4	109
Methylene Chloride	75-09-2	104
Naphthalene	91-20-3	120
o-Xylene	95-47-6	112
Propylbenzene	103-65-1	107
Styrene	100-42-5	121
Toluene	108-88-3	108
trans-1,2-Dichloroethene	156-60-5	118
trans-1,3-Dichloropropene	10061-02-6	113
Vinyl Chloride	75-01-4	118

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	74-123	91
4-Bromofluorobenzene	460-00-4	81-117	96
Toluene-d8	2037-26-5	86-112	100

* % Recovery is calculated using unrounded analytical results.

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	LCS		
Lab ID:	2202482AR1-07B	**Date/Time Analyzed:**	3/4/22 01:07 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msd14.i / 14030410a

Compound	CAS#	%Recovery
Tetrachloroethene	127-18-4	110
Tetrahydrofuran	109-99-9	101
Trichloroethene	79-01-6	95

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	83
4-Bromofluorobenzene	460-00-4	75-115	96
Toluene-d8	2037-26-5	85-115	97

* % Recovery is calculated using unrounded analytical results.

EPA METHOD TO-15 GC/MS
Red Hill Site Characterization

Client ID:	LCSD		
Lab ID:	2202482AR1-07BB	**Date/Time Analyzed:**	3/4/22 01:28 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	msd14.i / 14030411a

Compound	CAS#	%Recovery
Tetrachloroethene	127-18-4	106
Tetrahydrofuran	109-99-9	102
Trichloroethene	79-01-6	101

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
1,2-Dichloroethane-d4	17060-07-0	59-144	84
4-Bromofluorobenzene	460-00-4	75-115	101
Toluene-d8	2037-26-5	85-115	99

* % Recovery is calculated using unrounded analytical results.

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Analysis Request /Canister Chain of Custody

For Laboratory Use Only

PID: _____ Workorder #: 2202482

180 Blue Ravine Rd. Suite B, Folsom, CA 95630
Phone (800) 985-5955; Fax (916) 351-8279

Client: AECOM
Project Name: RED HILL SITE CHARACTERIZATION
Project Manager: [redacted] (b) (6) Project # 60674414
Sampler:
Site Name: RED HILL

Special Instructions/Notes:
[redacted] (b) (6) @ aecom.com
1 copy [redacted] (b) (6) @ aecom.com

Turnaround Time (Rush surcharges may apply)
Standard _____ Rush X (5 day) (specify)

Lab ID	Field Sample Identification(Location)	Can #	Flow Controller #	Start Sampling Information Date	Start Sampling Information Time	Stop Sampling Information Date	Stop Sampling Information Time	Canister Vacuum/Pressure Initial (in Hg)	Canister Vacuum/Pressure Final (in Hg)	Lab Use Only Receipt	Lab Use Only Final (psig) Gas: N_2 / He	Requested Analyses TO-15	Requested Analyses TO-3	Requested Analyses ASTM D-1946	
01A	A3B-150-GSN02-000.0-021822	IL2909	25527	02/18/22	1234	02/18/22	1240	-29	-5			X	X	X	
02A	A3250-GSN01-000.0-021822	IL2253	25050	02/18/22	1211	02/18/22	1216	-29	-5			X	X	X	
03A	25075-GSN01-000.0-021822	IL2984	25336	02/18/22	1257	02/18/22	1307	-28	-5			X	X	X	
04A	25075-~~GSN01~~ (b) (6) 000.0-021822 GSFD01	40872	25336	02/18/22	1257	02/18/22	1307	-29	-5			X	X	X	

[redacted] (b) (6)
02/18/22

[redacted] (b) (6) /Affiliation) AECOM	Date 02/18/22	Time 1430	[redacted] (b) (6) nature/Affiliation) TAIL
[redacted] /Affiliation)	Date	Time	Received by: (Signature/Affiliation)
Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)

Date 02/19/22 Time 1010

Lab Use Only

Shipper Name: FEDEX | Custody Seals Intact? Yes No None

Sample Transportation Notice: Relinquishing signature on this document indicates that samples are shipped in compliance with all applicable local, State, Federal, and international laws, regulations, and ordinances of any kind. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Eurofins Air Toxics against any claim, demand, or action, of any kind, related to the collection, handling, of shipping of samples. D.O.T Hotline (800) 467-4922

SIN ID:HNLA (281) 543-7636

OM
I BISHOP ST STE 1600

NOLULU, HI 96813
ITED STATES US

SHIP DATE: 18FEB22
ACTWGT: 30.45 LB
CAD: 6994242/SSFE2220
DIMS: 19x19x18 IN

BILL THIRD PARTY

SAMPLE RECEIVING
180 BLUE RAVINE ROAD SUITE B

FOLSOM CA 95630

(916) 985-1000
INV:
PO:
REF: 60674414.02.30.01
DEPT:

FedEx
Express

E

SATURDAY 12:00P
PRIORITY OVERNIGHT

TRK# 0201 2700 0402 6810

DSR
95630
CA-US SMF

WO MHRA

TUE 15623/4.35 HNDW2 EXP 09/22

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5/23/2022
Ms. [redacted]
AECOM
1300 East 9th Street
Suite 500
Cleveland OH 4411

Project Name: Red Hill Site Characterization
Project #: 60674414
Workorder #: 2202482BR2

Dear Ms. [redacted]

The following report includes the data for the above referenced project for sample(s) received on 2/19/2022 at Eurofins Air Toxics LLC.

The data and associated QC analyzed by Modified TO-3 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics LLC. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: [redacted] at [redacted] if you have any questions regarding the data in this report.

Regards,

[redacted]

Project Manager

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WORK ORDER #: 2202482BR2

Work Order Summary

CLIENT:	Ms. [redacted] (b) (6) AECOM 1300 East 9th Street Suite 500 Cleveland, OH 4411	**BILL TO:**	Accounts Payable Austin AECOM PO Box 203970 Austin, TX 78720
PHONE:	[redacted] (b) (6)	**P.O. #**	142618
FAX:	216-622-2428	**PROJECT #**	60674414 Red Hill Site Characterization
DATE RECEIVED:	02/19/2022	**CONTACT:**	[redacted] (b) (6)
DATE COMPLETED:	03/03/2022		
DATE REISSUED:	05/23/2022		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	A3B-150-GSN01-000.0-021822	Modified TO-3	5.5 "Hg	10 psi
01AA	A3B-150-GSN01-000.0-021822 Lab Dupli	Modified TO-3	5.5 "Hg	10 psi
02A	A3250-GSN01-000.0-021822	Modified TO-3	5.7 "Hg	10.1 psi
03A	2S075-GSN01-000.0-021822	Modified TO-3	5.9 "Hg	10.1 psi
04A	2S075-GSFD01-000.0-021822	Modified TO-3	5.9 "Hg	10 psi
05A	Lab Blank	Modified TO-3	NA	NA
06A	CCV	Modified TO-3	NA	NA
06B	CCV	Modified TO-3	NA	NA
07A	LCS	Modified TO-3	NA	NA
07AA	LCSD	Modified TO-3	NA	NA

CERTIFIED BY: [redacted] (b) (6)

Technical Director

DATE: 05/23/22

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP - 209221, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP - T104704434-21-17, UT NELAP – CA009332021-13, VA NELAP - 10615, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005-015, Effective date: 10/18/2021, Expiration date: 10/17/2022.
Eurofins Air Toxics, LLC certifies that the test results contained in this report meet all requirements of the NELAC standards

This report shall not be reproduced, except in full, without the written approval of Eurofins Air Toxics, LLC.

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
DoD QSM - TO-3
AECOM
Workorder# 2202482BR2

Four 1 Liter Summa Canister (100% Certified) samples were received on February 19, 2022. The laboratory performed analysis for volatile organic compounds in air via modified EPA Method TO-3 using gas chromatography with flame ionization detection. The TPH results are calculated using the response of Gasoline. A molecular weight of 100 is used to convert the TPH ppmv result to ug/m3. The method involves concentrating up to 200 mL of sample. The concentrated aliquot is then dry purged to remove water vapor prior to entering the chromatographic system.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the EATL modifications.

Requirement	***TO-3***	***ATL Modifications***
Sample Collection	In-line field method	Collection of sample in specially treated canisters or alternative inert containers for transport to and analysis by an off-site laboratory.
Preparation of Standards	Levels achieved through dilution of gas mixture	Levels achieved through loading various volumes of the gas mixture
Initial Calibration Calculation	4-point calibration using a linear regression model	5-point calibration using average Response Factor
Initial Calibration Frequency	Weekly	When daily calibration standard recovery is outside 75 - 125 %, or upon significant changes to procedure or instrumentation
Daily Calibration Standard Frequency	Prior to sample analysis and every 4 - 6 hrs	Prior to sample analysis and after the analytical batch </= 20 samples.
Minimum Detection Limit (MDL)	Calculated using the equation DL = A+3.3S, where A is intercept of calibration line and S is the standard deviation of at least 3 reps of low level standard	40 CFR Pt. 136 App. B
Moisture Control	Nafion system	Sorbent system

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

A DoD QSM waiver has been established and approved between Eurofins Air Toxics and the client. A copy of the waiver is available upon request.

As per project requirements, the laboratory has reported estimated values for target compound hits that are below the Reporting Limit but greater than the Method Detection Limit.

Samples were analyzed in one analytical batch on GC-D on 3-1-2022. The initial continuing calibration verification (CCV) for the batch is reported as lab fraction 06A and the ending CCV is reported as lab fraction 06B.

The workorder was reissued on 03/11/2022 to report results in ug/m3 per client's request.

Per client request, the workorder was reissued on 05/23/22 to report TPH (C5-C12 Hydrocarbons) referenced to Gasoline for all samples in the final report. Please note Eurofins Air Toxics is not DoD accredited for TPH (C5-C12 Hydrocarbons) referenced to Gasoline and will be flagged as such.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	A3B-150-GSN01-000.0-021822		
Lab ID:	2202482BR2-01A	**Date/Time Analyzed:**	3/1/22 08:24 PM
Date/Time Collected:	2/18/22 12:40 PM	**Dilution Factor:**	16.5
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gcd.i / d030117r2

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH (C5-C12 Hydrocarbons) ref. to Gasoline	9999-9999-293	200	D	1700	820000
TPH (Gasoline Range)	9999-9999-208	200	670	1700	460000

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	87

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	A3B-150-GSN01-000.0-021822 Lab Dupli		
Lab ID:	2202482BR2-01AA	**Date/Time Analyzed:**	3/1/22 07:42 PM
Date/Time Collected:	2/18/22 12:40 PM	**Dilution Factor:**	41.2
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gcd.i / d030116r2

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH (C5-C12 Hydrocarbons) ref. to Gasoline	9999-9999-293	510	D	4200	1000000
TPH (Gasoline Range)	9999-9999-208	490	1700	4200	520000

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	87

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	A3250-GSN01-000.0-021822		
Lab ID:	2202482BR2-02A	**Date/Time Analyzed:**	3/1/22 09:01 PM
Date/Time Collected:	2/18/22 12:16 PM	**Dilution Factor:**	16.6
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gcd.i / d030118r2

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH (C5-C12 Hydrocarbons) ref. to Gasoline	9999-9999-293	210	D	1700	1200000
TPH (Gasoline Range)	9999-9999-208	200	680	1700	820000

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	88

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	2S075-GSN01-000.0-021822		
Lab ID:	2202482BR2-03A	**Date/Time Analyzed:**	3/1/22 09:37 PM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	8.40
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gcd.i / d030119r2

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH (C5-C12 Hydrocarbons) ref. to Gasoline	9999-9999-293	100	D	860	1100000
TPH (Gasoline Range)	9999-9999-208	100	340	860	700000

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	90

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	2S075-GSFD01-000.0-021822		
Lab ID:	2202482BR2-04A	**Date/Time Analyzed:**	3/1/22 10:14 PM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	8.36
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gcd.i / d030120r2

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH (C5-C12 Hydrocarbons) ref. to Gasoline	9999-9999-293	100	D	850	1100000
TPH (Gasoline Range)	9999-9999-208	99	340	850	690000

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	90

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	Lab Blank		
Lab ID:	2202482BR2-05A	**Date/Time Analyzed:**	3/1/22 11:58 AM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gcd.i / d030105r2

Compound	CAS#	MDL (ug/m3)	LOD (ug/m3)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH (C5-C12 Hydrocarbons) ref. to Gasoline	9999-9999-293	12	D	100	65 J
TPH (Gasoline Range)	9999-9999-208	12	41	100	42 J

J = Estimated value.
D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	90

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	CCV		
Lab ID:	2202482BR2-06A	**Date/Time Analyzed:**	3/1/22 09:51 AM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gcd.i / d030102r2

Compound	CAS#	%Recovery
C2 Hydrocarbons ref. to gasoline	9999-9999-162	103
TPH (Gasoline Range)	9999-9999-208	108

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	101

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	CCV		
Lab ID:	2202482BR2-06B	**Date/Time Analyzed:**	3/1/22 10:55 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gcd.i / d030121r2

Compound	CAS#	%Recovery
C2 Hydrocarbons ref. to gasoline	9999-9999-162	111
TPH (Gasoline Range)	9999-9999-208	115

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	93

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	LCS		
Lab ID:	2202482BR2-07A	**Date/Time Analyzed:**	3/1/22 10:32 AM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gcd.i / d030103r2

Compound	CAS#	%Recovery
C2 Hydrocarbons ref. to gasoline	9999-9999-162	100
TPH (Gasoline Range)	9999-9999-208	102

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	103

* % Recovery is calculated using unrounded analytical results.

MODIFIED EPA METHOD TO-3 GC/PID/FID
Red Hill Site Characterization

Client ID:	LCSD		
Lab ID:	2202482BR2-07AA	**Date/Time Analyzed:**	3/1/22 11:10 AM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gcd.i / d030104r2

Compound	CAS#	%Recovery
C2 Hydrocarbons ref. to gasoline	9999-9999-162	99
TPH (Gasoline Range)	9999-9999-208	102

D: Analyte not within the DoD scope of accreditation.

Surrogates	CAS#	Limits	%Recovery
Fluorobenzene (FID)	462-06-602	52-151	102

* % Recovery is calculated using unrounded analytical results.

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Analysis Request /Canister Chain of Custody

For Laboratory Use Only

PID: _____ Workorder #: 2202482

180 Blue Ravine Rd. Suite B, Folsom, CA 95630
Phone (800) 985-5955; Fax (916) 351-8279

page--of ---

Client: AECOM
Project Name: RED HILL SITE CHARACTERIZATION
Project Manager: [redacted] (b) (6) Project # 60674414
Sampler: [redacted]
Site Name: RED HILL

Special Instructions/Notes:
[redacted] (b) (6) @ aecom.com
& copy [redacted] (b) (6) @ aecom.com

Turnaround Time (Rush surcharges may apply)
Standard _____ Rush X (5 day) (specify)

Lab ID	Field Sample Identification(Location)	Can #	Flow Controller #	Start Sampling Information Date	Start Sampling Information Time	Stop Sampling Information Date	Stop Sampling Information Time	Canister Vacuum/Pressure Initial (in Hg)	Canister Vacuum/Pressure Final (in Hg)	Lab Use Only Receipt	Lab Use Only Final (psig) Gas: N_2 / He	Requested Analyses TO-15	Requested Analyses TO-3	Requested Analyses ASTM D-1946	
01A	A3B-150-GSN02-000.0-021822	IL2909	25527	02/18/22	1234	02/18/22	1240	-29	-5			X	X	X	
02A	A3250-GSN01-000.0-021822	IL2253	25050	02/18/22	1211	02/18/22	1216	-29	-5			X	X	X	
03A	25075-GSN01-000.0-021822	IL2984	25336	02/18/22	1257	02/18/22	1307	-28	-5			X	X	X	
04A	25075-~~GSN01~~ (b) (6) 000.0-021822 GSFD01	40872	25336	02/18/22	1257	02/18/22	1307	-29	-5			X	X	X	

[redacted] (b) (6)

02/18/22

Re[redacted] (b) (6) /Affiliation) AECOM	Date 02/18/22	Time 1430	[redacted] (b) (6) nature/Affiliation) FAIL
Date 02/19/22	Time 1010		
Re[redacted] e/Affiliation)	Date	Time	Received by: (Signature/Affiliation)
Date	Time		
Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)
Date	Time		

Lab Use Only

Shipper Name: FEDEX | Custody Seals Intact? Yes No None

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SIN ID:HNLA (281) 543-7636

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I BISHOP ST STE 1600

NOLULU, HI 96813
ITED STATES US

SHIP DATE: 18FEB22
ACTWGT: 30.45 LB
CAD: 6994242/SSFE2220
DIMS: 19x19x18 IN

BILL THIRD PARTY

SAMPLE RECEIVING
180 BLUE RAVINE ROAD SUITE B

FOLSOM CA 95630

(916) 985-1000
INV:
PO:
REF: 60674414.02.30.01
DEPT:

FedEx
Express

E

SATURDAY 12:00P
PRIORITY OVERNIGHT

TRK# 0201 2700 0402 6810

DSR
95630
CA-US SMF

WO MHRA

TUE 15623/4.35 HNDW2 EXP 09/22

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3/4/2022
Ms. [redacted] (b) (6)
AECOM
1300 East 9th Street
Suite 500
Cleveland OH 4411

Project Name: Red Hill Site Characterization
Project #: 60674414
Workorder #: 2202482C

Dear Ms. [redacted] (b) (6)

The following report includes the data for the above referenced project for sample(s) received on 2/19/2022 at Eurofins Air Toxics LLC.

The data and associated QC analyzed by Modified ASTM D-1946 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics LLC. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: [redacted] (b) (6) at [redacted] (b) (6) if you have any questions regarding the data in this report.

Regards,

[redacted] (b) (6)

Project Manager

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WORK ORDER #: 2202482C

Work Order Summary

CLIENT:	Ms. [redacted] (b) (6) AECOM 1300 East 9th Street Suite 500 Cleveland, OH 4411	**BILL TO:**	Accounts Payable Austin AECOM PO Box 203970 Austin, TX 78720
PHONE:	[redacted] (b) (6)	**P.O. #**	142618
FAX:	216-622-2428	**PROJECT #**	60674414 Red Hill Site Characterization
DATE RECEIVED:	02/19/2022	**CONTACT:**	[redacted] (b) (6)
DATE COMPLETED:	03/04/2022		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	A3B-150-GSN01-000.0-021822	Modified ASTM D-1946	5.5 "Hg	10 psi
02A	A3250-GSN01-000.0-021822	Modified ASTM D-1946	5.7 "Hg	10.1 psi
02AA	A3250-GSN01-000.0-021822 Lab Duplicate	Modified ASTM D-1946	5.7 "Hg	10.1 psi
03A	2S075-GSN01-000.0-021822	Modified ASTM D-1946	5.9 "Hg	10.1 psi
04A	2S075-GSFD01-000.0-021822	Modified ASTM D-1946	5.9 "Hg	10 psi
05A	Lab Blank	Modified ASTM D-1946	NA	NA
05B	Lab Blank	Modified ASTM D-1946	NA	NA
06A	CCV	Modified ASTM D-1946	NA	NA
06B	CCV	Modified ASTM D-1946	NA	NA
07A	LCS	Modified ASTM D-1946	NA	NA
07AA	LCSD	Modified ASTM D-1946	NA	NA

CERTIFIED BY: [redacted] (b) (6)

Technical Director

DATE: 03/04/22

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP - 209221, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP - T104704434-21-17, UT NELAP – CA009332021-13, VA NELAP - 10615, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005-015, Effective date: 10/18/2021, Expiration date: 10/17/2022.
Eurofins Air Toxics, LLC certifies that the test results contained in this report meet all requirements of the NELAC standards

This report shall not be reproduced, except in full, without the written approval of Eurofins Air Toxics, LLC.

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
DoD QSM - ASTM D1946
AECOM
Workorder# 2202482C

Four 1 Liter Summa Canister (100% Certified) samples were received on February 19, 2022. The laboratory performed analysis via Modified ASTM Method D-1946 for Methane and fixed gases in air using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

On the analytical column employed for this analysis, Oxygen coelutes with Argon. The corresponding peak is quantitated as Oxygen.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the EATL modifications.

Requirement	***ASTM D1946***	***ATL Modifications***
Reference Standard	The composition of any reference standard must be known to within 0.01 mol % for any component.	The standards used by ATL are blended to a >/= 95% accuracy.
Sample Injection Volume	Components whose concentrations are in excess of 5 % should not be analyzed by using sample volumes greater than 0.5 mL.	The sample container is connected directly to a fixed volume sample loop of 1.0 mL on the GC. Linear range is defined by the calibration curve. Bags are loaded by vacuum.
Calibration	A single point calibration is performed using a reference standard closely matching the composition of the unknown.	A minimum of 5-point calibration curve is performed. Quantitation is based on average Response Factor.
Normalization	Normalize the mole percent values by multiplying each value by 100 and dividing by the sum of the original values. The sum of the original values should not differ from 100% by more than 1.0%.	Results are not normalized. The sum of the reported values can differ from 100% by as much as 15%, either due to analytical variability or an unusual sample matrix.
Precision	Precision requirements established at each concentration level.	Duplicates should agree within 25% RPD for detections > 5 X's the RL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

A DoD QSM waiver has been established and approved between Eurofins Air Toxics and the client. A copy of the waiver is available upon request.

As per project requirements, the laboratory has reported estimated values for target compound hits that are below the Reporting Limit but greater than the Method Detection Limit.

Samples were analyzed in one analytical batch on GC-10 . The initial continuing calibration verification (CCV) for the batch is reported as lab fraction 06A and the ending CCV is reported as lab fraction 06B.

A Limit of Detection (LOD) study is not maintained for Oxygen, therefore the laboratory has reported estimated value for this compounds that is below the Reporting Limit but greater than the Method Detection Limit.

The recovery for Carbon Dioxide and Oxygen in the ICV exceeded In-house generated control limits.

Methane was manually integrated in samples A3250-GSN01-000.0-021822 Lab Duplicate and 2S075-GSFD01-000.0-021822.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	A3B-150-GSN01-000.0-021822		
Lab ID:	2202482C-01A	**Date/Time Analyzed:**	3/3/22 10:46 AM
Date/Time Collected:	2/18/22 12:40 PM	**Dilution Factor:**	2.06
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gc10.i / 10030247

Compound	CAS#	MDL (%)	LOD (%)	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	124-38-9	0.00092	0.0078	0.021	0.71
Helium	7440-59-7	0.0024	0.0080	0.10	0.0080 U
Methane	74-82-8	0.000033	0.000099	0.00021	0.00024
Oxygen	7782-44-7	0.015	0.015	0.21	20

U = The analyte was not detected above the MDL.

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	A3250-GSN01-000.0-021822		
Lab ID:	2202482C-02A	**Date/Time Analyzed:**	3/3/22 11:20 AM
Date/Time Collected:	2/18/22 12:16 PM	**Dilution Factor:**	2.08
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gc10.i / 10030248

Compound	CAS#	MDL (%)	LOD (%)	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	124-38-9	0.00093	0.0079	0.021	2.4
Helium	7440-59-7	0.0024	0.0081	0.10	0.0081 U
Methane	74-82-8	0.000033	0.00010	0.00021	0.00027
Oxygen	7782-44-7	0.015	0.015	0.21	17

U = The analyte was not detected above the MDL.

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	A3250-GSN01-000.0-021822 Lab Duplica		
Lab ID:	2202482C-02AA	**Date/Time Analyzed:**	3/3/22 01:19 PM
Date/Time Collected:	2/18/22 12:16 PM	**Dilution Factor:**	2.08
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gc10.i / 10030251

Compound	CAS#	MDL (%)	LOD (%)	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	124-38-9	0.00093	0.0079	0.021	2.4
Helium	7440-59-7	0.0024	0.0081	0.10	0.0081 U
Methane	74-82-8	0.000033	0.00010	0.00021	0.00027
Oxygen	7782-44-7	0.015	0.015	0.21	17

U = The analyte was not detected above the MDL.

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	2S075-GSN01-000.0-021822		
Lab ID:	2202482C-03A	**Date/Time Analyzed:**	3/3/22 11:58 AM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	2.10
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gc10.i / 10030249

Compound	CAS#	MDL (%)	LOD (%)	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	124-38-9	0.00094	0.0080	0.021	0.068
Helium	7440-59-7	0.0025	0.0082	0.10	0.0082 U
Methane	74-82-8	0.000034	0.00010	0.00021	0.00022
Oxygen	7782-44-7	0.015	0.015	0.21	20

U = The analyte was not detected above the MDL.

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	2S075-GSFD01-000.0-021822		
Lab ID:	2202482C-04A	**Date/Time Analyzed:**	3/3/22 12:50 PM
Date/Time Collected:	2/18/22 01:07 PM	**Dilution Factor:**	2.09
Media:	1 Liter Summa Canister (100% Certified)	**Instrument/Filename:**	gc10.i / 10030250

Compound	CAS#	MDL (%)	LOD (%)	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	124-38-9	0.00093	0.0079	0.021	0.070
Helium	7440-59-7	0.0024	0.0082	0.10	0.0082 U
Methane	74-82-8	0.000033	0.00010	0.00021	0.00018 J
Oxygen	7782-44-7	0.015	0.015	0.21	20

J = Estimated value.
U = The analyte was not detected above the MDL.

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	Lab Blank		
Lab ID:	2202482C-05A	**Date/Time Analyzed:**	3/2/22 07:08 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gc10.i / 10030229

Compound	CAS#	MDL (%)	LOD (%)	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	124-38-9	0.00045	0.0038	0.010	0.0038 U
Methane	74-82-8	0.000016	0.000048	0.00010	0.000048 U
Oxygen	7782-44-7	0.0073	0.0073	0.10	0.0073 U

U = The analyte was not detected above the MDL.

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	Lab Blank		
Lab ID:	2202482C-05B	**Date/Time Analyzed:**	3/2/22 07:38 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gc10.i / 10030230c

Compound	CAS#	MDL (%)	LOD (%)	Rpt. Limit (%)	Amount (%)
Helium	7440-59-7	0.0012	0.0039	0.050	0.0039 U

U = The analyte was not detected above the MDL.

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	CCV		
Lab ID:	2202482C-06A	**Date/Time Analyzed:**	3/2/22 05:32 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gc10.i / 10030226

Compound	CAS#	%Recovery
Carbon Dioxide	124-38-9	104
Helium	7440-59-7	95
Methane	74-82-8	101
Oxygen	7782-44-7	96

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	CCV		
Lab ID:	2202482C-06B	**Date/Time Analyzed:**	3/3/22 02:10 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gc10.i / 10030252

Compound	CAS#	%Recovery
Carbon Dioxide	124-38-9	103
Helium	7440-59-7	95
Methane	74-82-8	101
Oxygen	7782-44-7	95

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	LCS		
Lab ID:	2202482C-07A	**Date/Time Analyzed:**	3/2/22 06:01 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gc10.i / 10030227DOD

Compound	CAS#	%Recovery
Carbon Dioxide	124-38-9	104
Helium	7440-59-7	112
Methane	74-82-8	102
Oxygen	7782-44-7	96

* % Recovery is calculated using unrounded analytical results.

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946
Red Hill Site Characterization

Client ID:	LCSD		
Lab ID:	2202482C-07AA	**Date/Time Analyzed:**	3/2/22 06:31 PM
Date/Time Collected:	NA - Not Applicable	**Dilution Factor:**	1.00
Media:	NA - Not Applicable	**Instrument/Filename:**	gc10.i / 10030228DOD

Compound	CAS#	%Recovery
Carbon Dioxide	124-38-9	104
Helium	7440-59-7	112
Methane	74-82-8	102
Oxygen	7782-44-7	96

* % Recovery is calculated using unrounded analytical results.

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Analysis Request /Canister Chain of Custody

For Laboratory Use Only

PID: _____ Workorder #: 2202482

180 Blue Ravine Rd. Suite B, Folsom, CA 95630
Phone (800) 985-5955; Fax (916) 351-8279

Client: AECOM
Project Name: RED HILL SITE CHARACTERIZATION
Project Manager: [redacted] (b) (6) Project # 60674414
Sampler: [redacted]
Site Name: RED HILL

Special Instructions/Notes:
[redacted] (b) (6) @ aecom.com
+ copy [redacted] (b) (6) @ aecom.com

Turnaround Time (Rush surcharges may apply)
Standard _____ Rush X (5 day) (specify)

Lab ID	Field Sample Identification(Location)	Can #	Flow Controller #	Start Sampling Information Date	Start Sampling Information Time	Stop Sampling Information Date	Stop Sampling Information Time	Canister Vacuum/Pressure Initial (in Hg)	Canister Vacuum/Pressure Final (in Hg)	Lab Use Only Receipt	Lab Use Only Final (psig) Gas: N_2 / He	Requested Analyses TO-15	Requested Analyses TO-3	Requested Analyses ASTM D-1946	
01A	A3B-150-GSN02-000.0-021822	IL2909	25527	02/18/22	1234	02/18/22	1240	-29	-5			X	X	X	
02A	A3250-GSN01-000.0-021822	IL2253	25050	02/18/22	1211	02/18/22	1216	-29	-5			X	X	X	
03A	25075-GSN01-000.0-021822	IL2984	25336	02/18/22	1257	02/18/22	1307	-28	-5			X	X	X	
04A	25075-~~GSN01~~ (b) (6) 000.0-021822 GSFD01	40872	25336	02/18/22	1257	02/18/22	1307	-29	-5			X	X	X	

[redacted] (b) (6)

02/18/22

Re[redacted] (b) (6) e/Affiliation) AECOM	Date 02/18/22	Time 1430	[redacted] (b) (6) nature/Affiliation) ZAIL
Re e/Affiliation)	Date	Time	Received by: (Signature/Affiliation)
Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)

Date 02/19/22 Time 1010

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Shipper Name: FEDEX | Custody Seals Intact? Yes No None

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SIN ID:HNLA (281) 543-7636

OM
I BISHOP ST STE 1600

NOLULU, HI 96813
ITED STATES US

SHIP DATE: 18FEB22
ACTWGT: 30.45 LB
CAD: 6994242/SSFE2220
DIMS: 19x19x18 IN

BILL THIRD PARTY

SAMPLE RECEIVING
180 BLUE RAVINE ROAD SUITE B

FOLSOM CA 95630

(916) 985-1000
INV:
PO:
REF: 60674414.02.30.01
DEPT:

FedEx
Express

E

SATURDAY 12:00P
PRIORITY OVERNIGHT

TRK# 0201 2700 0402 6810

DSR
95630
CA-US SMF

WO MHRA

TUE 15623/4.35 HNDW2 EXP 09/22

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-111187-1
Client Project/Site: Red Hill JBPHH N62742-17-D-1800
Revision: 5

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/22/2022 4:44:46 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

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Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-111187-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: Red Hill JBPHH N62742-17-D-1800
Report Number: 580-111187-1

REVISION 5 SEPTEMBER 22, 2022
Report revised to include the MS/MSD data for RRO and to include the initial sample data for A3MIS-375-SON01-000.0-1 (580-111187-8), as it is associated to this MS/MSD. Narrative comments added in the DRO/ORO section below.

REVISION 4 SEPTEMBER 20, 2022
Report has been revised to change the carbon range for GRO to C6-C10. IO. In addition, the ORO fraction has been split out into a separate sample in order to accommodate the EDMS database. The sample IDs had an added -1 appended to end of the client ID for this fraction.

REVISION 3 AUGUST 3, 2022
Report revised to correct the client ID for sample 580-111187-6 from A3MIS225-SON01-000.0 (580-111187-6) to A3MIS215-SON01-000.0 (580-111187-6).

REVISION 2 July 29, 2022
Report has been revised for 8260B CALUFT results. Chromatographic integrations have been adjusted to forced baseline-baseline integration per Method and SOP.

REVISION 1: JULY 20, 2022
Revision required to add missing ICV/CCV data for GRO and DRO and to correct IDs for samples 5, 6, & 7.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
Seven samples were received on 3/9/2022 9:45 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 2 coolers at receipt time were 0.4º C and 1.3º C.

Receipt Exceptions

The following samples were received in pre-weighed containers with a label that was added in the field, which would cause a slight low bias in the final results. A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0

Job ID: 580-111187-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

(580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), A3MIS000-SON01-000.0 (580-111187-5), A3MIS215-SON01-000.0 (580-111187-6) and 2MIS75-SON01-000.0 (580-111187-7). The label was placed over the lid, preventing the containers from being easily opened. The lid is included in the pre-tared weight, and additional labels should not be placed over the lid or the bottle.

Applied labels do not match the times written on the bags of samples A3MIS-150-SOFT01-000.0 (580-111187-2) and A3MIS-150-SOFT03-000.0 (580-111187-4). The applied label on -2 is identical to the label applied to A3MIS225-150-SON01-000.0 (580-111187-6).
The time on -6 matches the label, so this sample was determined to be A3MIS225-SON01-000.0. **Per client, the ID should be A3MIS215-SON01-000.0.**
The time written on sample -4 is 3:10, so this sample was determined to be A3MIS-150-SOFT03-000.0 despite the applied label reading A3MIS-150-SOFT01-000.0.
The time written on sample -2 is 2:50, so this sample was determined to be A3MIS-150-SOFT01-000.0 despite the applied label reading A3MIS225-SON01-000.0.

The Field Sampler was not listed on the Chain of Custody.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

GASOLINE RANGE ORGANICS WITH INCREMENTAL PREPARATION
Samples A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), A3MIS000-SON01-000.0 (580-111187-5), A3MIS215-SON01-000.0 (580-111187-6) and 2MIS75-SON01-000.0 (580-111187-7) were analyzed for gasoline range organics with incremental preparation in accordance with EPA SW-846 Method 8015B - GRO with incremental preparation. The samples were leached on 03/14/2022, and prepared and analyzed on 03/14/2022 and 03/15/2022.

The following sample was provided to the laboratory with a significantly different initial weight than that required by the reference method: A3MIS000-150-SON01-000.0 (580-111187-5). Deviations in the weight by more than 20% may affect reporting limits and potentially method performance. The method specifies 150g. The amount provided was below this range.

The following samples were analyzed at reduced volume due to high concentrations of target analytes: A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), 2MIS75-SON01-000.0 (580-111187-7), (580-111187-A-7-C MS) and (580-111187-A-7-D MSD). The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor.

The closing CCV fails high (31.3%) for Gasoline Range Organics (C6-C12) due to carry over from the previous sample. The change occurred following the change to the calibration. A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), 2SMIS75-SON01-000.0 (580-111187-7), (CCV 580-383779/30), (580-111187-A-7-C MS) and (580-111187-A-7-D MSD)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS) WITH INCREMENTAL PREPARATION
Samples A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), A3MIS000-SON01-000.0 (580-111187-5), A3MIS215-SON01-000.0 (580-111187-6) and 2MIS75-SON01-000.0 (580-111187-7) were analyzed for volatile organic compounds (GC-MS) in accordance with 8260D_DOD5 with incremental preparation. The samples were leached on 03/14/2022, and prepared and analyzed on 03/14/2022.

The following sample was provided to the laboratory with a significantly different initial weight than that required by the reference method: A3MIS000-SON01-000.0 (580-111187-5). Deviations in the weight by more than 20% may affect reporting limits and potentially method performance. The method specifies 150g. The amount provided was below this range.

Job ID: 580-111187-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

The following samples were analyzed at reduced volume due to high concentrations of non-target analytes: A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), A3MIS000-SON01-000.0 (580-111187-5), A3MIS215-SON01-000.0 (580-111187-6), 2MIS75-SON01-000.0 (580-111187-7), (580-111187-A-7-C MS) and (580-111187-A-7-D MSD). The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) WITH INCREMENTAL PREPARATION

Samples A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), A3MIS000-SON01-000.0 (580-111187-5), A3MIS215-SON01-000.0 (580-111187-6) and 2MIS75-SON01-000.0 (580-111187-7) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) with incremental preparation in accordance with 8270E SIM. The samples were leached on 03/10/2022, prepared on 03/14/2022 and analyzed on 03/15/2022 and 03/16/2022.

2,4,6-Tribromophenol failed the surrogate recovery criteria low for 2MIS75-SON01-000.0 (580-111187-7). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

The following sample was diluted to bring the concentration of target analytes within the calibration range: A3MIS-375-SON01-000.0 (580-111187-1). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL AND OIL RANGE ORGANICS (GC) WITH INCREMENTAL PREPARATION

Samples A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), A3MIS000-SON01-000.0 (580-111187-5), A3MIS215-SON01-000.0 (580-111187-6) and 2MIS75-SON01-000.0 (580-111187-7) were analyzed for diesel and oil range organics with incremental preparation in accordance with 8015D DRO. The samples were leached on 03/10/2022, prepared on 03/14/2022, 03/15/2022 and 03/18/2022 and analyzed on 03/15/2022, 03/16/2022 and 03/18/2022.

Due to the high concentration of C10-C24, the matrix spike / matrix spike duplicate (MS/MSD) for preparation batch 580-383433 and 580-383748 and analytical batch 580-383879 could not be evaluated for accuracy. The associated laboratory control sample (LCS) met acceptance criteria.

The presence of the '4' qualifier indicates analytes where the concentration in the unspiked sample exceeded four times the spiking amount.

Surrogate recovery for the following sample was outside control limits: A3MIS-375-SON01-000.0-1 (580-111187-8). Re-extraction and reanalysis was performed within holding time with acceptable results. The initial extraction data is reported due to it being the parer sample for the MS/MSD.

The matrix spike and matrix spike duplicate (MS/MSD) recoveries for preparation batch 580-383434 and 580-383968 and analytical batch 580-384047 were outside control limits. Sample matrix interference is suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

MOISTURE CONTENT WITH INCREMENTAL PREPARATION

Samples A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), A3MIS000-SON01-000.0 (580-111187-5), A3MIS215-SON01-000.0 (580-111187-6) and 2MIS75-SON01-000.0 (580-111187-7) were analyzed for moisture content with incremental preparation in accordance with ASTM D2216. The samples were leached on 03/10/2022 and analyzed on 03/10/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC/MS Semi VOA

Qualifier	Qualifier Description
D	The reported value is from a dilution.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Glossary (Continued)

Abbreviation	These commonly used abbreviations may or may not be present in this report.
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-375-SON01-000.0

Date Collected: 03/05/22 14:10
Date Received: 03/09/22 09:45

Lab Sample ID: 580-111187-1

Matrix: Solid
Percent Solids: 91.7

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	130		49	16	mg/Kg	☼	03/14/22 11:30	03/14/22 18:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*67 - 134*	*03/14/22 11:30*	*03/14/22 18:22*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.19	U	0.25	0.047	mg/Kg	☼	03/14/22 11:30	03/14/22 18:22	1
Toluene	0.37	U	0.74	0.17	mg/Kg	☼	03/14/22 11:30	03/14/22 18:22	1
Ethylbenzene	0.37	U	0.49	0.11	mg/Kg	☼	03/14/22 11:30	03/14/22 18:22	1
m-Xylene & p-Xylene	0.13	J	0.49	0.088	mg/Kg	☼	03/14/22 11:30	03/14/22 18:22	1
o-Xylene	0.068	J	0.49	0.062	mg/Kg	☼	03/14/22 11:30	03/14/22 18:22	1
Xylenes, Total	0.20	J	0.49	0.088	mg/Kg	☼	03/14/22 11:30	03/14/22 18:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*95*		*85 - 116*	*03/14/22 11:30*	*03/14/22 18:22*	*1*
4-Bromofluorobenzene (Surr)	*97*		*79 - 119*	*03/14/22 11:30*	*03/14/22 18:22*	*1*
Dibromofluoromethane (Surr)	*97*		*78 - 119*	*03/14/22 11:30*	*03/14/22 18:22*	*1*
1,2-Dichloroethane-d4 (Surr)	*103*		*71 - 136*	*03/14/22 11:30*	*03/14/22 18:22*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	5.0		0.0049	0.0016	mg/Kg	☼	03/14/22 12:58	03/15/22 17:20	1
2-Methylnaphthalene	16	D	0.049	0.020	mg/Kg	☼	03/14/22 12:58	03/16/22 17:55	10
1-Methylnaphthalene	15	D	0.049	0.0062	mg/Kg	☼	03/14/22 12:58	03/16/22 17:55	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*101*		*58 - 132*	*03/14/22 12:58*	*03/15/22 17:20*	*1*
Terphenyl-d14	*91*		*58 - 132*	*03/14/22 12:58*	*03/16/22 17:55*	*10*
2-methylnaphthalene-d10	*107*	*M*	*40 - 140*	*03/14/22 12:58*	*03/15/22 17:20*	*1*
2-methylnaphthalene-d10	*91*	*M*	*40 - 140*	*03/14/22 12:58*	*03/16/22 17:55*	*10*
Fluoranthene-d10 (Surr)	*90*		*40 - 140*	*03/14/22 12:58*	*03/15/22 17:20*	*1*
Fluoranthene-d10 (Surr)	*79*		*40 - 140*	*03/14/22 12:58*	*03/16/22 17:55*	*10*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	6200		44	8.8	mg/Kg	☼	03/14/22 12:19	03/15/22 15:15	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*89*		*45 - 130*	*03/14/22 12:19*	*03/15/22 15:15*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	91.7		0.1	0.1	%			03/10/22 15:24	1
Percent Moisture	8.3		0.1	0.1	%			03/10/22 15:24	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-150-SOFT01-000.0

Date Collected: 03/05/22 14:50
Date Received: 03/09/22 09:45

Lab Sample ID: 580-111187-2

Matrix: Solid
Percent Solids: 86.0

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	200		54	18	mg/Kg	☼	03/14/22 11:30	03/14/22 18:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*67 - 134*	*03/14/22 11:30*	*03/14/22 18:45*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.20	U	0.27	0.051	mg/Kg	☼	03/14/22 11:30	03/14/22 18:45	1
Toluene	0.41	U	0.81	0.18	mg/Kg	☼	03/14/22 11:30	03/14/22 18:45	1
Ethylbenzene	0.41	U M	0.54	0.12	mg/Kg	☼	03/14/22 11:30	03/14/22 18:45	1
m-Xylene & p-Xylene	0.20	U	0.54	0.096	mg/Kg	☼	03/14/22 11:30	03/14/22 18:45	1
o-Xylene	0.20	U M	0.54	0.068	mg/Kg	☼	03/14/22 11:30	03/14/22 18:45	1
Xylenes, Total	0.20	U	0.54	0.096	mg/Kg	☼	03/14/22 11:30	03/14/22 18:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*96*		*85 - 116*	*03/14/22 11:30*	*03/14/22 18:45*	*1*
4-Bromofluorobenzene (Surr)	*97*		*79 - 119*	*03/14/22 11:30*	*03/14/22 18:45*	*1*
Dibromofluoromethane (Surr)	*95*		*78 - 119*	*03/14/22 11:30*	*03/14/22 18:45*	*1*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 136*	*03/14/22 11:30*	*03/14/22 18:45*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.037	M	0.0057	0.0018	mg/Kg	☼	03/14/22 12:58	03/15/22 17:39	1
2-Methylnaphthalene	0.033	M	0.0057	0.0023	mg/Kg	☼	03/14/22 12:58	03/15/22 17:39	1
1-Methylnaphthalene	0.055	M	0.0057	0.00071	mg/Kg	☼	03/14/22 12:58	03/15/22 17:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*102*		*58 - 132*	*03/14/22 12:58*	*03/15/22 17:39*	*1*
2-methylnaphthalene-d10	*83*	*M*	*40 - 140*	*03/14/22 12:58*	*03/15/22 17:39*	*1*
Fluoranthene-d10 (Surr)	*94*		*40 - 140*	*03/14/22 12:58*	*03/15/22 17:39*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	1300		58	11	mg/Kg	☼	03/14/22 12:19	03/15/22 15:35	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*87*		*45 - 130*	*03/14/22 12:19*	*03/15/22 15:35*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86.0		0.1	0.1	%			03/10/22 15:24	1
Percent Moisture	14.0		0.1	0.1	%			03/10/22 15:24	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-150-SOFT02-000.0

Date Collected: 03/05/22 15:00
Date Received: 03/09/22 09:45

Lab Sample ID: 580-111187-3

Matrix: Solid
Percent Solids: 87.1

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	220		54	17	mg/Kg	☼	03/14/22 11:30	03/14/22 19:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*67 - 134*	*03/14/22 11:30*	*03/14/22 19:08*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.20	U	0.27	0.051	mg/Kg	☼	03/14/22 11:30	03/14/22 19:08	1
Toluene	0.40	U M	0.81	0.18	mg/Kg	☼	03/14/22 11:30	03/14/22 19:08	1
Ethylbenzene	0.40	U	0.54	0.12	mg/Kg	☼	03/14/22 11:30	03/14/22 19:08	1
m-Xylene & p-Xylene	0.20	U M	0.54	0.095	mg/Kg	☼	03/14/22 11:30	03/14/22 19:08	1
o-Xylene	0.20	U	0.54	0.067	mg/Kg	☼	03/14/22 11:30	03/14/22 19:08	1
Xylenes, Total	0.20	U	0.54	0.095	mg/Kg	☼	03/14/22 11:30	03/14/22 19:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*98*		*85 - 116*	*03/14/22 11:30*	*03/14/22 19:08*	*1*
4-Bromofluorobenzene (Surr)	*98*		*79 - 119*	*03/14/22 11:30*	*03/14/22 19:08*	*1*
Dibromofluoromethane (Surr)	*97*		*78 - 119*	*03/14/22 11:30*	*03/14/22 19:08*	*1*
1,2-Dichloroethane-d4 (Surr)	*102*		*71 - 136*	*03/14/22 11:30*	*03/14/22 19:08*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.046	M	0.0057	0.0018	mg/Kg	☼	03/14/22 12:58	03/15/22 17:58	1
2-Methylnaphthalene	0.045	M	0.0057	0.0023	mg/Kg	☼	03/14/22 12:58	03/15/22 17:58	1
1-Methylnaphthalene	0.093	M	0.0057	0.00072	mg/Kg	☼	03/14/22 12:58	03/15/22 17:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*104*		*58 - 132*	*03/14/22 12:58*	*03/15/22 17:58*	*1*
2-methylnaphthalene-d10	*83*	*M*	*40 - 140*	*03/14/22 12:58*	*03/15/22 17:58*	*1*
Fluoranthene-d10 (Surr)	*95*		*40 - 140*	*03/14/22 12:58*	*03/15/22 17:58*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	1400		55	11	mg/Kg	☼	03/14/22 12:19	03/15/22 15:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*86*		*45 - 130*	*03/14/22 12:19*	*03/15/22 15:55*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87.1		0.1	0.1	%			03/10/22 15:24	1
Percent Moisture	12.9		0.1	0.1	%			03/10/22 15:24	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-150-SOFT03-000.0

Date Collected: 03/05/22 15:10
Date Received: 03/09/22 09:45

Lab Sample ID: 580-111187-4

Matrix: Solid
Percent Solids: 85.8

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	190		59	19	mg/Kg	☼	03/14/22 11:30	03/14/22 19:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*67 - 134*	*03/14/22 11:30*	*03/14/22 19:31*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.22	U M	0.29	0.056	mg/Kg	☼	03/14/22 11:30	03/14/22 19:31	1
Toluene	0.44	U	0.88	0.20	mg/Kg	☼	03/14/22 11:30	03/14/22 19:31	1
Ethylbenzene	0.44	U	0.59	0.13	mg/Kg	☼	03/14/22 11:30	03/14/22 19:31	1
m-Xylene & p-Xylene	0.22	U M	0.59	0.10	mg/Kg	☼	03/14/22 11:30	03/14/22 19:31	1
o-Xylene	0.22	U	0.59	0.073	mg/Kg	☼	03/14/22 11:30	03/14/22 19:31	1
Xylenes, Total	0.22	U	0.59	0.10	mg/Kg	☼	03/14/22 11:30	03/14/22 19:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*98*		*85 - 116*	*03/14/22 11:30*	*03/14/22 19:31*	*1*
4-Bromofluorobenzene (Surr)	*98*		*79 - 119*	*03/14/22 11:30*	*03/14/22 19:31*	*1*
Dibromofluoromethane (Surr)	*95*		*78 - 119*	*03/14/22 11:30*	*03/14/22 19:31*	*1*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*	*03/14/22 11:30*	*03/14/22 19:31*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.036	M	0.0056	0.0018	mg/Kg	☼	03/14/22 12:58	03/15/22 18:24	1
2-Methylnaphthalene	0.051	M	0.0056	0.0023	mg/Kg	☼	03/14/22 12:58	03/15/22 18:24	1
1-Methylnaphthalene	0.094	M	0.0056	0.00070	mg/Kg	☼	03/14/22 12:58	03/15/22 18:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*113*		*58 - 132*	*03/14/22 12:58*	*03/15/22 18:24*	*1*
2-methylnaphthalene-d10	*86*	*M*	*40 - 140*	*03/14/22 12:58*	*03/15/22 18:24*	*1*
Fluoranthene-d10 (Surr)	*103*		*40 - 140*	*03/14/22 12:58*	*03/15/22 18:24*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	1000		58	11	mg/Kg	☼	03/14/22 12:19	03/15/22 16:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*76*		*45 - 130*	*03/14/22 12:19*	*03/15/22 16:14*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85.8		0.1	0.1	%			03/10/22 15:24	1
Percent Moisture	14.2		0.1	0.1	%			03/10/22 15:24	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS000-SON01-000.0

Date Collected: 03/05/22 15:35
Date Received: 03/09/22 09:45

Lab Sample ID: 580-111187-5

Matrix: Solid
Percent Solids: 82.7

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	54	U	72	23	mg/Kg	☼	03/15/22 12:59	03/15/22 14:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*67 - 134*	*03/15/22 12:59*	*03/15/22 14:20*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.32	U	0.42	0.080	mg/Kg	☼	03/14/22 11:30	03/14/22 15:15	1
Toluene	0.63	U M	1.3	0.28	mg/Kg	☼	03/14/22 11:30	03/14/22 15:15	1
Ethylbenzene	0.63	U M	0.84	0.19	mg/Kg	☼	03/14/22 11:30	03/14/22 15:15	1
m-Xylene & p-Xylene	0.32	U	0.84	0.15	mg/Kg	☼	03/14/22 11:30	03/14/22 15:15	1
o-Xylene	0.32	U M	0.84	0.11	mg/Kg	☼	03/14/22 11:30	03/14/22 15:15	1
Xylenes, Total	0.32	U	0.84	0.15	mg/Kg	☼	03/14/22 11:30	03/14/22 15:15	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*98*		*85 - 116*	*03/14/22 11:30*	*03/14/22 15:15*	*1*
4-Bromofluorobenzene (Surr)	*99*		*79 - 119*	*03/14/22 11:30*	*03/14/22 15:15*	*1*
Dibromofluoromethane (Surr)	*97*		*78 - 119*	*03/14/22 11:30*	*03/14/22 15:15*	*1*
1,2-Dichloroethane-d4 (Surr)	*104*		*71 - 136*	*03/14/22 11:30*	*03/14/22 15:15*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**0.13**	**M**	0.0058	0.0019	mg/Kg	☼	03/14/22 12:58	03/15/22 19:21	1
2-Methylnaphthalene	**1.2**	**M**	0.0058	0.0024	mg/Kg	☼	03/14/22 12:58	03/15/22 19:21	1
1-Methylnaphthalene	**2.0**	**M**	0.0058	0.00073	mg/Kg	☼	03/14/22 12:58	03/15/22 19:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*104*		*58 - 132*	*03/14/22 12:58*	*03/15/22 19:21*	*1*
2-methylnaphthalene-d10	*95*	*M*	*40 - 140*	*03/14/22 12:58*	*03/15/22 19:21*	*1*
Fluoranthene-d10 (Surr)	*95*		*40 - 140*	*03/14/22 12:58*	*03/15/22 19:21*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**4200**	**J1**	60	12	mg/Kg	☼	03/14/22 12:19	03/15/22 16:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*89*		*45 - 130*	*03/14/22 12:19*	*03/15/22 16:34*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**82.7**		0.1	0.1	%			03/10/22 15:24	1
Percent Moisture	**17.3**		0.1	0.1	%			03/10/22 15:24	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS215-SON01-000.0

Date Collected: 03/05/22 16:05
Date Received: 03/09/22 09:45

Lab Sample ID: 580-111187-6

Matrix: Solid
Percent Solids: 86.0

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	36	J	58	19	mg/Kg	☼	03/15/22 12:59	03/15/22 14:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*67 - 134*	*03/15/22 12:59*	*03/15/22 14:44*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	2.2	U M	2.9	0.55	mg/Kg	☼	03/14/22 11:30	03/14/22 16:02	1
Toluene	4.3	U	8.7	1.9	mg/Kg	☼	03/14/22 11:30	03/14/22 16:02	1
Ethylbenzene	4.3	U M	5.8	1.3	mg/Kg	☼	03/14/22 11:30	03/14/22 16:02	1
m-Xylene & p-Xylene	2.2	U	5.8	1.0	mg/Kg	☼	03/14/22 11:30	03/14/22 16:02	1
o-Xylene	2.2	U	5.8	0.72	mg/Kg	☼	03/14/22 11:30	03/14/22 16:02	1
Xylenes, Total	2.2	U	5.8	1.0	mg/Kg	☼	03/14/22 11:30	03/14/22 16:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*98*		*85 - 116*	*03/14/22 11:30*	*03/14/22 16:02*	*1*
4-Bromofluorobenzene (Surr)	*96*		*79 - 119*	*03/14/22 11:30*	*03/14/22 16:02*	*1*
Dibromofluoromethane (Surr)	*95*		*78 - 119*	*03/14/22 11:30*	*03/14/22 16:02*	*1*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*	*03/14/22 11:30*	*03/14/22 16:02*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0043	J M	0.0058	0.0019	mg/Kg	☼	03/14/22 12:58	03/15/22 19:41	1
2-Methylnaphthalene	0.011	M	0.0058	0.0024	mg/Kg	☼	03/14/22 12:58	03/15/22 19:41	1
1-Methylnaphthalene	0.020	M	0.0058	0.00073	mg/Kg	☼	03/14/22 12:58	03/15/22 19:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*93*		*58 - 132*	*03/14/22 12:58*	*03/15/22 19:41*	*1*
2-methylnaphthalene-d10	*83*	*M*	*40 - 140*	*03/14/22 12:58*	*03/15/22 19:41*	*1*
Fluoranthene-d10 (Surr)	*86*		*40 - 140*	*03/14/22 12:58*	*03/15/22 19:41*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	260		57	11	mg/Kg	☼	03/14/22 12:19	03/16/22 10:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*86*	*M*	*45 - 130*	*03/14/22 12:19*	*03/16/22 10:59*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86.0		0.1	0.1	%			03/10/22 15:24	1
Percent Moisture	14.0		0.1	0.1	%			03/10/22 15:24	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: 2SMIS75-SON01-000.0

Date Collected: 03/04/22 15:50
Date Received: 03/09/22 09:45

Lab Sample ID: 580-111187-7

Matrix: Solid
Percent Solids: 95.5

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	39	U	52	17	mg/Kg	☼	03/14/22 11:30	03/14/22 16:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*67 - 134*	*03/14/22 11:30*	*03/14/22 16:25*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.20	U	0.26	0.050	mg/Kg	☼	03/14/22 11:30	03/14/22 16:25	1
Toluene	0.39	U	0.79	0.18	mg/Kg	☼	03/14/22 11:30	03/14/22 16:25	1
Ethylbenzene	0.39	U	0.52	0.12	mg/Kg	☼	03/14/22 11:30	03/14/22 16:25	1
m-Xylene & p-Xylene	0.20	U	0.52	0.093	mg/Kg	☼	03/14/22 11:30	03/14/22 16:25	1
o-Xylene	0.20	U	0.52	0.065	mg/Kg	☼	03/14/22 11:30	03/14/22 16:25	1
Xylenes, Total	0.20	U	0.52	0.093	mg/Kg	☼	03/14/22 11:30	03/14/22 16:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*98*		*85 - 116*	*03/14/22 11:30*	*03/14/22 16:25*	*1*
4-Bromofluorobenzene (Surr)	*95*		*79 - 119*	*03/14/22 11:30*	*03/14/22 16:25*	*1*
Dibromofluoromethane (Surr)	*96*		*78 - 119*	*03/14/22 11:30*	*03/14/22 16:25*	*1*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*	*03/14/22 11:30*	*03/14/22 16:25*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**0.22**		0.0048	0.0016	mg/Kg	☼	03/14/22 12:58	03/15/22 20:00	1
2-Methylnaphthalene	**1.9**		0.0048	0.0020	mg/Kg	☼	03/14/22 12:58	03/15/22 20:00	1
1-Methylnaphthalene	**1.6**		0.0048	0.00061	mg/Kg	☼	03/14/22 12:58	03/15/22 20:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*86*		*58 - 132*	*03/14/22 12:58*	*03/15/22 20:00*	*1*
2-methylnaphthalene-d10	*79*	*M*	*40 - 140*	*03/14/22 12:58*	*03/15/22 20:00*	*1*
Fluoranthene-d10 (Surr)	*79*		*40 - 140*	*03/14/22 12:58*	*03/15/22 20:00*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**400**		49	9.7	mg/Kg	☼	03/14/22 12:21	03/16/22 11:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*81*	*M*	*45 - 130*	*03/14/22 12:21*	*03/16/22 11:19*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**95.5**		0.1	0.1	%			03/10/22 15:24	1
Percent Moisture	**4.5**		0.1	0.1	%			03/10/22 15:24	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-375-SON01-000.0-1

Lab Sample ID: 580-111187-8

Date Collected: 03/05/22 14:10
Matrix: Solid
Date Received: 03/09/22 09:45

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	110	J1	48	19	mg/Kg		03/15/22 21:05	03/16/22 17:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*36*	*Q*	*45 - 130*	*03/15/22 21:05*	*03/16/22 17:31*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) - RE

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	310		46	18	mg/Kg		03/18/22 10:15	03/18/22 18:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*116*		*45 - 130*	*03/18/22 10:15*	*03/18/22 18:48*	*1*

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-150-SOFT01-000.0-1

Lab Sample ID: 580-111187-9

Date Collected: 03/05/22 14:50
Date Received: 03/09/22 09:45

Matrix: Solid

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	160		47	19	mg/Kg		03/15/22 21:05	03/16/22 18:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*82*		*45 - 130*	*03/15/22 21:05*	*03/16/22 18:31*	*1*

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-150-SOFT02-000.0-1

Lab Sample ID: 580-111187-10

Date Collected: 03/05/22 15:00
Date Received: 03/09/22 09:45

Matrix: Solid

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	190		46	18	mg/Kg		03/15/22 21:05	03/16/22 18:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*83*		*45 - 130*	*03/15/22 21:05*	*03/16/22 18:50*	*1*

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-150-SOFT03-000.0-1

Lab Sample ID: 580-111187-11

Date Collected: 03/05/22 15:10
Date Received: 03/09/22 09:45

Matrix: Solid

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	150		47	19	mg/Kg		03/15/22 21:05	03/16/22 19:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*74*		*45 - 130*	*03/15/22 21:05*	*03/16/22 19:09*	*1*

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS000-SON01-000.0-1

Lab Sample ID: 580-111187-12

Date Collected: 03/05/22 15:35
Matrix: Solid
Date Received: 03/09/22 09:45

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	280		47	19	mg/Kg		03/15/22 21:05	03/16/22 19:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*75*		*45 - 130*	*03/15/22 21:05*	*03/16/22 19:29*	*1*

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS215-SON01-000.0-1

Lab Sample ID: 580-111187-13

Date Collected: 03/05/22 16:05
Date Received: 03/09/22 09:45

Matrix: Solid

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	100		47	19	mg/Kg		03/15/22 21:05	03/16/22 19:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*77*		*45 - 130*	*03/15/22 21:05*	*03/16/22 19:48*	*1*

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: 2SMIS75-SON01-000.0-1

Lab Sample ID: 580-111187-14

Date Collected: 03/04/22 15:50
Date Received: 03/09/22 09:45

Matrix: Solid

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	250		46	18	mg/Kg		03/15/22 21:05	03/16/22 20:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*82*		*45 - 130*	*03/15/22 21:05*	*03/16/22 20:08*	*1*

QC Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 580-383770/1-A
Matrix: Solid
Analysis Batch: 383779

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 383770

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	3.0	U	4.0	1.3	mg/Kg		03/14/22 11:30	03/14/22 11:46	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*96*		*67 - 134*	*03/14/22 11:30*	*03/14/22 11:46*	*1*

Lab Sample ID: LCS 580-383770/4-A
Matrix: Solid
Analysis Batch: 383779

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 383770

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Gasoline Range Organics [C6 - C10]			40.0	35.7		mg/Kg		89	79 - 122		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*98*		*67 - 134*

Lab Sample ID: LCSD 580-383770/5-A
Matrix: Solid
Analysis Batch: 383779

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 383770

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics [C6 - C10]			40.0	36.6		mg/Kg		91	79 - 122	2	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*98*		*67 - 134*

Lab Sample ID: 580-111187-7 MS
Matrix: Solid
Analysis Batch: 383779

Client Sample ID: 2SMIS75-SON01-000.0
Prep Type: Total/NA
Prep Batch: 383770

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Gasoline Range Organics [C6 - C10]	39	U	524	605		mg/Kg	☼	115	79 - 122		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*98*		*67 - 134*

Lab Sample ID: 580-111187-7 MSD
Matrix: Solid
Analysis Batch: 383779

Client Sample ID: 2SMIS75-SON01-000.0
Prep Type: Total/NA
Prep Batch: 383770

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics [C6 - C10]	39	U	524	617		mg/Kg	☼	118	79 - 122	2	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*105*		*67 - 134*

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 580-383903/1-A
Matrix: Solid
Analysis Batch: 383933

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 383903

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	3.0	U	4.0	1.3	mg/Kg		03/15/22 08:00	03/15/22 12:24	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*67 - 134*	*03/15/22 08:00*	*03/15/22 12:24*	*1*

Lab Sample ID: LCS 580-383903/4-A
Matrix: Solid
Analysis Batch: 383933

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 383903

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics [C6 - C10]	40.0	37.5		mg/Kg		94	79 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*98*		*67 - 134*

Lab Sample ID: LCSD 580-383903/5-A
Matrix: Solid
Analysis Batch: 383933

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 383903

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics [C6 - C10]	40.0	37.1		mg/Kg		93	79 - 122	1	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*100*		*67 - 134*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 580-383770/1-A
Matrix: Solid
Analysis Batch: 383776

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 383770

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U	0.020	0.0038	mg/Kg		03/14/22 11:30	03/14/22 11:46	1
Toluene	0.030	U	0.060	0.014	mg/Kg		03/14/22 11:30	03/14/22 11:46	1
Ethylbenzene	0.030	U	0.040	0.0091	mg/Kg		03/14/22 11:30	03/14/22 11:46	1
m-Xylene & p-Xylene	0.015	U	0.040	0.0071	mg/Kg		03/14/22 11:30	03/14/22 11:46	1
o-Xylene	0.015	U	0.040	0.0050	mg/Kg		03/14/22 11:30	03/14/22 11:46	1
Xylenes, Total	0.015	U	0.040	0.0071	mg/Kg		03/14/22 11:30	03/14/22 11:46	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*99*		*85 - 116*	*03/14/22 11:30*	*03/14/22 11:46*	*1*
4-Bromofluorobenzene (Surr)	*94*		*79 - 119*	*03/14/22 11:30*	*03/14/22 11:46*	*1*
Dibromofluoromethane (Surr)	*95*		*78 - 119*	*03/14/22 11:30*	*03/14/22 11:46*	*1*
1,2-Dichloroethane-d4 (Surr)	*102*		*71 - 136*	*03/14/22 11:30*	*03/14/22 11:46*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 580-383770/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383776 — **Prep Batch: 383770**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	0.800	0.778		mg/Kg		97	77 - 121
Toluene	0.800	0.757		mg/Kg		95	77 - 121
Ethylbenzene	0.800	0.755		mg/Kg		94	76 - 122
m-Xylene & p-Xylene	0.800	0.758		mg/Kg		95	77 - 124
o-Xylene	0.800	0.743		mg/Kg		93	77 - 123
Xylenes, Total	1.60	1.50		mg/Kg		94	78 - 124

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Toluene-d8 (Surr)	*97*		*85 - 116*
4-Bromofluorobenzene (Surr)	*97*		*79 - 119*
Dibromofluoromethane (Surr)	*96*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*

Lab Sample ID: LCSD 580-383770/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383776 — **Prep Batch: 383770**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	0.800	0.803		mg/Kg		100	77 - 121	3	20
Toluene	0.800	0.786		mg/Kg		98	77 - 121	4	20
Ethylbenzene	0.800	0.777		mg/Kg		97	76 - 122	3	20
m-Xylene & p-Xylene	0.800	0.785		mg/Kg		98	77 - 124	3	20
o-Xylene	0.800	0.777		mg/Kg		97	77 - 123	4	20
Xylenes, Total	1.60	1.56		mg/Kg		98	78 - 124	4	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*97*		*85 - 116*
4-Bromofluorobenzene (Surr)	*98*		*79 - 119*
Dibromofluoromethane (Surr)	*100*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*

Lab Sample ID: 580-111187-7 MS — **Client Sample ID: 2SMIS75-SON01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383776 — **Prep Batch: 383770**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	0.20	U	5.24	5.59		mg/Kg	☼	107	77 - 121
Toluene	0.39	U	5.24	5.41		mg/Kg	☼	103	77 - 121
Ethylbenzene	0.39	U	5.24	5.39		mg/Kg	☼	103	76 - 122
m-Xylene & p-Xylene	0.20	U	5.24	5.46		mg/Kg	☼	104	77 - 124
o-Xylene	0.20	U	5.24	5.38		mg/Kg	☼	103	77 - 123
Xylenes, Total	0.20	U	10.5	10.8		mg/Kg	☼	103	78 - 124

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Toluene-d8 (Surr)	*97*		*85 - 116*
4-Bromofluorobenzene (Surr)	*98*		*79 - 119*
Dibromofluoromethane (Surr)	*100*		*78 - 119*

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 580-111187-7 MS
Matrix: Solid
Analysis Batch: 383776

Client Sample ID: 2SMIS75-SON01-000.0
Prep Type: Total/NA
Prep Batch: 383770

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*102*		*71 - 136*

Lab Sample ID: 580-111187-7 MSD
Matrix: Solid
Analysis Batch: 383776

Client Sample ID: 2SMIS75-SON01-000.0
Prep Type: Total/NA
Prep Batch: 383770

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	0.20	U	5.24	5.55		mg/Kg	☼	106	77 - 121	1	20
Toluene	0.39	U	5.24	5.60		mg/Kg	☼	107	77 - 121	3	20
Ethylbenzene	0.39	U	5.24	5.51		mg/Kg	☼	105	76 - 122	2	20
m-Xylene & p-Xylene	0.20	U	5.24	5.60		mg/Kg	☼	107	77 - 124	3	20
o-Xylene	0.20	U	5.24	5.42		mg/Kg	☼	104	77 - 123	1	20
Xylenes, Total	0.20	U	10.5	11.0		mg/Kg	☼	105	78 - 124	2	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*98*		*85 - 116*
4-Bromofluorobenzene (Surr)	*94*		*79 - 119*
Dibromofluoromethane (Surr)	*98*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-383752/1-A
Matrix: Solid
Analysis Batch: 383876

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 383752

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		03/14/22 12:58	03/15/22 12:30	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		03/14/22 12:58	03/15/22 12:30	1
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		03/14/22 12:58	03/15/22 12:30	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*110*		*58 - 132*	*03/14/22 12:58*	*03/15/22 12:30*	*1*
2-methylnaphthalene-d10	*89*		*40 - 140*	*03/14/22 12:58*	*03/15/22 12:30*	*1*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*	*03/14/22 12:58*	*03/15/22 12:30*	*1*

Lab Sample ID: LCS 580-383752/2-A
Matrix: Solid
Analysis Batch: 383876

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 383752

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Naphthalene	1.00	0.901		mg/Kg		90	38 - 111
2-Methylnaphthalene	1.00	0.868		mg/Kg		87	39 - 114
1-Methylnaphthalene	1.00	0.899		mg/Kg		90	43 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Terphenyl-d14	*103*		*58 - 132*
2-methylnaphthalene-d10	*87*		*40 - 140*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCS 580-383752/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383876 — **Prep Batch: 383752**

Surrogate	LCS %Recovery	LCS Qualifier	Limits
Fluoranthene-d10 (Surr)	*93*		*40 - 140*

Lab Sample ID: 580-111187-4 MS — **Client Sample ID: A3MIS-150-SOFT03-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383876 — **Prep Batch: 383752**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Naphthalene	0.036	M	1.13	1.01		mg/Kg	☼	86	38 - 111
2-Methylnaphthalene	0.051	M	1.13	1.01		mg/Kg	☼	85	39 - 114
1-Methylnaphthalene	0.094	M	1.13	1.02	M	mg/Kg	☼	82	43 - 111

Surrogate	MS %Recovery	MS Qualifier	Limits
Terphenyl-d14	*97*		*58 - 132*
2-methylnaphthalene-d10	*79*	*M*	*40 - 140*
Fluoranthene-d10 (Surr)	*89*		*40 - 140*

Lab Sample ID: 580-111187-4 MSD — **Client Sample ID: A3MIS-150-SOFT03-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383876 — **Prep Batch: 383752**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Naphthalene	0.036	M	1.12	1.05		mg/Kg	☼	91	38 - 111	4	20
2-Methylnaphthalene	0.051	M	1.12	1.05		mg/Kg	☼	89	39 - 114	4	20
1-Methylnaphthalene	0.094	M	1.12	1.18		mg/Kg	☼	97	43 - 111	15	20

Surrogate	MSD %Recovery	MSD Qualifier	Limits
Terphenyl-d14	*99*		*58 - 132*
2-methylnaphthalene-d10	*81*	*M*	*40 - 140*
Fluoranthene-d10 (Surr)	*91*		*40 - 140*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-383748/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383879 — **Prep Batch: 383748**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		03/14/22 12:19	03/15/22 14:16	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	*82*		*45 - 130*	*03/14/22 12:19*	*03/15/22 14:16*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: LCS 580-383748/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383879 — **Prep Batch: 383748**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)			500	495		mg/Kg		99	75 - 125		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*101*		*45 - 130*

Lab Sample ID: LCSD 580-383748/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383879 — **Prep Batch: 383748**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			500	490		mg/Kg		98	75 - 125	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*96*		*45 - 130*

Lab Sample ID: 580-111187-5 MS — **Client Sample ID: A3MIS000-SON01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383879 — **Prep Batch: 383748**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)	4200	J1	588	4830	4	mg/Kg	☼	100	75 - 125		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*96*		*45 - 130*

Lab Sample ID: 580-111187-5 MSD — **Client Sample ID: A3MIS000-SON01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 383879 — **Prep Batch: 383748**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	4200	J1	575	4520	4	mg/Kg	☼	48	75 - 125	7	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*94*		*45 - 130*

Lab Sample ID: MB 580-383968/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384047 — **Prep Batch: 383968**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		03/15/22 21:10	03/16/22 16:13	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*78*		*45 - 130*	*03/15/22 21:10*	*03/16/22 16:13*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: LCS 580-383968/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384047 — **Prep Batch: 383968**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Motor Oil Range Organics (C24-C40)			500	487		mg/Kg		97	39 - 106		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*103*		*45 - 130*

Lab Sample ID: LCSD 580-383968/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384047 — **Prep Batch: 383968**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Motor Oil Range Organics (C24-C40)			500	520		mg/Kg		104	39 - 106	7	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*101*		*45 - 130*

Lab Sample ID: 580-111187-8 MS — **Client Sample ID: A3MIS-375-SON01-000.0-1**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384047 — **Prep Batch: 383968**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Motor Oil Range Organics (C24-C40)	110	J1	473	749	J1	mg/Kg		136	39 - 106		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*98*		*45 - 130*

Lab Sample ID: 580-111187-8 MSD — **Client Sample ID: A3MIS-375-SON01-000.0-1**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384047 — **Prep Batch: 383968**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Motor Oil Range Organics (C24-C40)	110	J1	473	720	J1	mg/Kg		129	39 - 106	4	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*91*		*45 - 130*

Lab Sample ID: MB 580-384294/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384352 — **Prep Batch: 384294**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		03/18/22 10:15	03/18/22 17:29	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*88*		*45 - 130*	*03/18/22 10:15*	*03/18/22 17:29*	*1*

QC Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: LCS 580-384294/2-A
Matrix: Solid
Analysis Batch: 384352

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 384294

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Motor Oil Range Organics (C24-C40)			500	485		mg/Kg		97	39 - 106		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*112*		*45 - 130*

Lab Sample ID: LCSD 580-384294/3-A
Matrix: Solid
Analysis Batch: 384352

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 384294

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Motor Oil Range Organics (C24-C40)			500	462		mg/Kg		92	39 - 106	5	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*106*		*45 - 130*

Lab Chronicle

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-375-SON01-000.0

Lab Sample ID: 580-111187-1
Date Collected: 03/05/22 14:10
Matrix: Solid
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Analysis	2540G		1	383504	ASL	EET SEA	03/10/22 15:24

Client Sample ID: A3MIS-375-SON01-000.0

Lab Sample ID: 580-111187-1
Date Collected: 03/05/22 14:10
Matrix: Solid
Date Received: 03/09/22 09:45
Percent Solids: 91.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260/CALUFT DOD		1	383779	RJL	EET SEA	03/14/22 18:22
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260D		1	383776	RJL	EET SEA	03/14/22 18:22
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383752	DH	EET SEA	03/14/22 12:58
Total/NA	Analysis	8270E SIM		1	383876	E1L	EET SEA	03/15/22 17:20
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383752	DH	EET SEA	03/14/22 12:58
Total/NA	Analysis	8270E SIM		10	384094	T1L	EET SEA	03/16/22 17:55
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383748	DH	EET SEA	03/14/22 12:19
Total/NA	Analysis	8015D DRO		1	383879	ADB	EET SEA	03/15/22 15:15

Client Sample ID: A3MIS-150-SOFT01-000.0

Lab Sample ID: 580-111187-2
Date Collected: 03/05/22 14:50
Matrix: Solid
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Analysis	2540G		1	383504	ASL	EET SEA	03/10/22 15:24

Client Sample ID: A3MIS-150-SOFT01-000.0

Lab Sample ID: 580-111187-2
Date Collected: 03/05/22 14:50
Matrix: Solid
Date Received: 03/09/22 09:45
Percent Solids: 86.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260/CALUFT DOD		1	383779	RJL	EET SEA	03/14/22 18:45
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260D		1	383776	RJL	EET SEA	03/14/22 18:45
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383752	DH	EET SEA	03/14/22 12:58
Total/NA	Analysis	8270E SIM		1	383876	E1L	EET SEA	03/15/22 17:39

Lab Chronicle

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-150-SOFT01-000.0 — Lab Sample ID: 580-111187-2

Date Collected: 03/05/22 14:50 — **Matrix: Solid**
Date Received: 03/09/22 09:45 — **Percent Solids: 86.0**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383748	DH	EET SEA	03/14/22 12:19
Total/NA	Analysis	8015D DRO		1	383879	ADB	EET SEA	03/15/22 15:35

Client Sample ID: A3MIS-150-SOFT02-000.0 — Lab Sample ID: 580-111187-3

Date Collected: 03/05/22 15:00 — **Matrix: Solid**
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Analysis	2540G		1	383504	ASL	EET SEA	03/10/22 15:24

Client Sample ID: A3MIS-150-SOFT02-000.0 — Lab Sample ID: 580-111187-3

Date Collected: 03/05/22 15:00 — **Matrix: Solid**
Date Received: 03/09/22 09:45 — **Percent Solids: 87.1**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260/CALUFT DOD		1	383779	RJL	EET SEA	03/14/22 19:08
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260D		1	383776	RJL	EET SEA	03/14/22 19:08
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383752	DH	EET SEA	03/14/22 12:58
Total/NA	Analysis	8270E SIM		1	383876	E1L	EET SEA	03/15/22 17:58
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383748	DH	EET SEA	03/14/22 12:19
Total/NA	Analysis	8015D DRO		1	383879	ADB	EET SEA	03/15/22 15:55

Client Sample ID: A3MIS-150-SOFT03-000.0 — Lab Sample ID: 580-111187-4

Date Collected: 03/05/22 15:10 — **Matrix: Solid**
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Analysis	2540G		1	383504	ASL	EET SEA	03/10/22 15:24

Client Sample ID: A3MIS-150-SOFT03-000.0 — Lab Sample ID: 580-111187-4

Date Collected: 03/05/22 15:10 — **Matrix: Solid**
Date Received: 03/09/22 09:45 — **Percent Solids: 85.8**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260/CALUFT DOD		1	383779	RJL	EET SEA	03/14/22 19:31

Lab Chronicle

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-150-SOFT03-000.0

Lab Sample ID: 580-111187-4
Date Collected: 03/05/22 15:10
Matrix: Solid
Date Received: 03/09/22 09:45
Percent Solids: 85.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260D		1	383776	RJL	EET SEA	03/14/22 19:31
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383752	DH	EET SEA	03/14/22 12:58
Total/NA	Analysis	8270E SIM		1	383876	E1L	EET SEA	03/15/22 18:24
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383748	DH	EET SEA	03/14/22 12:19
Total/NA	Analysis	8015D DRO		1	383879	ADB	EET SEA	03/15/22 16:14

Client Sample ID: A3MIS000-SON01-000.0

Lab Sample ID: 580-111187-5
Date Collected: 03/05/22 15:35
Matrix: Solid
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Analysis	2540G		1	383504	ASL	EET SEA	03/10/22 15:24

Client Sample ID: A3MIS000-SON01-000.0

Lab Sample ID: 580-111187-5
Date Collected: 03/05/22 15:35
Matrix: Solid
Date Received: 03/09/22 09:45
Percent Solids: 82.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383903	RJL	EET SEA	03/15/22 12:59
Total/NA	Analysis	8260/CALUFT DOD		1	383933	CJ	EET SEA	03/15/22 14:20
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260D		1	383776	RJL	EET SEA	03/14/22 15:15
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383752	DH	EET SEA	03/14/22 12:58
Total/NA	Analysis	8270E SIM		1	383876	E1L	EET SEA	03/15/22 19:21
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383748	DH	EET SEA	03/14/22 12:19
Total/NA	Analysis	8015D DRO		1	383879	ADB	EET SEA	03/15/22 16:34

Client Sample ID: A3MIS215-SON01-000.0

Lab Sample ID: 580-111187-6
Date Collected: 03/05/22 16:05
Matrix: Solid
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Analysis	2540G		1	383504	ASL	EET SEA	03/10/22 15:24

Lab Chronicle

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS215-SON01-000.0

Lab Sample ID: 580-111187-6
Date Collected: 03/05/22 16:05
Matrix: Solid
Date Received: 03/09/22 09:45
Percent Solids: 86.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383903	RJL	EET SEA	03/15/22 12:59
Total/NA	Analysis	8260/CALUFT DOD		1	383933	CJ	EET SEA	03/15/22 14:44
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260D		1	383776	RJL	EET SEA	03/14/22 16:02
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383752	DH	EET SEA	03/14/22 12:58
Total/NA	Analysis	8270E SIM		1	383876	E1L	EET SEA	03/15/22 19:41
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383748	DH	EET SEA	03/14/22 12:19
Total/NA	Analysis	8015D DRO		1	384047	ADB	EET SEA	03/16/22 10:59

Client Sample ID: 2SMIS75-SON01-000.0

Lab Sample ID: 580-111187-7
Date Collected: 03/04/22 15:50
Matrix: Solid
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Analysis	2540G		1	383504	ASL	EET SEA	03/10/22 15:24

Client Sample ID: 2SMIS75-SON01-000.0

Lab Sample ID: 580-111187-7
Date Collected: 03/04/22 15:50
Matrix: Solid
Date Received: 03/09/22 09:45
Percent Solids: 95.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260/CALUFT DOD		1	383779	RJL	EET SEA	03/14/22 16:25
Total/NA	ISM Prep	Increment, Prep			383768	JBT	EET SEA	03/14/22 11:20
Total/NA	Prep	5035			383770	JBT	EET SEA	03/14/22 11:30
Total/NA	Analysis	8260D		1	383776	RJL	EET SEA	03/14/22 16:25
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383752	DH	EET SEA	03/14/22 12:58
Total/NA	Analysis	8270E SIM		1	383876	E1L	EET SEA	03/15/22 20:00
Total/NA	ISM Prep	Increment, prep			383433	JHR	EET SEA	03/10/22 10:00
Total/NA	Prep	3546			383748	DH	EET SEA	03/14/22 12:21
Total/NA	Analysis	8015D DRO		1	384047	ADB	EET SEA	03/16/22 11:19

Lab Chronicle

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS-375-SON01-000.0-1 — Lab Sample ID: 580-111187-8

Date Collected: 03/05/22 14:10 — **Matrix: Solid**
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383434	CLC	EET SEA	03/10/22 10:04
Total/NA	Prep	3546			383968	DH	EET SEA	03/15/22 21:05
Total/NA	Analysis	8015D DRO		1	384047	ADB	EET SEA	03/16/22 17:31
Total/NA	ISM Prep	Increment, prep	RE		383434	CLC	EET SEA	03/10/22 10:04
Total/NA	Prep	3546	RE		384294	JCM	EET SEA	03/18/22 10:15
Total/NA	Analysis	8015D DRO	RE	1	384352	ADB	EET SEA	03/18/22 18:48

Client Sample ID: A3MIS-150-SOFT01-000.0-1 — Lab Sample ID: 580-111187-9

Date Collected: 03/05/22 14:50 — **Matrix: Solid**
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383434	CLC	EET SEA	03/10/22 10:04
Total/NA	Prep	3546			383968	DH	EET SEA	03/15/22 21:05
Total/NA	Analysis	8015D DRO		1	384047	ADB	EET SEA	03/16/22 18:31

Client Sample ID: A3MIS-150-SOFT02-000.0-1 — Lab Sample ID: 580-111187-10

Date Collected: 03/05/22 15:00 — **Matrix: Solid**
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383434	CLC	EET SEA	03/10/22 10:04
Total/NA	Prep	3546			383968	DH	EET SEA	03/15/22 21:05
Total/NA	Analysis	8015D DRO		1	384047	ADB	EET SEA	03/16/22 18:50

Client Sample ID: A3MIS-150-SOFT03-000.0-1 — Lab Sample ID: 580-111187-11

Date Collected: 03/05/22 15:10 — **Matrix: Solid**
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383434	CLC	EET SEA	03/10/22 10:04
Total/NA	Prep	3546			383968	DH	EET SEA	03/15/22 21:05
Total/NA	Analysis	8015D DRO		1	384047	ADB	EET SEA	03/16/22 19:09

Client Sample ID: A3MIS000-SON01-000.0-1 — Lab Sample ID: 580-111187-12

Date Collected: 03/05/22 15:35 — **Matrix: Solid**
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383434	CLC	EET SEA	03/10/22 10:04
Total/NA	Prep	3546			383968	DH	EET SEA	03/15/22 21:05
Total/NA	Analysis	8015D DRO		1	384047	ADB	EET SEA	03/16/22 19:29

Lab Chronicle

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Client Sample ID: A3MIS215-SON01-000.0-1

Lab Sample ID: 580-111187-13
Date Collected: 03/05/22 16:05
Matrix: Solid
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383434	CLC	EET SEA	03/10/22 10:04
Total/NA	Prep	3546			383968	DH	EET SEA	03/15/22 21:05
Total/NA	Analysis	8015D DRO		1	384047	ADB	EET SEA	03/16/22 19:48

Client Sample ID: 2SMIS75-SON01-000.0-1

Lab Sample ID: 580-111187-14
Date Collected: 03/04/22 15:50
Matrix: Solid
Date Received: 03/09/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			383434	CLC	EET SEA	03/10/22 10:04
Total/NA	Prep	3546			383968	DH	EET SEA	03/15/22 21:05
Total/NA	Analysis	8015D DRO		1	384047	ADB	EET SEA	03/16/22 20:08

Laboratory References:

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-111187-1
Project/Site: Red Hill JBPHH N62742-17-D-1800

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111187-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-111187-1	A3MIS-375-SON01-000.0	Solid	03/05/22 14:10	03/09/22 09:45
580-111187-2	A3MIS-150-SOFT01-000.0	Solid	03/05/22 14:50	03/09/22 09:45
580-111187-3	A3MIS-150-SOFT02-000.0	Solid	03/05/22 15:00	03/09/22 09:45
580-111187-4	A3MIS-150-SOFT03-000.0	Solid	03/05/22 15:10	03/09/22 09:45
580-111187-5	A3MIS000-SON01-000.0	Solid	03/05/22 15:35	03/09/22 09:45
580-111187-6	A3MIS215-SON01-000.0	Solid	03/05/22 16:05	03/09/22 09:45
580-111187-7	2SMIS75-SON01-000.0	Solid	03/04/22 15:50	03/09/22 09:45
580-111187-8	A3MIS-375-SON01-000.0-1	Solid	03/05/22 14:10	03/09/22 09:45
580-111187-9	A3MIS-150-SOFT01-000.0-1	Solid	03/05/22 14:50	03/09/22 09:45
580-111187-10	A3MIS-150-SOFT02-000.0-1	Solid	03/05/22 15:00	03/09/22 09:45
580-111187-11	A3MIS-150-SOFT03-000.0-1	Solid	03/05/22 15:10	03/09/22 09:45
580-111187-12	A3MIS000-SON01-000.0-1	Solid	03/05/22 15:35	03/09/22 09:45
580-111187-13	A3MIS215-SON01-000.0-1	Solid	03/05/22 16:05	03/09/22 09:45
580-111187-14	2SMIS75-SON01-000.0-1	Solid	03/04/22 15:50	03/09/22 09:45

Eurofins-Seattle
5755 8th St E,
Tacoma, WA 98424
Phone : 253-248-4972

580-111187 Chain of Custody

Chain of Custody Record

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Client Information	Sampler:	Lab PM: [redacted] (b) (6)	Carrier Tracking No(s):	COC No: 460-141251-91360.5
Client Contact: Mr. [redacted] (b) (6)	Phone:	E-Mail: [redacted] (b) (6) @EurofinsET.com	State of Origin:	Page: Page 5 of 5
Company: AECOM	PWSID:			Job #:
Address: 1001 Bishop Street, ASB Tower, Suite 1600	Due Date Requested:			
City: Honolulu	TAT Requested (days):			
State, Zip: Hawaii, 96813	Compliance Project: Δ Yes Δ No			
Phone: [redacted] (b) (6)	PO #: Purchase Order Requested			
Email: [redacted] (b) (6) @aecom.com	WO #:			
Project Name: Site Char, Cut-outs	Project #: ='Data Input'!D1			
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Z - Methanol

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX/TPH-g	N,1MN,2MN, TPHd/o	Total Number of containers	Special Instructions/Note:
			Preservation Code:				F			
A3MIS-375-SON01-000.0	3/5/22	2:10:00 PM	MIS	SO			6	1		
A3MIS-150-SOFT01-000.0	3/5/22	2:50:00 PM	MIS	SO			6	1		
A3MIS-150-SOFT02-000.0	3/5/22	3:00:00 PM	MIS	SO			6	1		
#N/A	#N/A	#N/A	#N/A	#N/A			###	###		
#N/A	#N/A	#N/A	#N/A	#N/A			###	###		

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown* ☐ *Radiological*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by: [redacted] (b) (6)	Date:	Time:	Method of Shipment:		
Relinqui [redacted]	Date/Time: 7 MAR 22	Company: AECOM	Received by: [redacted] (b) (6)	Date/Time: 3/9/22 0945	Company: EFGS
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: FedPO Ing Red /wet /bub A3 0.4/0.4 w/cs

Eurofins-Seattle
5755 8th St E,
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

Client Information	Sampler:	Lab PM: [redacted] (b) (6)	Carrier Tracking No(s):	COC No: 460-141251-91360.5 2 of 2
Client Contact: Mr. [redacted] (b) (6)	Phone:	E-Mail: [redacted] (b) (6) @EurofinsET.com	State of Origin:	Page: Page 5 of 5
Company: AECOM	PWSID:			Job #:
Address: 1001 Bishop Street, ASB Tower, Suite 1600	Due Date Requested:			
City: Honolulu	TAT Requested (days):			
State, Zip: Hawaii, 96813	Compliance Project: Δ Yes Δ No			
Phone: [redacted] (b) (6)	PO #: Purchase Order Requested			
Email: [redacted] (b) (6) @aecom.com	WO #:			
Project Name: Site Char, Cut-outs	Project #: ='Data Input'!D1			
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - Di Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - Methanol

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX/TPH-g	N,1MN,2MN, TPHd/o	Total Number of containers	Special Instructions/Note:
			Preservation Code:				F			
3MIS-150-SOFT03-000.0	3/5/22	3:10:00 PM	MIS	SO			6	1		
3MIS000-SON01-000.0	3/5/22	3:35:00 PM	MIS	SO			6	1		
3MIS225-SON01-000.0	3/5/22	4:05:00 PM	MIS	SO			6	1		
SMIS75-SON01-000.0	3/4/22	3:50:00 PM	MIS	SO			6	1		
N/A	#N/A	#N/A	#N/A	#N/A			###	###		
N/A	#N/A	#N/A	#N/A	#N/A			###	###		

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown* ☐ *Radiological*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
[redacted] (b) (6)	7 MAR 22	AECOM	[redacted] (b) (6)	3/9/22 0945	EFGS
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: FedPo LgRed/wet/bub A3 1.3/1.3 w/cs

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-111187-1

Login Number: 111187
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	No Name
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details. See Other-Anomaly
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-111395-1
Client Project/Site: Red Hill JBPHH N62742-17-D-1800
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
8/26/2022 2:34:46 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-111395-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: Red Hill JBPHH N62742-17-D-1800
Report Number: 580-111395-1

REVISION 1: AUGUST 8, 26, 2022
Report revised to include the missing ICAL and raw data for 8270E SIM on TAC023. In addition, one surrogate was removed from the SIM list that was not required.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
Six samples were received on 3/15/2022 10:30 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.6º C.

Receipt Exceptions

All container labels lack IDs. Samples lined up per sampling times. A3215-SON01-002.0 (580-111395-1), A3325-SON01-002.0 (580-111395-2), A3-150-SON01-002.0 (580-111395-3), A3000-SON01-002.0 (580-111395-4), A3325-WGN01-002.0 (580-111395-5) and A3215-WGN01-002.0 (580-111395-6)

The container of the following water sample is ~3/4 full. A3325-WGN01-002.0 (580-111395-5)

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) - SOIL
Samples A3215-SON01-002.0 (580-111395-1), A3325-SON01-002.0 (580-111395-2), A3-150-SON01-002.0 (580-111395-3) and A3000-SON01-002.0 (580-111395-4) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 03/17/2022 and analyzed on 03/21/2022.

2,4,6-Tribromophenol, 2-methylnaphthalene-d10, Fluoranthene-d10 (Surr) and Terphenyl-d14 failed the surrogate recovery criteria low for A3-150-SON01-002.0 (580-111395-3). 2,4,6-Tribromophenol, 2-methylnaphthalene-d10, Fluoranthene-d10 (Surr) and Terphenyl-d14

Job ID: 580-111395-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

failed the surrogate recovery criteria low for A3000-SON01-002.0 (580-111395-4). The sample were re-extracted and reanalyzed with passing surrogates. The reanalyses have been reported for these samples.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) - WATER

Samples A3325-WGN01-002.0 (580-111395-5) and A3215-WGN01-002.0 (580-111395-6) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 03/16/2022 and analyzed on 03/17/2022.

The following samples were decanted prior to preparation because the samples were provided in a 500mL container A3325-WGN01-002.0 (580-111395-5) and A3215-WGN01-002.0 (580-111395-6). This necessitated adding surrogate and solvent directly into the separatory funnel for each sample. The samples were otherwise processed normally according to the SOP.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS - SOIL

Samples A3215-SON01-002.0 (580-111395-1), A3325-SON01-002.0 (580-111395-2), A3-150-SON01-002.0 (580-111395-3) and A3000-SON01-002.0 (580-111395-4) were analyzed for diesel range organics in accordance with 8015DRO. The samples were prepared on 03/16/2022 and analyzed on 03/21/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS - WATER

Samples A3325-WGN01-002.0 (580-111395-5) and A3215-WGN01-002.0 (580-111395-6) were analyzed for Diesel Range Organics in accordance with 8015D DRO. The samples were prepared on 03/18/2022 and analyzed on 03/21/2022.

The following samples were decanted prior to preparation because the samples were provided in a 500mL container A3325-WGN01-002.0 (580-111395-5) and A3215-WGN01-002.0 (580-111395-6). This necessitated adding surrogate and solvent directly into the separatory funnel for each sample. The samples were otherwise processed normally according to the SOP.

C10-C24 was detected in method blank MB 580-384319/1-A at a level that was above the method detection limit but below the reporting limit. The value should be considered an estimate. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. There was insufficient sample to perform a re-extraction and/or re-analysis; therefore, the data have been reported.

o-Terphenyl failed the surrogate recovery criteria low for MB 580-384319/1-A. There was insufficient sample to perform a re-extraction and/or re-analysis; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Samples A3215-SON01-002.0 (580-111395-1), A3325-SON01-002.0 (580-111395-2), A3-150-SON01-002.0 (580-111395-3) and A3000-SON01-002.0 (580-111395-4) were analyzed for percent solids in accordance with ASTM D2216. The samples were analyzed on 03/18/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Job ID: 580-111395-1
Project/Site: Red Hill JBPHH N62742-17-D-1800

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
B	Blank contamination: The analyte was detected above one-half the reporting limit in an associated blank.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Client Sample ID: A3215-SON01-002.0

Date Collected: 03/11/22 11:55
Date Received: 03/15/22 10:30

Lab Sample ID: 580-111395-1

Matrix: Solid
Percent Solids: 61.2

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**0.0013**	**J M**	0.0075	0.00095	mg/Kg	☼	03/17/22 13:24	03/21/22 14:05	1
2-Methylnaphthalene	0.0045	U M	0.0075	0.0031	mg/Kg	☼	03/17/22 13:24	03/21/22 14:05	1
Naphthalene	**0.0027**	**J M**	0.0075	0.0024	mg/Kg	☼	03/17/22 13:24	03/21/22 14:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*85*		*40 - 140*	*03/17/22 13:24*	*03/21/22 14:05*	*1*
Fluoranthene-d10 (Surr)	*87*		*40 - 140*	*03/17/22 13:24*	*03/21/22 14:05*	*1*
Terphenyl-d14	*98*		*58 - 132*	*03/17/22 13:24*	*03/21/22 14:05*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	47	U	78	16	mg/Kg	☼	03/16/22 15:08	03/21/22 22:04	1
Motor Oil Range Organics (C24-C40)	47	U	78	31	mg/Kg	☼	03/16/22 15:08	03/21/22 22:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*89*		*45 - 130*	*03/16/22 15:08*	*03/21/22 22:04*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**61.2**		0.1	0.1	%			03/18/22 09:19	1
Percent Moisture	**38.8**		0.1	0.1	%			03/18/22 09:19	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Client Sample ID: A3325-SON01-002.0

Date Collected: 03/11/22 12:05
Date Received: 03/15/22 10:30

Lab Sample ID: 580-111395-2

Matrix: Solid
Percent Solids: 68.6

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0024	J M	0.0068	0.00086	mg/Kg	☼	03/17/22 13:24	03/21/22 14:25	1
2-Methylnaphthalene	0.0044	J M	0.0068	0.0028	mg/Kg	☼	03/17/22 13:24	03/21/22 14:25	1
Naphthalene	0.030	M	0.0068	0.0022	mg/Kg	☼	03/17/22 13:24	03/21/22 14:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*106*		*40 - 140*	*03/17/22 13:24*	*03/21/22 14:25*	*1*
Fluoranthene-d10 (Surr)	*121*		*40 - 140*	*03/17/22 13:24*	*03/21/22 14:25*	*1*
Terphenyl-d14	*128*		*58 - 132*	*03/17/22 13:24*	*03/21/22 14:25*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	18	J	69	14	mg/Kg	☼	03/16/22 15:08	03/21/22 22:24	1
Motor Oil Range Organics (C24-C40)	83		69	28	mg/Kg	☼	03/16/22 15:08	03/21/22 22:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*85*		*45 - 130*	*03/16/22 15:08*	*03/21/22 22:24*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	68.6		0.1	0.1	%			03/18/22 09:19	1
Percent Moisture	31.4		0.1	0.1	%			03/18/22 09:19	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Client Sample ID: A3-150-SON01-002.0

Date Collected: 03/11/22 12:45
Date Received: 03/15/22 10:30

Lab Sample ID: 580-111395-3

Matrix: Solid
Percent Solids: 65.7

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0018	U	0.0061	0.00076	mg/Kg	☼	03/23/22 17:37	03/24/22 18:42	1
2-Methylnaphthalene	0.0036	U	0.0061	0.0025	mg/Kg	☼	03/23/22 17:37	03/24/22 18:42	1
Naphthalene	0.0048	U M	0.0061	0.0020	mg/Kg	☼	03/23/22 17:37	03/24/22 18:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*90*		*40 - 140*	*03/23/22 17:37*	*03/24/22 18:42*	*1*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*	*03/23/22 17:37*	*03/24/22 18:42*	*1*
Terphenyl-d14	*102*		*58 - 132*	*03/23/22 17:37*	*03/24/22 18:42*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**20**	**J**	67	13	mg/Kg	☼	03/16/22 15:08	03/21/22 22:45	1
Motor Oil Range Organics (C24-C40)	**93**		67	27	mg/Kg	☼	03/16/22 15:08	03/21/22 22:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*81*		*45 - 130*	*03/16/22 15:08*	*03/21/22 22:45*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**65.7**		0.1	0.1	%			03/18/22 09:19	1
Percent Moisture	**34.3**		0.1	0.1	%			03/18/22 09:19	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Client Sample ID: A3000-SON01-002.0

Date Collected: 03/11/22 13:05
Date Received: 03/15/22 10:30

Lab Sample ID: 580-111395-4

Matrix: Solid
Percent Solids: 55.6

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**8.6**		0.0082	0.0010	mg/Kg	☼	03/23/22 17:37	03/24/22 19:01	1
2-Methylnaphthalene	**11**		0.0082	0.0033	mg/Kg	☼	03/23/22 17:37	03/24/22 19:01	1
Naphthalene	**4.8**		0.0082	0.0026	mg/Kg	☼	03/23/22 17:37	03/24/22 19:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*67*		*40 - 140*	*03/23/22 17:37*	*03/24/22 19:01*	*1*
Fluoranthene-d10 (Surr)	*106*		*40 - 140*	*03/23/22 17:37*	*03/24/22 19:01*	*1*
Terphenyl-d14	*114*		*58 - 132*	*03/23/22 17:37*	*03/24/22 19:01*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**3800**		82	16	mg/Kg	☼	03/16/22 15:08	03/21/22 23:05	1
Motor Oil Range Organics (C24-C40)	49	U	82	33	mg/Kg	☼	03/16/22 15:08	03/21/22 23:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*86*		*45 - 130*	*03/16/22 15:08*	*03/21/22 23:05*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**55.6**		0.1	0.1	%			03/18/22 09:19	1
Percent Moisture	**44.4**		0.1	0.1	%			03/18/22 09:19	1

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Client Sample ID: A3325-WGN01-002.0

Lab Sample ID: 580-111395-5

Date Collected: 03/11/22 11:15
Matrix: Water
Date Received: 03/15/22 10:30

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**0.049**	**J M**	0.094	0.018	ug/L		03/16/22 11:14	03/17/22 17:06	1
2-Methylnaphthalene	0.076	U M	0.19	0.037	ug/L		03/16/22 11:14	03/17/22 17:06	1
Naphthalene	0.076	U M	0.094	0.029	ug/L		03/16/22 11:14	03/17/22 17:06	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*59*		*40 - 140*	*03/16/22 11:14*	*03/17/22 17:06*	*1*
Fluoranthene-d10 (Surr)	*93*		*40 - 140*	*03/16/22 11:14*	*03/17/22 17:06*	*1*
Terphenyl-d14	*115*		*58 - 132*	*03/16/22 11:14*	*03/17/22 17:06*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**570**	**B**	140	83	ug/L		03/18/22 11:10	03/21/22 04:21	1
Motor Oil Range Organics (C24-C40)	**630**		450	230	ug/L		03/18/22 11:10	03/21/22 04:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*63*		*56 - 125*	*03/18/22 11:10*	*03/21/22 04:21*	*1*

Client Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Client Sample ID: A3215-WGN01-002.0

Lab Sample ID: 580-111395-6

Date Collected: 03/11/22 11:35
Matrix: Water
Date Received: 03/15/22 10:30

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.036	U	0.11	0.021	ug/L		03/16/22 11:14	03/17/22 17:29	1
2-Methylnaphthalene	0.089	U M	0.22	0.043	ug/L		03/16/22 11:14	03/17/22 17:29	1
Naphthalene	0.089	U	0.11	0.035	ug/L		03/16/22 11:14	03/17/22 17:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*53*		*40 - 140*	*03/16/22 11:14*	*03/17/22 17:29*	*1*
Fluoranthene-d10 (Surr)	*82*		*40 - 140*	*03/16/22 11:14*	*03/17/22 17:29*	*1*
Terphenyl-d14	*97*		*58 - 132*	*03/16/22 11:14*	*03/17/22 17:29*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**230**	**B**	120	72	ug/L		03/18/22 11:10	03/21/22 04:59	1
Motor Oil Range Organics (C24-C40)	**380**	**J**	390	200	ug/L		03/18/22 11:10	03/21/22 04:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*58*		*56 - 125*	*03/18/22 11:10*	*03/21/22 04:59*	*1*

QC Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-384030/1-A
Matrix: Water
Analysis Batch: 384150

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 384030

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.032	U	0.10	0.019	ug/L		03/16/22 11:14	03/17/22 13:25	1
2-Methylnaphthalene	0.080	U	0.20	0.039	ug/L		03/16/22 11:14	03/17/22 13:25	1
Naphthalene	0.080	U	0.10	0.031	ug/L		03/16/22 11:14	03/17/22 13:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*87*		*40 - 140*	*03/16/22 11:14*	*03/17/22 13:25*	*1*
Fluoranthene-d10 (Surr)	*103*		*40 - 140*	*03/16/22 11:14*	*03/17/22 13:25*	*1*
Terphenyl-d14	*127*		*58 - 132*	*03/16/22 11:14*	*03/17/22 13:25*	*1*

Lab Sample ID: LCS 580-384030/2-A
Matrix: Water
Analysis Batch: 384150

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 384030

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	4.00	2.95		ug/L		74	41 - 115
2-Methylnaphthalene	4.00	3.06		ug/L		76	39 - 114
Naphthalene	4.00	2.86		ug/L		71	43 - 114

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*88*		*40 - 140*
Fluoranthene-d10 (Surr)	*108*		*40 - 140*
Terphenyl-d14	*131*	*M*	*58 - 132*

Lab Sample ID: LCSD 580-384030/3-A
Matrix: Water
Analysis Batch: 384150

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 384030

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	4.00	2.67		ug/L		67	41 - 115	10	20
2-Methylnaphthalene	4.00	2.73		ug/L		68	39 - 114	11	20
Naphthalene	4.00	2.51		ug/L		63	43 - 114	13	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*74*		*40 - 140*
Fluoranthene-d10 (Surr)	*107*		*40 - 140*
Terphenyl-d14	*131*		*58 - 132*

Lab Sample ID: MB 580-384185/1-A
Matrix: Solid
Analysis Batch: 384521

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 384185

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		03/17/22 13:24	03/21/22 12:10	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		03/17/22 13:24	03/21/22 12:10	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		03/17/22 13:24	03/21/22 12:10	1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: MB 580-384185/1-A
Matrix: Solid
Analysis Batch: 384521

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 384185

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
2-methylnaphthalene-d10	104		40 - 140	03/17/22 13:24	03/21/22 12:10	1
Fluoranthene-d10 (Surr)	120		40 - 140	03/17/22 13:24	03/21/22 12:10	1
Terphenyl-d14	129		58 - 132	03/17/22 13:24	03/21/22 12:10	1

Lab Sample ID: LCS 580-384185/2-A
Matrix: Solid
Analysis Batch: 384521

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 384185

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	1.09		mg/Kg		109	43 - 111
2-Methylnaphthalene	1.00	1.06		mg/Kg		106	39 - 114
Naphthalene	1.00	1.06		mg/Kg		106	38 - 111

Surrogate	LCS %Recovery	LCS Qualifier	Limits
2-methylnaphthalene-d10	109		40 - 140
Fluoranthene-d10 (Surr)	111		40 - 140
Terphenyl-d14	120		58 - 132

Lab Sample ID: LCSD 580-384185/3-A
Matrix: Solid
Analysis Batch: 384521

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 384185

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	1.00	0.970		mg/Kg		97	43 - 111	11	20
2-Methylnaphthalene	1.00	0.942		mg/Kg		94	39 - 114	12	20
Naphthalene	1.00	0.978		mg/Kg		98	38 - 111	9	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
2-methylnaphthalene-d10	99		40 - 140
Fluoranthene-d10 (Surr)	101		40 - 140
Terphenyl-d14	109		58 - 132

Lab Sample ID: 580-111395-2 MS
Matrix: Solid
Analysis Batch: 384521

Client Sample ID: A3325-SON01-002.0
Prep Type: Total/NA
Prep Batch: 384185

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	0.0024	J M	1.17	1.15		mg/Kg	☼	98	43 - 111
2-Methylnaphthalene	0.0044	J M	1.17	1.11		mg/Kg	☼	95	39 - 114
Naphthalene	0.030	M	1.17	1.13		mg/Kg	☼	94	38 - 111

Surrogate	MS %Recovery	MS Qualifier	Limits
2-methylnaphthalene-d10	94		40 - 140
Fluoranthene-d10 (Surr)	84		40 - 140
Terphenyl-d14	89		58 - 132

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: 580-111395-2 MSD — **Client Sample ID: A3325-SON01-002.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384521 — **Prep Batch: 384185**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	0.0024	J M	1.34	1.20		mg/Kg	☼	89	43 - 111	4	20
2-Methylnaphthalene	0.0044	J M	1.34	1.17		mg/Kg	☼	87	39 - 114	5	20
Naphthalene	0.030	M	1.34	1.22		mg/Kg	☼	88	38 - 111	8	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*87*		*40 - 140*
Fluoranthene-d10 (Surr)	*86*		*40 - 140*
Terphenyl-d14	*91*		*58 - 132*

Lab Sample ID: LCS 580-384875/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384984 — **Prep Batch: 384875**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.903		mg/Kg		90	43 - 111
2-Methylnaphthalene	1.00	0.869		mg/Kg		87	39 - 114
Naphthalene	1.00	0.884		mg/Kg		88	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*95*		*40 - 140*
Fluoranthene-d10 (Surr)	*94*		*40 - 140*
Terphenyl-d14	*102*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-384051/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384575 — **Prep Batch: 384051**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		03/16/22 14:24	03/21/22 14:41	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		03/16/22 14:24	03/21/22 14:41	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*96*		*45 - 130*	*03/16/22 14:24*	*03/21/22 14:41*	*1*

Lab Sample ID: LCS 580-384051/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 384575 — **Prep Batch: 384051**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	500	494		mg/Kg		99	75 - 125
Motor Oil Range Organics (C24-C40)	500	496		mg/Kg		99	39 - 106

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*80*		*45 - 130*

QC Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: LCSD 580-384051/3-A
Matrix: Solid
Analysis Batch: 384575

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 384051

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			500	495		mg/Kg		99	75 - 125	0	20
Motor Oil Range Organics (C24-C40)			500	494		mg/Kg		99	39 - 106	0	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*78*		*45 - 130*

Lab Sample ID: MB 580-384319/1-A
Matrix: Water
Analysis Batch: 384476

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 384319

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	73.7	J	110	65	ug/L		03/18/22 11:10	03/21/22 01:28	1
Motor Oil Range Organics (C24-C40)	300	U	350	180	ug/L		03/18/22 11:10	03/21/22 01:28	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*51*	*Q*	*56 - 125*	*03/18/22 11:10*	*03/21/22 01:28*	*1*

Lab Sample ID: LCS 580-384319/2-A
Matrix: Water
Analysis Batch: 384476

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 384319

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)			4000	3080		ug/L		77	36 - 132		
Motor Oil Range Organics (C24-C40)			4000	3520		ug/L		88	41 - 113		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*76*		*56 - 125*

Lab Sample ID: LCSD 580-384319/3-A
Matrix: Water
Analysis Batch: 384476

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 384319

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			4000	3050		ug/L		76	36 - 132	1	20
Motor Oil Range Organics (C24-C40)			4000	3540		ug/L		88	41 - 113	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*72*		*56 - 125*

QC Sample Results

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Method: 2540G - SM 2540G

Lab Sample ID: 580-111395-4 DU
Matrix: Solid
Analysis Batch: 384281

Client Sample ID: A3000-SON01-002.0
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	55.6			55.9		%				0.4	20
Percent Moisture	44.4			44.1		%				0.6	20

Lab Chronicle

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Client Sample ID: A3215-SON01-002.0
Lab Sample ID: 580-111395-1
Date Collected: 03/11/22 11:55
Matrix: Solid
Date Received: 03/15/22 10:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	384281	TOA	EET SEA	03/18/22 09:19

Client Sample ID: A3215-SON01-002.0
Lab Sample ID: 580-111395-1
Date Collected: 03/11/22 11:55
Matrix: Solid
Date Received: 03/15/22 10:30
Percent Solids: 61.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			384185	DH	EET SEA	03/17/22 13:24
Total/NA	Analysis	8270E SIM		1	384521	TL1	EET SEA	03/21/22 14:05
Total/NA	Prep	3546			384051	DH	EET SEA	03/16/22 15:08
Total/NA	Analysis	8015D DRO		1	384575	T1W	EET SEA	03/21/22 22:04

Client Sample ID: A3325-SON01-002.0
Lab Sample ID: 580-111395-2
Date Collected: 03/11/22 12:05
Matrix: Solid
Date Received: 03/15/22 10:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	384281	TOA	EET SEA	03/18/22 09:19

Client Sample ID: A3325-SON01-002.0
Lab Sample ID: 580-111395-2
Date Collected: 03/11/22 12:05
Matrix: Solid
Date Received: 03/15/22 10:30
Percent Solids: 68.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			384185	DH	EET SEA	03/17/22 13:24
Total/NA	Analysis	8270E SIM		1	384521	TL1	EET SEA	03/21/22 14:25
Total/NA	Prep	3546			384051	DH	EET SEA	03/16/22 15:08
Total/NA	Analysis	8015D DRO		1	384575	T1W	EET SEA	03/21/22 22:24

Client Sample ID: A3-150-SON01-002.0
Lab Sample ID: 580-111395-3
Date Collected: 03/11/22 12:45
Matrix: Solid
Date Received: 03/15/22 10:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	384281	TOA	EET SEA	03/18/22 09:19

Client Sample ID: A3-150-SON01-002.0
Lab Sample ID: 580-111395-3
Date Collected: 03/11/22 12:45
Matrix: Solid
Date Received: 03/15/22 10:30
Percent Solids: 65.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			384875	TOA	EET SEA	03/23/22 17:37
Total/NA	Analysis	8270E SIM		1	384984	W1T	EET SEA	03/24/22 18:42
Total/NA	Prep	3546			384051	DH	EET SEA	03/16/22 15:08
Total/NA	Analysis	8015D DRO		1	384575	T1W	EET SEA	03/21/22 22:45

Lab Chronicle

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Client Sample ID: A3000-SON01-002.0
Lab Sample ID: 580-111395-4
Date Collected: 03/11/22 13:05
Matrix: Solid
Date Received: 03/15/22 10:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	384281	TOA	EET SEA	03/18/22 09:19

Client Sample ID: A3000-SON01-002.0
Lab Sample ID: 580-111395-4
Date Collected: 03/11/22 13:05
Matrix: Solid
Date Received: 03/15/22 10:30
Percent Solids: 55.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			384875	TOA	EET SEA	03/23/22 17:37
Total/NA	Analysis	8270E SIM		1	384984	W1T	EET SEA	03/24/22 19:01
Total/NA	Prep	3546			384051	DH	EET SEA	03/16/22 15:08
Total/NA	Analysis	8015D DRO		1	384575	T1W	EET SEA	03/21/22 23:05

Client Sample ID: A3325-WGN01-002.0
Lab Sample ID: 580-111395-5
Date Collected: 03/11/22 11:15
Matrix: Water
Date Received: 03/15/22 10:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3510C			384030	M1E	EET SEA	03/16/22 11:14
Total/NA	Analysis	8270E SIM		1	384150	W1T	EET SEA	03/17/22 17:06
Total/NA	Prep	3510C			384319	ASL	EET SEA	03/18/22 11:10
Total/NA	Analysis	8015D DRO		1	384476	JAE	EET SEA	03/21/22 04:21

Client Sample ID: A3215-WGN01-002.0
Lab Sample ID: 580-111395-6
Date Collected: 03/11/22 11:35
Matrix: Water
Date Received: 03/15/22 10:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3510C			384030	M1E	EET SEA	03/16/22 11:14
Total/NA	Analysis	8270E SIM		1	384150	W1T	EET SEA	03/17/22 17:29
Total/NA	Prep	3510C			384319	ASL	EET SEA	03/18/22 11:10
Total/NA	Analysis	8015D DRO		1	384476	JAE	EET SEA	03/21/22 04:59

Laboratory References:
EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-111395-1
Project/Site: Red Hill JBPHH N62742-17-D-1800

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: Red Hill JBPHH N62742-17-D-1800

Job ID: 580-111395-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-111395-1	A3215-SON01-002.0	Solid	03/11/22 11:55	03/15/22 10:30
580-111395-2	A3325-SON01-002.0	Solid	03/11/22 12:05	03/15/22 10:30
580-111395-3	A3-150-SON01-002.0	Solid	03/11/22 12:45	03/15/22 10:30
580-111395-4	A3000-SON01-002.0	Solid	03/11/22 13:05	03/15/22 10:30
580-111395-5	A3325-WGN01-002.0	Water	03/11/22 11:15	03/15/22 10:30
580-111395-6	A3215-WGN01-002.0	Water	03/11/22 11:35	03/15/22 10:30

580-111395 Chain of Custody

Eurofins-Seattle
5755 8th St E,
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

111395

Client Information	Sampler: (b) (6) [redacted]	Lab PM: (b) (6) [redacted]	Carrier Tracking No(s):	COC No: 1 of 1
Client Contact: Mr. (b) (6) [redacted]	Phone:	E-Mail: (b) (6) [redacted] @EurofinsET.com	State of Origin:	Page: Page 1 of 1
Company: AECOM	PWSID:			Job #: CTO 22F0106 - 02.30
Address: 1001 Bishop Street, ASB Tower, Suite 1600	Due Date Requested: 21-Mar-22			
City: Honolulu	TAT Requested (days): 4 Day TAT			
State, Zip: Hawaii, 96813	Compliance Project: Δ Yes Δ No			
Phone: (b) (6) [redacted]	PO #: Purchase Order Requested			
Email: (b) (6) [redacted] @aecom.com	WO #:			
Project Name: Site Char, Cut-outs	Project #: CTO 22F0106 02.30			
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

	Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	Total Number of containers	Special Instructions/Note:
				Preservation Code:				F			
-1	A3215-SON01-002.0	3/11/22	11:55:00 AM	G	SO			0	1		
	A3325-SON01-002.0	3/11/22	12:05:00 PM	G	SO			0	1		
-3	A3-150-SON01-002.0	3/11/22	12:45:00 PM	G	SO			0	1		
	A3000-SON01-002.0	3/11/22	1:05:00 PM	G	SO			0	1		
-5	A3325-WGN01-002.0	3/11/22	11:15:00 AM	G	WG			0	1		
	A3215-WGN01-002.0	3/11/22	11:35:00 AM	G	WG			0	1		

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown* ☐ *Radiological*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by: | Date: | Time: | Method of Shipment: FEDEX

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6) [redacted]	Digitally signed by Hart, Jeff DN: cn=Hart, Jeff, ou=USHNL1, email=Jeff.Hart@aecom.com Date: 2022.03.14 11:44:10 -10'00' 3/14/22 1300	AECOM	(b) (6) [redacted]	3/14/22 1200	AECOM
(b) (6) [redacted]	3/14/22 1400	AECOM	(b) (6) [redacted]	3/15/22 1030	EFGS
			[redacted]		

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: FedEx LgWhi/wet/bub A2 0.6/0.7 w/cs

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-111395-1

Login Number: 111395
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	False	1-500mL vs. the proper 2-250mL
Sample bottles are completely filled.	False	ncm
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-112035-1
Client Project/Site: 22F0106
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
7/29/2022 5:11:13 PM
[redacted], Client Service Manager
[redacted]
[redacted]@et.eurofinsus.com

Designee for

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-112035-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-112035-1

REVISION 1 July 29, 2022

Report has been revised for 8260B CALUFT results. Chromatographic integrations have been adjusted to forced baseline-baseline integration per Method and SOP.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT

Six samples were received on 3/31/2022 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 1.5º C.

Receipt Exceptions

A trip blank was submitted for analysis with these samples; however, it was not listed on the Chain of Custody (COC).

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

GASOLINE RANGE ORGANICS WITH INCREMENTAL PREPARATION

Samples A3000MISH-SOFT01-000.0 (580-112035-1), A3000MISH-SOFT02-000.0 (580-112035-2) and A3000MISH-SOFT03-000.0 (580-112035-3) were analyzed for gasoline range organics with incremental preparation in accordance with EPA SW-846 Method 8015B - GRO with incremental preparation. The samples were leached on 04/02/2022, and prepared and analyzed on 04/02/2022.

The following samples were provided to the laboratory with a significantly different initial weight than that required by the reference method: A3000MISH-SOFT01-000.0 (580-112035-1), A3000MISH-SOFT02-000.0 (580-112035-2), and A3000MISH-SOFT03-000.0 (580-112035-3). Deviations in the weight by more than 20% may affect reporting limits and potentially method performance. The method specifies 150g. The amount provided was below this range.

One of the ISM jars had dried out for sample A3000MISH-SOFT01-000.0 (580-112035-1). It was not used in the ism process and sample was processed using five jars instead of six.

Job ID: 580-112035-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

Gasoline Range Organics (GRO)-C6-C10 was detected in method blank MB 580-386132/1-A at a level that was above the method detection limit but below the reporting limit. The value should be considered an estimate. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. Result concentrations were less than ½ the reporting limit.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GASOLINE RANGE ORGANICS (GRO)

Samples A3-010-SON01-002.0 (580-112035-4), A3325H-SON01-001.0 (580-112035-5) and Trip Blank (580-112035-6) were analyzed for gasoline range organics (GRO) in accordance with 8260B CALUFT. The samples were prepared on 04/02/2022 and 04/25/2022 and analyzed on 04/03/2022 and 04/25/2022.

The following samples were provided to the laboratory with a significantly different initial weight than that required by the reference method: A3-010-SON01-002.0 (580-112035-4), A3-010-SON01-002.0 MS (580-112035-4 MS), and A3-010-SON01-002.0 MSD (580-112035-4 MSD). Deviations in the weight by more than 20% may affect reporting limits and potentially method performance. The method specifies 150g. The amount provided was below this range.

The following samples were provided to the laboratory with a significantly different initial weight than that required by the reference method: A3325H-SON01-001.0 (580-112035-5), A3325H-SON01-001.0 MS (580-112035-5 MS), and A3325H-SON01-001.0 MSD (580-112035-5 MSD). Deviations in the weight by more than 20% may affect reporting limits and potentially method performance. The method specifies 10g. The amount provided was below this range.

Gasoline Range Organics (GRO)-C6-C10 was detected in method blank MB 580-386132/1-A at a level that was above the method detection limit but below the reporting limit. The value should be considered an estimate. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. Result concentrations were less than ½ the reporting limit.

The following sample was analyzed at reduced volume due to high concentrations of target analytes: A3-010-SON01-002.0 (580-112035-4). The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor.

Reanalysis of the following samples was performed outside of the analytical holding time due to samples being out of order in the initial analysis without ability to confirm proper order: A3325H-SON01-001.0 (580-112035-5) and Trip Blank (580-112035-6). No charges are applied to these GRO samples.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS) WITH INCREMENTAL PREPARATION

Samples A3000MISH-SOFT01-000.0 (580-112035-1), A3000MISH-SOFT02-000.0 (580-112035-2) and A3000MISH-SOFT03-000.0 (580-112035-3) were analyzed for volatile organic compounds (GC-MS) in accordance with 8260D_DOD5 with incremental preparation. The samples were leached on 04/02/2022, and prepared and analyzed on 04/02/2022.

The following samples were provided to the laboratory with a significantly different initial weight than that required by the reference method: A3000MISH-SOFT01-000.0 (580-112035-1), A3000MISH-SOFT02-000.0 (580-112035-2), and A3000MISH-SOFT03-000.0 (580-112035-3). Deviations in the weight by more than 20% may affect reporting limits and potentially method performance. The method specifies 150g. The amount provided was below this range.

One of the ISM jars had dried out for sample A3000MISH-SOFT01-000.0 (580-112035-1). It was not used in the ism process and sample was processed using five jars instead of six.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS)

Samples A3-010-SON01-002.0 (580-112035-4), A3325H-SON01-001.0 (580-112035-5) and Trip Blank (580-112035-6) were analyzed for volatile organic compounds (GC-MS) in accordance with 8260D_DOD5. The samples were prepared on 04/02/2022, 04/22/2022 and 04/25/2022 and analyzed on 04/03/2022, 04/22/2022 and 04/25/2022.

Job ID: 580-112035-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

The following samples were provided to the laboratory with a significantly different initial weight than that required by the reference method: A3-010-SON01-002.0 (580-112035-4), A3-010-SON01-002.0 MS (580-112035-4 MS), and A3-010-SON01-002.0 MSD (580-112035-4 MSD). Deviations in the weight by more than 20% may affect reporting limits and potentially method performance. The method specifies 150g. The amount provided was below this range.

The following samples were provided to the laboratory with a significantly different initial weight than that required by the reference method: A3325H-SON01-001.0 (580-112035-5), A3325H-SON01-001.0 MS (580-112035-5 MS), and A3325H-SON01-001.0 MSD (580-112035-5 MSD). Deviations in the weight by more than 20% may affect reporting limits and potentially method performance. The method specifies 10g. The amount provided was below this range.

m-Xylene & p-Xylene, o-Xylene and Xylenes, Total were detected in method blank MB 580-388281/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. The result concentrations were less than ½ the reporting limit.

m-Xylene & p-Xylene, o-Xylene and Xylenes, Total were detected in method blank MB 580-388466/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. The result concentrations were less than ½ the reporting limit.

m-Xylene & p-Xylene, o-Xylene and Xylenes, Total failed the recovery criteria low for the MS of sample A3-010-SON01-002.0MS (580-112035-4) in batch 580-386136. The associated laboratory control sample (LCS) recovery was within acceptance limits.

The matrix spike / matrix spike duplicate (MS/MSD) recoveries of sample A3-010-SON01-002.0MSD (580-112035-4) in batch 580-386136 were outside control limits. The associated LCS/LCSD recoveries were in control.

Several analytes exceeded the RPD limit for the MSD of sample A3-010-SON01-002.0MSD (580-112035-4) in batch 580-386136.

The following samples were analyzed at reduced volume due to high concentrations of target analytes: A3-010-SON01-002.0 (580-112035-4), A3-010-SON01-002.0 MS (580-112035-4 MS), and A3-010-SON01-002.0 MSD (580-112035-4 MSD). The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor.

Reanalysis of the following samples was performed outside of the analytical holding time due to samples being out of order in the initial analysis without ability to confirm proper order: A3325H-SON01-001.0 (580-112035-5) and Trip Blank (580-112035-6). No charges are applied to these VOC samples.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) WITH INCREMENTAL PREPARATION

Samples A3000MISH-SOFT01-000.0 (580-112035-1), A3000MISH-SOFT02-000.0 (580-112035-2) and A3000MISH-SOFT03-000.0 (580-112035-3) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) with incremental preparation in accordance with 8270E SIM. The samples were leached on 04/05/2022, prepared on 04/06/2022 and analyzed on 04/07/2022.

The sample duplicate and sample triplicate (DUP/TRL) precision for preparation batch 580-386444 and 580-386580 and analytical batch 580-386635 was outside control limits for 2-Methylnaphthalene and Naphthalene. This is attributed to trace concentration of analytes amplifying any observed deviations.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)

Samples A3-010-SON01-002.0 (580-112035-4) and A3325H-SON01-001.0 (580-112035-5) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 04/04/2022 and analyzed on 04/05/2022 and 04/08/2022.

The following sample was diluted due to the nature of the sample matrix: A3-010-SON01-002.0 (580-112035-4). Elevated reporting limits

Job ID: 580-112035-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

(RLs) are provided.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS WITH INCREMENTAL PREPARATION

Samples A3000MISH-SOFT01-000.0 (580-112035-1), A3000MISH-SOFT02-000.0 (580-112035-2) and A3000MISH-SOFT03-000.0 (580-112035-3) were analyzed for diesel range organics with Incremental preparation in accordance with 8015D DRO. The samples were leached on 04/05/2022 and 04/07/2022, prepared on 04/06/2022 and 04/08/2022 and analyzed on 04/06/2022 and 04/09/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS

Samples A3-010-SON01-002.0 (580-112035-4) and A3325H-SON01-001.0 (580-112035-5) were analyzed for diesel range organics in accordance with 8015DRO. The samples were prepared on 04/04/2022 and analyzed on 04/04/2022 and 04/05/2022.

The following sample was diluted to bring the concentration of target analytes within the calibration range: A3-010-SON01-002.0 (580-112035-4). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

MOISTURE CONTENT WITH INCREMENTAL PREPARATION

Samples A3000MISH-SOFT01-000.0 (580-112035-1), A3000MISH-SOFT02-000.0 (580-112035-2) and A3000MISH-SOFT03-000.0 (580-112035-3) were analyzed for moisture content with incremental preparation in accordance with ASTM D2216. The samples were leached on 04/05/2022 and analyzed on 04/08/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Samples A3-010-SON01-002.0 (580-112035-4) and A3325H-SON01-001.0 (580-112035-5) were analyzed for percent solids in accordance with ASTM D2216. The samples were analyzed on 04/08/2022.

Percent Moisture exceeded the RPD limit for the duplicate of sample A3325H-SON01-001.0DU (580-112035-5). Refer to the QC report for details.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
B	Blank contamination: The analyte was detected above one-half the reporting limit in an associated blank.
H	Sample was prepped or analyzed beyond the specified holding time
J	Estimated: The analyte was positively identified; the quantitation is an estimation
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC/MS Semi VOA

Qualifier	Qualifier Description
D	The reported value is from a dilution.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
D	The reported value is from a dilution.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

General Chemistry

Qualifier	Qualifier Description
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive

Glossary (Continued)

Abbreviation	These commonly used abbreviations may or may not be present in this report.
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Client Sample ID: A3000MISH-SOFT01-000.0

Date Collected: 03/29/22 16:20
Date Received: 03/31/22 09:30

Lab Sample ID: 580-112035-1

Matrix: Solid
Percent Solids: 90.7

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	4.6	U M	6.2	2.0	mg/Kg	☼	04/02/22 14:00	04/02/22 22:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*93*		*67 - 134*	*04/02/22 14:00*	*04/02/22 22:04*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.023	U	0.031	0.0059	mg/Kg	☼	04/02/22 14:00	04/02/22 22:04	1
Toluene	0.046	U	0.092	0.021	mg/Kg	☼	04/02/22 14:00	04/02/22 22:04	1
Ethylbenzene	0.046	U	0.062	0.014	mg/Kg	☼	04/02/22 14:00	04/02/22 22:04	1
m-Xylene & p-Xylene	**0.015**	**J**	0.062	0.011	mg/Kg	☼	04/02/22 14:00	04/02/22 22:04	1
o-Xylene	0.023	U	0.062	0.0077	mg/Kg	☼	04/02/22 14:00	04/02/22 22:04	1
Xylenes, Total	**15**	**J**	62	11	ug/Kg	☼	04/02/22 14:00	04/02/22 22:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*98*		*85 - 116*	*04/02/22 14:00*	*04/02/22 22:04*	*1*
4-Bromofluorobenzene (Surr)	*91*		*79 - 119*	*04/02/22 14:00*	*04/02/22 22:04*	*1*
Dibromofluoromethane (Surr)	*90*		*78 - 119*	*04/02/22 14:00*	*04/02/22 22:04*	*1*
1,2-Dichloroethane-d4 (Surr)	*99*		*71 - 136*	*04/02/22 14:00*	*04/02/22 22:04*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**0.0075**	**M**	0.0052	0.0017	mg/Kg	☼	04/06/22 13:48	04/07/22 03:08	1
2-Methylnaphthalene	**0.0030**	**J**	0.0052	0.0021	mg/Kg	☼	04/06/22 13:48	04/07/22 03:08	1
1-Methylnaphthalene	**0.0023**	**J M**	0.0052	0.00066	mg/Kg	☼	04/06/22 13:48	04/07/22 03:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*105*		*58 - 132*	*04/06/22 13:48*	*04/07/22 03:08*	*1*
2-methylnaphthalene-d10	*77*		*40 - 140*	*04/06/22 13:48*	*04/07/22 03:08*	*1*
Fluoranthene-d10 (Surr)	*94*		*40 - 140*	*04/06/22 13:48*	*04/07/22 03:08*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C24	**16**	**J**	52	10	mg/Kg	☼	04/06/22 08:37	04/06/22 15:45	1
C24-C40	**67**		48	19	mg/Kg		04/08/22 11:21	04/09/22 05:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*86*		*45 - 130*	*04/06/22 08:37*	*04/06/22 15:45*	*1*
o-Terphenyl	*78*		*45 - 130*	*04/08/22 11:21*	*04/09/22 05:44*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**90.7**		0.1	0.1	%			04/08/22 09:38	1
Percent Moisture	**9.3**		0.1	0.1	%			04/08/22 09:38	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Client Sample ID: A3000MISH-SOFT02-000.0

Date Collected: 03/29/22 16:20
Date Received: 03/31/22 09:30

Lab Sample ID: 580-112035-2

Matrix: Solid
Percent Solids: 90.5

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	5.0	U M	6.7	2.2	mg/Kg	☼	04/02/22 14:00	04/02/22 23:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*93*		*67 - 134*	*04/02/22 14:00*	*04/02/22 23:14*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.025	U	0.033	0.0063	mg/Kg	☼	04/02/22 14:00	04/02/22 23:14	1
Toluene	0.050	U	0.10	0.022	mg/Kg	☼	04/02/22 14:00	04/02/22 23:14	1
Ethylbenzene	0.050	U	0.067	0.015	mg/Kg	☼	04/02/22 14:00	04/02/22 23:14	1
m-Xylene & p-Xylene	0.025	U	0.067	0.012	mg/Kg	☼	04/02/22 14:00	04/02/22 23:14	1
o-Xylene	0.025	U	0.067	0.0083	mg/Kg	☼	04/02/22 14:00	04/02/22 23:14	1
Xylenes, Total	25	U	67	12	ug/Kg	☼	04/02/22 14:00	04/02/22 23:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*100*		*85 - 116*	*04/02/22 14:00*	*04/02/22 23:14*	*1*
4-Bromofluorobenzene (Surr)	*90*		*79 - 119*	*04/02/22 14:00*	*04/02/22 23:14*	*1*
Dibromofluoromethane (Surr)	*89*		*78 - 119*	*04/02/22 14:00*	*04/02/22 23:14*	*1*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 136*	*04/02/22 14:00*	*04/02/22 23:14*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**0.012**		0.0053	0.0017	mg/Kg	☼	04/06/22 13:48	04/07/22 04:20	1
2-Methylnaphthalene	**0.0038**	**J**	0.0053	0.0022	mg/Kg	☼	04/06/22 13:48	04/07/22 04:20	1
1-Methylnaphthalene	**0.0030**	**J**	0.0053	0.00067	mg/Kg	☼	04/06/22 13:48	04/07/22 04:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*111*		*58 - 132*	*04/06/22 13:48*	*04/07/22 04:20*	*1*
2-methylnaphthalene-d10	*83*		*40 - 140*	*04/06/22 13:48*	*04/07/22 04:20*	*1*
Fluoranthene-d10 (Surr)	*99*		*40 - 140*	*04/06/22 13:48*	*04/07/22 04:20*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C24	**20**	**J**	52	10	mg/Kg	☼	04/06/22 08:38	04/06/22 16:43	1
C24-C40	**70**		48	19	mg/Kg		04/08/22 11:24	04/09/22 07:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*84*		*45 - 130*	*04/06/22 08:38*	*04/06/22 16:43*	*1*
o-Terphenyl	*77*		*45 - 130*	*04/08/22 11:24*	*04/09/22 07:00*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**90.5**		0.1	0.1	%			04/08/22 09:38	1
Percent Moisture	**9.5**		0.1	0.1	%			04/08/22 09:38	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Client Sample ID: A3000MISH-SOFT03-000.0

Date Collected: 03/29/22 16:20
Date Received: 03/31/22 09:30

Lab Sample ID: 580-112035-3

Matrix: Solid
Percent Solids: 88.6

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	4.8	U M	6.4	2.1	mg/Kg	☼	04/02/22 14:00	04/02/22 23:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*94*		*67 - 134*	*04/02/22 14:00*	*04/02/22 23:37*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.024	U	0.032	0.0060	mg/Kg	☼	04/02/22 14:00	04/02/22 23:37	1
Toluene	0.048	U	0.095	0.021	mg/Kg	☼	04/02/22 14:00	04/02/22 23:37	1
Ethylbenzene	0.048	U	0.064	0.014	mg/Kg	☼	04/02/22 14:00	04/02/22 23:37	1
m-Xylene & p-Xylene	0.024	U	0.064	0.011	mg/Kg	☼	04/02/22 14:00	04/02/22 23:37	1
o-Xylene	0.024	U	0.064	0.0079	mg/Kg	☼	04/02/22 14:00	04/02/22 23:37	1
Xylenes, Total	24	U	64	11	ug/Kg	☼	04/02/22 14:00	04/02/22 23:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*100*		*85 - 116*	*04/02/22 14:00*	*04/02/22 23:37*	*1*
4-Bromofluorobenzene (Surr)	*91*		*79 - 119*	*04/02/22 14:00*	*04/02/22 23:37*	*1*
Dibromofluoromethane (Surr)	*89*		*78 - 119*	*04/02/22 14:00*	*04/02/22 23:37*	*1*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 136*	*04/02/22 14:00*	*04/02/22 23:37*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**0.024**	**M**	0.0054	0.0017	mg/Kg	☼	04/06/22 13:48	04/07/22 04:45	1
2-Methylnaphthalene	**0.0090**		0.0054	0.0022	mg/Kg	☼	04/06/22 13:48	04/07/22 04:45	1
1-Methylnaphthalene	**0.0061**	**M**	0.0054	0.00068	mg/Kg	☼	04/06/22 13:48	04/07/22 04:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*107*		*58 - 132*	*04/06/22 13:48*	*04/07/22 04:45*	*1*
2-methylnaphthalene-d10	*82*		*40 - 140*	*04/06/22 13:48*	*04/07/22 04:45*	*1*
Fluoranthene-d10 (Surr)	*96*		*40 - 140*	*04/06/22 13:48*	*04/07/22 04:45*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C24	**33**	**J**	53	11	mg/Kg	☼	04/06/22 08:38	04/06/22 17:03	1
C24-C40	**85**		46	18	mg/Kg		04/08/22 11:41	04/09/22 07:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*82*		*45 - 130*	*04/06/22 08:38*	*04/06/22 17:03*	*1*
o-Terphenyl	*81*		*45 - 130*	*04/08/22 11:41*	*04/09/22 07:19*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**88.6**		0.1	0.1	%			04/08/22 09:38	1
Percent Moisture	**11.4**		0.1	0.1	%			04/08/22 09:38	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Client Sample ID: A3-010-SON01-002.0

Date Collected: 03/30/22 10:10
Date Received: 03/31/22 09:30

Lab Sample ID: 580-112035-4

Matrix: Solid
Percent Solids: 58.8

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	250		82	27	mg/Kg	☼	04/02/22 19:21	04/03/22 00:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*67 - 134*	*04/02/22 19:21*	*04/03/22 00:24*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.31	U J1	0.41	0.078	mg/Kg	☼	04/02/22 19:21	04/03/22 00:24	1
Toluene	0.31	J J1	1.2	0.28	mg/Kg	☼	04/02/22 19:21	04/03/22 00:24	1
Ethylbenzene	1.7	J1	0.82	0.19	mg/Kg	☼	04/02/22 19:21	04/03/22 00:24	1
m-Xylene & p-Xylene	4.7	J1	0.82	0.15	mg/Kg	☼	04/02/22 19:21	04/03/22 00:24	1
o-Xylene	4.9	J1	0.82	0.10	mg/Kg	☼	04/02/22 19:21	04/03/22 00:24	1
Xylenes, Total	9600	J1	820	150	ug/Kg	☼	04/02/22 19:21	04/03/22 00:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*99*		*85 - 116*	*04/02/22 19:21*	*04/03/22 00:24*	*1*
4-Bromofluorobenzene (Surr)	*96*		*79 - 119*	*04/02/22 19:21*	*04/03/22 00:24*	*1*
Dibromofluoromethane (Surr)	*92*		*78 - 119*	*04/02/22 19:21*	*04/03/22 00:24*	*1*
1,2-Dichloroethane-d4 (Surr)	*100*		*71 - 136*	*04/02/22 19:21*	*04/03/22 00:24*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	53	D	0.13	0.016	mg/Kg	☼	04/04/22 15:29	04/08/22 16:26	20
2-Methylnaphthalene	74	D	0.13	0.052	mg/Kg	☼	04/04/22 15:29	04/08/22 16:26	20
Naphthalene	32	D	0.13	0.041	mg/Kg	☼	04/04/22 15:29	04/08/22 16:26	20

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*41*		*28 - 143*	*04/04/22 15:29*	*04/08/22 16:26*	*20*
Fluoranthene-d10 (Surr)	*74*		*40 - 140*	*04/04/22 15:29*	*04/08/22 16:26*	*20*
Terphenyl-d14	*80*		*58 - 132*	*04/04/22 15:29*	*04/08/22 16:26*	*20*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C24-C40	70	J	72	29	mg/Kg	☼	04/04/22 09:05	04/04/22 14:49	1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) - DL

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C24	50000	D	720	140	mg/Kg	☼	04/04/22 09:05	04/05/22 05:35	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*77*		*45 - 130*	*04/04/22 09:05*	*04/05/22 05:35*	*10*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	58.8		0.1	0.1	%			04/08/22 09:38	1
Percent Moisture	41.2		0.1	0.1	%			04/08/22 09:38	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Client Sample ID: A3325H-SON01-001.0

Date Collected: 03/30/22 11:45
Date Received: 03/31/22 09:30

Lab Sample ID: 580-112035-5

Matrix: Solid
Percent Solids: 97.5

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	4.0	J H	5.9	1.9	mg/Kg	☼	04/25/22 11:04	04/25/22 12:28	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	103		67 - 134	04/25/22 11:04	04/25/22 12:28	1

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.023	U H	0.030	0.0057	mg/Kg	☼	04/22/22 10:00	04/22/22 16:54	1
Toluene	0.045	U H	0.090	0.020	mg/Kg	☼	04/22/22 10:00	04/22/22 16:54	1
Ethylbenzene	0.014	J H	0.060	0.014	mg/Kg	☼	04/22/22 10:00	04/22/22 16:54	1
m-Xylene & p-Xylene	0.035	J H	0.060	0.011	mg/Kg	☼	04/22/22 10:00	04/22/22 16:54	1
o-Xylene	0.030	J H	0.060	0.0075	mg/Kg	☼	04/22/22 10:00	04/22/22 16:54	1
Xylenes, Total	65	H B	60	11	ug/Kg	☼	04/22/22 10:00	04/22/22 16:54	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Toluene-d8 (Surr)	98		85 - 116	04/22/22 10:00	04/22/22 16:54	1
4-Bromofluorobenzene (Surr)	104		79 - 119	04/22/22 10:00	04/22/22 16:54	1
Dibromofluoromethane (Surr)	96		78 - 119	04/22/22 10:00	04/22/22 16:54	1
1,2-Dichloroethane-d4 (Surr)	99		71 - 136	04/22/22 10:00	04/22/22 16:54	1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.79		0.0046	0.00058	mg/Kg	☼	04/04/22 15:29	04/05/22 14:18	1
2-Methylnaphthalene	0.93		0.0046	0.0019	mg/Kg	☼	04/04/22 15:29	04/05/22 14:18	1
Naphthalene	0.12	M	0.0046	0.0015	mg/Kg	☼	04/04/22 15:29	04/05/22 14:18	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,4,6-Tribromophenol	81		28 - 143	04/04/22 15:29	04/05/22 14:18	1
2-methylnaphthalene-d10	97		40 - 140	04/04/22 15:29	04/05/22 14:18	1
Fluoranthene-d10 (Surr)	95		40 - 140	04/04/22 15:29	04/05/22 14:18	1
Terphenyl-d14	106		58 - 132	04/04/22 15:29	04/05/22 14:18	1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C24	2000		47	9.2	mg/Kg	☼	04/04/22 09:05	04/04/22 15:09	1
C24-C40	35	J	47	19	mg/Kg	☼	04/04/22 09:05	04/04/22 15:09	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	77		45 - 130	04/04/22 09:05	04/04/22 15:09	1

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	97.5		0.1	0.1	%			04/08/22 09:38	1
Percent Moisture	2.5		0.1	0.1	%			04/08/22 09:38	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Client Sample ID: Trip Blank

Lab Sample ID: 580-112035-6

Date Collected: 03/29/22 00:00
Matrix: Solid
Date Received: 03/31/22 09:30

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	**80**	**H**	4.0	1.3	mg/Kg		04/25/22 11:04	04/25/22 12:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*114*		*67 - 134*	*04/25/22 11:04*	*04/25/22 12:51*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U H	0.020	0.0038	mg/Kg		04/25/22 11:04	04/25/22 12:51	1
Toluene	0.030	U H	0.060	0.014	mg/Kg		04/25/22 11:04	04/25/22 12:51	1
Ethylbenzene	**0.012**	**J H**	0.040	0.0091	mg/Kg		04/25/22 11:04	04/25/22 12:51	1
m-Xylene & p-Xylene	**0.014**	**J H**	0.040	0.0071	mg/Kg		04/25/22 11:04	04/25/22 12:51	1
o-Xylene	**0.0068**	**J H**	0.040	0.0050	mg/Kg		04/25/22 11:04	04/25/22 12:51	1
Xylenes, Total	**21**	**J H**	40	7.1	ug/Kg		04/25/22 11:04	04/25/22 12:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*93*		*85 - 116*	*04/25/22 11:04*	*04/25/22 12:51*	*1*
4-Bromofluorobenzene (Surr)	*110*		*79 - 119*	*04/25/22 11:04*	*04/25/22 12:51*	*1*
Dibromofluoromethane (Surr)	*100*		*78 - 119*	*04/25/22 11:04*	*04/25/22 12:51*	*1*
1,2-Dichloroethane-d4 (Surr)	*97*		*71 - 136*	*04/25/22 11:04*	*04/25/22 12:51*	*1*

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 580-386132/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386139 — **Prep Batch: 386132**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	3.0	U	4.0	1.3	mg/Kg		04/02/22 14:00	04/02/22 20:09	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*93*		*67 - 134*	*04/02/22 14:00*	*04/02/22 20:09*	*1*

Lab Sample ID: LCS 580-386132/4-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386139 — **Prep Batch: 386132**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics (GRO)-C6-C10	40.0	38.2		mg/Kg		96	79 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*95*		*67 - 134*

Lab Sample ID: LCSD 580-386132/5-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386139 — **Prep Batch: 386132**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics (GRO)-C6-C10	40.0	38.2		mg/Kg		95	79 - 122	0	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*100*		*67 - 134*

Lab Sample ID: 580-112035-1 DU — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386139 — **Prep Batch: 386132**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Gasoline Range Organics (GRO)-C6-C10	4.6	U M	4.7	U	mg/Kg	☼	NC	30

Surrogate	*DU %Recovery*	*DU Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*94*		*67 - 134*

Lab Sample ID: 580-112035-1 TRL — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386139 — **Prep Batch: 386132**

Analyte	Sample Result	Sample Qualifier	TRL Result	TRL Qualifier	Unit	D	RSD	RSD Limit
Gasoline Range Organics (GRO)-C6-C10	4.6	U M	4.6	U	mg/Kg	☼	NC	

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: 580-112035-1 TRL — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386139 — **Prep Batch: 386132**

Surrogate	TRL %Recovery	TRL Qualifier	Limits
4-Bromofluorobenzene (Surr)	91		67 - 134

Lab Sample ID: MB 580-388466/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388541 — **Prep Batch: 388466**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	3.0	U	4.0	1.3	mg/Kg		04/25/22 10:00	04/25/22 10:31	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	106		67 - 134	04/25/22 10:00	04/25/22 10:31	1

Lab Sample ID: LCS 580-388466/4-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388541 — **Prep Batch: 388466**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Gasoline Range Organics (GRO)-C6-C10			40.0	38.7		mg/Kg		97	79 - 122		

Surrogate	LCS %Recovery	LCS Qualifier	Limits
4-Bromofluorobenzene (Surr)	107		67 - 134

Lab Sample ID: LCSD 580-388466/5-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388541 — **Prep Batch: 388466**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics (GRO)-C6-C10			40.0	37.8		mg/Kg		95	79 - 122	2	30

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
4-Bromofluorobenzene (Surr)	104		67 - 134

Method: 8260D - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 580-386132/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386136 — **Prep Batch: 386132**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U	0.020	0.0038	mg/Kg		04/02/22 14:00	04/02/22 20:09	1
Toluene	0.030	U	0.060	0.014	mg/Kg		04/02/22 14:00	04/02/22 20:09	1
Ethylbenzene	0.030	U	0.040	0.0091	mg/Kg		04/02/22 14:00	04/02/22 20:09	1
m-Xylene & p-Xylene	0.015	U	0.040	0.0071	mg/Kg		04/02/22 14:00	04/02/22 20:09	1
o-Xylene	0.015	U	0.040	0.0050	mg/Kg		04/02/22 14:00	04/02/22 20:09	1
Xylenes, Total	15	U	40	7.1	ug/Kg		04/02/22 14:00	04/02/22 20:09	1

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 580-386132/1-A
Matrix: Solid
Analysis Batch: 386136

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386132

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Toluene-d8 (Surr)	102		85 - 116	04/02/22 14:00	04/02/22 20:09	1
4-Bromofluorobenzene (Surr)	90		79 - 119	04/02/22 14:00	04/02/22 20:09	1
Dibromofluoromethane (Surr)	89		78 - 119	04/02/22 14:00	04/02/22 20:09	1
1,2-Dichloroethane-d4 (Surr)	97		71 - 136	04/02/22 14:00	04/02/22 20:09	1

Lab Sample ID: LCS 580-386132/2-A
Matrix: Solid
Analysis Batch: 386136

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386132

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	0.800	0.809		mg/Kg		101	77 - 121
Toluene	0.800	0.831		mg/Kg		104	77 - 121
Ethylbenzene	0.800	0.845		mg/Kg		106	76 - 122
m-Xylene & p-Xylene	0.800	0.817		mg/Kg		102	77 - 124
o-Xylene	0.800	0.817		mg/Kg		102	77 - 123
Xylenes, Total	1600	1630		ug/Kg		102	78 - 124

Surrogate	LCS %Recovery	LCS Qualifier	Limits
Toluene-d8 (Surr)	101		85 - 116
4-Bromofluorobenzene (Surr)	95		79 - 119
Dibromofluoromethane (Surr)	97		78 - 119
1,2-Dichloroethane-d4 (Surr)	97		71 - 136

Lab Sample ID: LCSD 580-386132/3-A
Matrix: Solid
Analysis Batch: 386136

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 386132

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	0.800	0.829		mg/Kg		104	77 - 121	2	20
Toluene	0.800	0.820		mg/Kg		102	77 - 121	1	20
Ethylbenzene	0.800	0.824		mg/Kg		103	76 - 122	2	20
m-Xylene & p-Xylene	0.800	0.810		mg/Kg		101	77 - 124	1	20
o-Xylene	0.800	0.818		mg/Kg		102	77 - 123	0	20
Xylenes, Total	1600	1630		ug/Kg		102	78 - 124	0	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
Toluene-d8 (Surr)	101		85 - 116
4-Bromofluorobenzene (Surr)	94		79 - 119
Dibromofluoromethane (Surr)	101		78 - 119
1,2-Dichloroethane-d4 (Surr)	100		71 - 136

Lab Sample ID: 580-112035-4 MS
Matrix: Solid
Analysis Batch: 386136

Client Sample ID: A3-010-SON01-002.0
Prep Type: Total/NA
Prep Batch: 386132

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	0.31	U J1	8.18	1.56	J1	mg/Kg	☼	19	77 - 121
Toluene	0.31	J1	8.18	1.63	J1	mg/Kg	☼	16	77 - 121

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 580-112035-4 MS — **Client Sample ID: A3-010-SON01-002.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386136 — **Prep Batch: 386132**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Ethylbenzene	1.7	J1	8.18	2.49	J1	mg/Kg	☼	9	76 - 122
m-Xylene & p-Xylene	4.7	J1	8.18	4.34	J1	mg/Kg	☼	-4	77 - 124
o-Xylene	4.9	J1	8.18	4.58	J1	mg/Kg	☼	-4	77 - 123
Xylenes, Total	9600	J1	16400	8920	J1	ug/Kg	☼	-4	78 - 124

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Toluene-d8 (Surr)	*97*		*85 - 116*
4-Bromofluorobenzene (Surr)	*93*		*79 - 119*
Dibromofluoromethane (Surr)	*96*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*99*		*71 - 136*

Lab Sample ID: 580-112035-4 MSD — **Client Sample ID: A3-010-SON01-002.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386136 — **Prep Batch: 386132**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	0.31	U J1	8.18	2.11	J1	mg/Kg	☼	26	77 - 121	30	20
Toluene	0.31	J1	8.18	2.29	J1	mg/Kg	☼	24	77 - 121	34	20
Ethylbenzene	1.7	J1	8.18	3.26	J1	mg/Kg	☼	19	76 - 122	27	20
m-Xylene & p-Xylene	4.7	J1	8.18	5.58	J1	mg/Kg	☼	11	77 - 124	25	20
o-Xylene	4.9	J1	8.18	5.69	J1	mg/Kg	☼	9	77 - 123	22	20
Xylenes, Total	9600	J1	16400	11300	J1	ug/Kg	☼	10	78 - 124	23	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*100*		*85 - 116*
4-Bromofluorobenzene (Surr)	*96*		*79 - 119*
Dibromofluoromethane (Surr)	*98*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 136*

Lab Sample ID: 580-112035-1 DU — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386136 — **Prep Batch: 386132**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Benzene	0.023	U	0.023	U	mg/Kg	☼	NC	20
Toluene	0.046	U	0.047	U	mg/Kg	☼	NC	20
Ethylbenzene	0.046	U	0.047	U	mg/Kg	☼	NC	20
m-Xylene & p-Xylene	0.015	J	0.023	U	mg/Kg	☼	NC	20
o-Xylene	0.023	U	0.023	U	mg/Kg	☼	NC	20
Xylenes, Total	15	J	23	U	ug/Kg	☼	NC	20

Surrogate	*DU %Recovery*	*DU Qualifier*	*Limits*
Toluene-d8 (Surr)	*101*		*85 - 116*
4-Bromofluorobenzene (Surr)	*92*		*79 - 119*
Dibromofluoromethane (Surr)	*90*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*99*		*71 - 136*

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 580-112035-1 TRL — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386136 — **Prep Batch: 386132**

Analyte	Sample Result	Sample Qualifier		TRL Result	TRL Qualifier	Unit	D			RSD	RSD Limit
Benzene	0.023	U		0.023	U	mg/Kg	☼			NC	20
Toluene	0.046	U		0.046	U	mg/Kg	☼			NC	20
Ethylbenzene	0.046	U		0.046	U	mg/Kg	☼			NC	20
m-Xylene & p-Xylene	0.015	J		0.023	U	mg/Kg	☼			NC	20
o-Xylene	0.023	U		0.023	U	mg/Kg	☼			NC	20
Xylenes, Total	15	J		23	U	ug/Kg	☼			NC	20

Surrogate	*TRL %Recovery*	*TRL Qualifier*	*Limits*
Toluene-d8 (Surr)	*99*		*85 - 116*
4-Bromofluorobenzene (Surr)	*89*		*79 - 119*
Dibromofluoromethane (Surr)	*90*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*97*		*71 - 136*

Lab Sample ID: MB 580-388281/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388335 — **Prep Batch: 388281**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U	0.020	0.0038	mg/Kg		04/22/22 12:00	04/22/22 12:15	1
Toluene	0.030	U	0.060	0.014	mg/Kg		04/22/22 12:00	04/22/22 12:15	1
Ethylbenzene	0.030	U	0.040	0.0091	mg/Kg		04/22/22 12:00	04/22/22 12:15	1
m-Xylene & p-Xylene	0.0159	J	0.040	0.0071	mg/Kg		04/22/22 12:00	04/22/22 12:15	1
o-Xylene	0.0104	J	0.040	0.0050	mg/Kg		04/22/22 12:00	04/22/22 12:15	1
Xylenes, Total	26.3	J	40	7.1	ug/Kg		04/22/22 12:00	04/22/22 12:15	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*99*		*85 - 116*	*04/22/22 12:00*	*04/22/22 12:15*	*1*
4-Bromofluorobenzene (Surr)	*99*		*79 - 119*	*04/22/22 12:00*	*04/22/22 12:15*	*1*
Dibromofluoromethane (Surr)	*97*		*78 - 119*	*04/22/22 12:00*	*04/22/22 12:15*	*1*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 136*	*04/22/22 12:00*	*04/22/22 12:15*	*1*

Lab Sample ID: LCS 580-388281/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388335 — **Prep Batch: 388281**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Benzene			0.800	0.835		mg/Kg		104	77 - 121		
Toluene			0.800	0.896		mg/Kg		112	77 - 121		
Ethylbenzene			0.800	0.878		mg/Kg		110	76 - 122		
m-Xylene & p-Xylene			0.800	0.890		mg/Kg		111	77 - 124		
o-Xylene			0.800	0.885		mg/Kg		111	77 - 123		
Xylenes, Total			1600	1780		ug/Kg		111	78 - 124		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Toluene-d8 (Surr)	*100*		*85 - 116*
4-Bromofluorobenzene (Surr)	*101*		*79 - 119*
Dibromofluoromethane (Surr)	*102*		*78 - 119*

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 580-388281/2-A
Matrix: Solid
Analysis Batch: 388335

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 388281

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 136*

Lab Sample ID: LCSD 580-388281/3-A
Matrix: Solid
Analysis Batch: 388335

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 388281

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene			0.800	0.822		mg/Kg		103	77 - 121	2	20
Toluene			0.800	0.875		mg/Kg		109	77 - 121	2	20
Ethylbenzene			0.800	0.870		mg/Kg		109	76 - 122	1	20
m-Xylene & p-Xylene			0.800	0.886		mg/Kg		111	77 - 124	0	20
o-Xylene			0.800	0.865		mg/Kg		108	77 - 123	2	20
Xylenes, Total			1600	1750		ug/Kg		109	78 - 124	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*100*		*85 - 116*
4-Bromofluorobenzene (Surr)	*102*		*79 - 119*
Dibromofluoromethane (Surr)	*103*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*99*		*71 - 136*

Lab Sample ID: MB 580-388466/1-A
Matrix: Solid
Analysis Batch: 388538

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 388466

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U	0.020	0.0038	mg/Kg		04/25/22 10:00	04/25/22 10:31	1
Toluene	0.030	U	0.060	0.014	mg/Kg		04/25/22 10:00	04/25/22 10:31	1
Ethylbenzene	0.030	U	0.040	0.0091	mg/Kg		04/25/22 10:00	04/25/22 10:31	1
m-Xylene & p-Xylene	0.0106	J	0.040	0.0071	mg/Kg		04/25/22 10:00	04/25/22 10:31	1
o-Xylene	0.00831	J	0.040	0.0050	mg/Kg		04/25/22 10:00	04/25/22 10:31	1
Xylenes, Total	18.9	J	40	7.1	ug/Kg		04/25/22 10:00	04/25/22 10:31	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*98*		*85 - 116*	*04/25/22 10:00*	*04/25/22 10:31*	*1*
4-Bromofluorobenzene (Surr)	*103*		*79 - 119*	*04/25/22 10:00*	*04/25/22 10:31*	*1*
Dibromofluoromethane (Surr)	*102*		*78 - 119*	*04/25/22 10:00*	*04/25/22 10:31*	*1*
1,2-Dichloroethane-d4 (Surr)	*96*		*71 - 136*	*04/25/22 10:00*	*04/25/22 10:31*	*1*

Lab Sample ID: LCS 580-388466/2-A
Matrix: Solid
Analysis Batch: 388538

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 388466

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Benzene			0.800	0.776		mg/Kg		97	77 - 121		
Toluene			0.800	0.833		mg/Kg		104	77 - 121		
Ethylbenzene			0.800	0.829		mg/Kg		104	76 - 122		
m-Xylene & p-Xylene			0.800	0.845		mg/Kg		106	77 - 124		
o-Xylene			0.800	0.830		mg/Kg		104	77 - 123		

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 580-388466/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388538 — **Prep Batch: 388466**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Xylenes, Total			1600	1680		ug/Kg		105	78 - 124		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Toluene-d8 (Surr)	*98*		*85 - 116*
4-Bromofluorobenzene (Surr)	*101*		*79 - 119*
Dibromofluoromethane (Surr)	*103*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*95*		*71 - 136*

Lab Sample ID: LCSD 580-388466/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388538 — **Prep Batch: 388466**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene			0.800	0.842		mg/Kg		105	77 - 121	8	20
Toluene			0.800	0.875		mg/Kg		109	77 - 121	5	20
Ethylbenzene			0.800	0.879		mg/Kg		110	76 - 122	6	20
m-Xylene & p-Xylene			0.800	0.898		mg/Kg		112	77 - 124	6	20
o-Xylene			0.800	0.899		mg/Kg		112	77 - 123	8	20
Xylenes, Total			1600	1800		ug/Kg		112	78 - 124	7	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*98*		*85 - 116*
4-Bromofluorobenzene (Surr)	*102*		*79 - 119*
Dibromofluoromethane (Surr)	*105*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*96*		*71 - 136*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-386287/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386376 — **Prep Batch: 386287**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		04/04/22 15:29	04/05/22 12:40	1
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		04/04/22 15:29	04/05/22 12:40	1
Naphthalene	0.0040	U M	0.0050	0.0016	mg/Kg		04/04/22 15:29	04/05/22 12:40	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*80*		*28 - 143*	*04/04/22 15:29*	*04/05/22 12:40*	*1*
2-methylnaphthalene-d10	*98*		*40 - 140*	*04/04/22 15:29*	*04/05/22 12:40*	*1*
Fluoranthene-d10 (Surr)	*116*		*40 - 140*	*04/04/22 15:29*	*04/05/22 12:40*	*1*
Terphenyl-d14	*131*		*58 - 132*	*04/04/22 15:29*	*04/05/22 12:40*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCS 580-386287/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386376 — **Prep Batch: 386287**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
2-Methylnaphthalene	1.00	1.03		mg/Kg		103	39 - 114
1-Methylnaphthalene	1.00	1.01		mg/Kg		101	43 - 111
Naphthalene	1.00	0.978		mg/Kg		98	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol	*94*		*28 - 143*
2-methylnaphthalene-d10	*130*		*40 - 140*
Fluoranthene-d10 (Surr)	*102*		*40 - 140*
Terphenyl-d14	*114*		*58 - 132*

Lab Sample ID: LCSD 580-386287/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386376 — **Prep Batch: 386287**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
2-Methylnaphthalene	1.00	1.01		mg/Kg		101	39 - 114	2	20
1-Methylnaphthalene	1.00	0.991		mg/Kg		99	43 - 111	2	20
Naphthalene	1.00	0.948		mg/Kg		95	38 - 111	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2,4,6-Tribromophenol	*95*		*28 - 143*
2-methylnaphthalene-d10	*132*		*40 - 140*
Fluoranthene-d10 (Surr)	*100*		*40 - 140*
Terphenyl-d14	*112*		*58 - 132*

Lab Sample ID: MB 580-386580/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386635 — **Prep Batch: 386580**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		04/06/22 13:48	04/07/22 01:07	1
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		04/06/22 13:48	04/07/22 01:07	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		04/06/22 13:48	04/07/22 01:07	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*49*		*28 - 143*	*04/06/22 13:48*	*04/07/22 01:07*	*1*
2-methylnaphthalene-d10	*81*		*40 - 140*	*04/06/22 13:48*	*04/07/22 01:07*	*1*
Fluoranthene-d10 (Surr)	*96*		*40 - 140*	*04/06/22 13:48*	*04/07/22 01:07*	*1*
Terphenyl-d14	*110*		*58 - 132*	*04/06/22 13:48*	*04/07/22 01:07*	*1*

Lab Sample ID: LCS 580-386580/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386635 — **Prep Batch: 386580**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
2-Methylnaphthalene	1.00	0.827		mg/Kg		83	39 - 114
1-Methylnaphthalene	1.00	0.817		mg/Kg		82	43 - 111
Naphthalene	1.00	0.767		mg/Kg		77	38 - 111

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Surrogate	LCS %Recovery	LCS Qualifier	Limits
2,4,6-Tribromophenol	86		28 - 143
2-methylnaphthalene-d10	99		40 - 140
Fluoranthene-d10 (Surr)	81		40 - 140
Terphenyl-d14	92		58 - 132

Lab Sample ID: LCSD 580-386580/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386635 — **Prep Batch: 386580**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
2-Methylnaphthalene			1.00	0.901		mg/Kg		90	39 - 114	8	20
1-Methylnaphthalene			1.00	0.880		mg/Kg		88	43 - 111	7	20
Naphthalene			1.00	0.829		mg/Kg		83	38 - 111	8	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
2,4,6-Tribromophenol	91		28 - 143
2-methylnaphthalene-d10	112		40 - 140
Fluoranthene-d10 (Surr)	88		40 - 140
Terphenyl-d14	100		58 - 132

Lab Sample ID: 580-112035-1 DU — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386635 — **Prep Batch: 386580**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Naphthalene	0.0075	M		0.0131	M J1	mg/Kg	☼			55	20
2-Methylnaphthalene	0.0030	J		0.00434	J	mg/Kg	☼			35	20
1-Methylnaphthalene	0.0023	J M		0.00276	J M	mg/Kg	☼			17	20

Surrogate	DU %Recovery	DU Qualifier	Limits
Terphenyl-d14	108		58 - 132
2-methylnaphthalene-d10	80		40 - 140
Fluoranthene-d10 (Surr)	97		40 - 140

Lab Sample ID: 580-112035-1 TRL — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386635 — **Prep Batch: 386580**

Analyte	Sample Result	Sample Qualifier		TRL Result	TRL Qualifier	Unit	D			RSD	RSD Limit
Naphthalene	0.0075	M		0.00861	M J1	mg/Kg	☼			31	20
2-Methylnaphthalene	0.0030	J		0.00305	J J1	mg/Kg	☼			21	20
1-Methylnaphthalene	0.0023	J M		0.00227	J	mg/Kg	☼			11	20

Surrogate	TRL %Recovery	TRL Qualifier	Limits
Terphenyl-d14	113		58 - 132
2-methylnaphthalene-d10	83		40 - 140
Fluoranthene-d10 (Surr)	102		40 - 140

QC Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-386187/1-A
Matrix: Solid
Analysis Batch: 386257

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386187

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C24	30	U	50	9.9	mg/Kg		04/04/22 09:05	04/04/22 12:48	1
C24-C40	30	U	50	20	mg/Kg		04/04/22 09:05	04/04/22 12:48	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*91*		*45 - 130*	*04/04/22 09:05*	*04/04/22 12:48*	*1*

Lab Sample ID: LCS 580-386187/2-A
Matrix: Solid
Analysis Batch: 386257

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386187

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
C10-C24	500	393		mg/Kg		79	75 - 125
C24-C40	500	369		mg/Kg		74	39 - 106

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*72*		*45 - 130*

Lab Sample ID: LCSD 580-386187/3-A
Matrix: Solid
Analysis Batch: 386257

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 386187

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
C10-C24	500	424		mg/Kg		85	75 - 125	8	20
C24-C40	500	402		mg/Kg		80	39 - 106	9	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*83*		*45 - 130*

Lab Sample ID: MB 580-386480/1-A
Matrix: Solid
Analysis Batch: 386539

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386480

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C24	30	U	50	9.9	mg/Kg		04/06/22 08:37	04/06/22 14:46	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*84*		*45 - 130*	*04/06/22 08:37*	*04/06/22 14:46*	*1*

Lab Sample ID: LCS 580-386480/2-A
Matrix: Solid
Analysis Batch: 386539

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386480

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
C10-C24	500	470		mg/Kg		94	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*98*		*45 - 130*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: LCSD 580-386480/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386539 — **Prep Batch: 386480**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
C10-C24			500	484		mg/Kg		97	75 - 125	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*102*		*45 - 130*

Lab Sample ID: 580-112035-1 DU — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386539 — **Prep Batch: 386480**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
C10-C24	16	J		18.0	J	mg/Kg	☼			10	20

Surrogate	*DU %Recovery*	*DU Qualifier*	*Limits*
o-Terphenyl	*84*		*45 - 130*

Lab Sample ID: 580-112035-1 TRL — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386539 — **Prep Batch: 386480**

Analyte	Sample Result	Sample Qualifier		TRL Result	TRL Qualifier	Unit	D			RSD	RSD Limit
C10-C24	16	J		18.9	J	mg/Kg	☼			8	

Surrogate	*TRL %Recovery*	*TRL Qualifier*	*Limits*
o-Terphenyl	*81*		*45 - 130*

Lab Sample ID: 580-112035-1 DU — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386855 — **Prep Batch: 386863**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
C24-C40	67			58.3		mg/Kg				14	20

Surrogate	*DU %Recovery*	*DU Qualifier*	*Limits*
o-Terphenyl	*79*	*M*	*45 - 130*

Lab Sample ID: 580-112035-1 TRL — **Client Sample ID: A3000MISH-SOFT01-000.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386855 — **Prep Batch: 386863**

Analyte	Sample Result	Sample Qualifier		TRL Result	TRL Qualifier	Unit	D			RSD	RSD Limit
C24-C40	67			68.8		mg/Kg				9	

Surrogate	*TRL %Recovery*	*TRL Qualifier*	*Limits*
o-Terphenyl	*78*		*45 - 130*

QC Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Method: 2540G - SM 2540G

Lab Sample ID: 580-112035-1 DU
Matrix: Solid
Analysis Batch: 386837

Client Sample ID: A3000MISH-SOFT01-000.0
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	90.7			90.1		%				0.6	20
Percent Moisture	9.3			9.9		%				6	20

Lab Sample ID: 580-112035-1 TRL
Matrix: Solid
Analysis Batch: 386837

Client Sample ID: A3000MISH-SOFT01-000.0
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		TRL Result	TRL Qualifier	Unit	D			RSD	RSD Limit
Percent Solids	90.7			91.0		%					
Percent Moisture	9.3			9.0		%					

Lab Sample ID: 580-112035-5 DU
Matrix: Solid
Analysis Batch: 386837

Client Sample ID: A3325H-SON01-001.0
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	97.5			96.3		%				0.8	20
Percent Moisture	2.5			3.7	J1	%				24	20

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Client Sample ID: A3000MISH-SOFT01-000.0 — Lab Sample ID: 580-112035-1

Date Collected: 03/29/22 16:20 — **Matrix: Solid**
Date Received: 03/31/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	ISM Prep	Increment, prep			386667	04/05/22 11:07	CLC	FGS SEA
Total/NA	Prep	3546			386863	04/08/22 11:21	TOA	FGS SEA
Total/NA	Analysis	8015D DRO		1	386855	04/09/22 05:44	JAE	FGS SEA
Total/NA	ISM Prep	Increment, prep			386444	04/05/22 11:00	CLC	FGS SEA
Total/NA	Analysis	2540G		1	386837	04/08/22 09:38	TOA	FGS SEA

Client Sample ID: A3000MISH-SOFT01-000.0 — Lab Sample ID: 580-112035-1

Date Collected: 03/29/22 16:20 — **Matrix: Solid**
Date Received: 03/31/22 09:30 — **Percent Solids: 90.7**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	ISM Prep	Increment, Prep			386131	04/02/22 13:00	RJL	FGS SEA
Total/NA	Prep	5035			386132	04/02/22 14:00	RJL	FGS SEA
Total/NA	Analysis	8260/CALUFT DOD		1	386139	04/02/22 22:04	JSM	FGS SEA
Total/NA	ISM Prep	Increment, Prep			386131	04/02/22 13:00	RJL	FGS SEA
Total/NA	Prep	5035			386132	04/02/22 14:00	RJL	FGS SEA
Total/NA	Analysis	8260D		1	386136	04/02/22 22:04	JSM	FGS SEA
Total/NA	ISM Prep	Increment, prep			386444	04/05/22 11:00	CLC	FGS SEA
Total/NA	Prep	3546			386580	04/06/22 13:48	TOA	FGS SEA
Total/NA	Analysis	8270E SIM		1	386635	04/07/22 03:08	ADB	FGS SEA
Total/NA	ISM Prep	Increment, prep			386444	04/05/22 11:00	CLC	FGS SEA
Total/NA	Prep	3546			386480	04/06/22 08:37	TOA	FGS SEA
Total/NA	Analysis	8015D DRO		1	386539	04/06/22 15:45	JAE	FGS SEA

Client Sample ID: A3000MISH-SOFT02-000.0 — Lab Sample ID: 580-112035-2

Date Collected: 03/29/22 16:20 — **Matrix: Solid**
Date Received: 03/31/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	ISM Prep	Increment, prep			386667	04/07/22 10:10	CLC	FGS SEA
Total/NA	Prep	3546			386863	04/08/22 11:24	TOA	FGS SEA
Total/NA	Analysis	8015D DRO		1	386855	04/09/22 07:00	JAE	FGS SEA
Total/NA	ISM Prep	Increment, prep			386444	04/05/22 11:00	CLC	FGS SEA
Total/NA	Analysis	2540G		1	386837	04/08/22 09:38	TOA	FGS SEA

Client Sample ID: A3000MISH-SOFT02-000.0 — Lab Sample ID: 580-112035-2

Date Collected: 03/29/22 16:20 — **Matrix: Solid**
Date Received: 03/31/22 09:30 — **Percent Solids: 90.5**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	ISM Prep	Increment, Prep			386131	04/02/22 13:00	RJL	FGS SEA
Total/NA	Prep	5035			386132	04/02/22 14:00	RJL	FGS SEA
Total/NA	Analysis	8260/CALUFT DOD		1	386139	04/02/22 23:14	JSM	FGS SEA
Total/NA	ISM Prep	Increment, Prep			386131	04/02/22 13:00	RJL	FGS SEA
Total/NA	Prep	5035			386132	04/02/22 14:00	RJL	FGS SEA
Total/NA	Analysis	8260D		1	386136	04/02/22 23:14	JSM	FGS SEA

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Client Sample ID: A3000MISH-SOFT02-000.0 — Lab Sample ID: 580-112035-2

Date Collected: 03/29/22 16:20 — **Matrix: Solid**
Date Received: 03/31/22 09:30 — **Percent Solids: 90.5**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	ISM Prep	Increment, prep			386444	04/05/22 11:00	CLC	FGS SEA
Total/NA	Prep	3546			386580	04/06/22 13:48	TOA	FGS SEA
Total/NA	Analysis	8270E SIM		1	386635	04/07/22 04:20	ADB	FGS SEA
Total/NA	ISM Prep	Increment, prep			386444	04/05/22 11:00	CLC	FGS SEA
Total/NA	Prep	3546			386480	04/06/22 08:38	TOA	FGS SEA
Total/NA	Analysis	8015D DRO		1	386539	04/06/22 16:43	JAE	FGS SEA

Client Sample ID: A3000MISH-SOFT03-000.0 — Lab Sample ID: 580-112035-3

Date Collected: 03/29/22 16:20 — **Matrix: Solid**
Date Received: 03/31/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	ISM Prep	Increment, prep			386667	04/07/22 10:10	CLC	FGS SEA
Total/NA	Prep	3546			386863	04/08/22 11:41	TOA	FGS SEA
Total/NA	Analysis	8015D DRO		1	386855	04/09/22 07:19	JAE	FGS SEA
Total/NA	ISM Prep	Increment, prep			386444	04/05/22 11:00	CLC	FGS SEA
Total/NA	Analysis	2540G		1	386837	04/08/22 09:38	TOA	FGS SEA

Client Sample ID: A3000MISH-SOFT03-000.0 — Lab Sample ID: 580-112035-3

Date Collected: 03/29/22 16:20 — **Matrix: Solid**
Date Received: 03/31/22 09:30 — **Percent Solids: 88.6**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	ISM Prep	Increment, Prep			386131	04/02/22 13:00	RJL	FGS SEA
Total/NA	Prep	5035			386132	04/02/22 14:00	RJL	FGS SEA
Total/NA	Analysis	8260/CALUFT DOD		1	386139	04/02/22 23:37	JSM	FGS SEA
Total/NA	ISM Prep	Increment, Prep			386131	04/02/22 13:00	RJL	FGS SEA
Total/NA	Prep	5035			386132	04/02/22 14:00	RJL	FGS SEA
Total/NA	Analysis	8260D		1	386136	04/02/22 23:37	JSM	FGS SEA
Total/NA	ISM Prep	Increment, prep			386444	04/05/22 11:00	CLC	FGS SEA
Total/NA	Prep	3546			386580	04/06/22 13:48	TOA	FGS SEA
Total/NA	Analysis	8270E SIM		1	386635	04/07/22 04:45	ADB	FGS SEA
Total/NA	ISM Prep	Increment, prep			386444	04/05/22 11:00	CLC	FGS SEA
Total/NA	Prep	3546			386480	04/06/22 08:38	TOA	FGS SEA
Total/NA	Analysis	8015D DRO		1	386539	04/06/22 17:03	JAE	FGS SEA

Client Sample ID: A3-010-SON01-002.0 — Lab Sample ID: 580-112035-4

Date Collected: 03/30/22 10:10 — **Matrix: Solid**
Date Received: 03/31/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1	386837	04/08/22 09:38	TOA	FGS SEA

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Client Sample ID: A3-010-SON01-002.0

Lab Sample ID: 580-112035-4
Date Collected: 03/30/22 10:10
Matrix: Solid
Date Received: 03/31/22 09:30
Percent Solids: 58.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			386132	04/02/22 19:21	RJL	FGS SEA
Total/NA	Analysis	8260/CALUFT DOD		1	386139	04/03/22 00:24	JSM	FGS SEA
Total/NA	Prep	5035			386132	04/02/22 19:21	RJL	FGS SEA
Total/NA	Analysis	8260D		1	386136	04/03/22 00:24	JSM	FGS SEA
Total/NA	Prep	3546			386287	04/04/22 15:29	TOA	FGS SEA
Total/NA	Analysis	8270E SIM		20	386847	04/08/22 16:26	JCM	FGS SEA
Total/NA	Prep	3546			386187	04/04/22 09:05	TOA	FGS SEA
Total/NA	Analysis	8015D DRO		1	386257	04/04/22 14:49	JAE	FGS SEA
Total/NA	Prep	3546	DL		386187	04/04/22 09:05	TOA	FGS SEA
Total/NA	Analysis	8015D DRO	DL	10	386256	04/05/22 05:35	JAE	FGS SEA

Client Sample ID: A3325H-SON01-001.0

Lab Sample ID: 580-112035-5
Date Collected: 03/30/22 11:45
Matrix: Solid
Date Received: 03/31/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1	386837	04/08/22 09:38	TOA	FGS SEA

Client Sample ID: A3325H-SON01-001.0

Lab Sample ID: 580-112035-5
Date Collected: 03/30/22 11:45
Matrix: Solid
Date Received: 03/31/22 09:30
Percent Solids: 97.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			388466	04/25/22 11:04	JBT	FGS SEA
Total/NA	Analysis	8260/CALUFT DOD		1	388541	04/25/22 12:28	JSM	FGS SEA
Total/NA	Prep	5035			388281	04/22/22 10:00	RJL	FGS SEA
Total/NA	Analysis	8260D		1	388335	04/22/22 16:54	JSM	FGS SEA
Total/NA	Prep	3546			386287	04/04/22 15:29	TOA	FGS SEA
Total/NA	Analysis	8270E SIM		1	386376	04/05/22 14:18	E1L	FGS SEA
Total/NA	Prep	3546			386187	04/04/22 09:05	TOA	FGS SEA
Total/NA	Analysis	8015D DRO		1	386257	04/04/22 15:09	JAE	FGS SEA

Client Sample ID: Trip Blank

Lab Sample ID: 580-112035-6
Date Collected: 03/29/22 00:00
Matrix: Solid
Date Received: 03/31/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			388466	04/25/22 11:04	JBT	FGS SEA
Total/NA	Analysis	8260/CALUFT DOD		1	388541	04/25/22 12:51	JSM	FGS SEA
Total/NA	Prep	5035			388466	04/25/22 11:04	JBT	FGS SEA
Total/NA	Analysis	8260D		1	388538	04/25/22 12:51	JSM	FGS SEA

Laboratory References:

FGS SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112035-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-112035-1	A3000MISH-SOFT01-000.0	Solid	03/29/22 16:20	03/31/22 09:30
580-112035-2	A3000MISH-SOFT02-000.0	Solid	03/29/22 16:20	03/31/22 09:30
580-112035-3	A3000MISH-SOFT03-000.0	Solid	03/29/22 16:20	03/31/22 09:30
580-112035-4	A3-010-SON01-002.0	Solid	03/30/22 10:10	03/31/22 09:30
580-112035-5	A3325H-SON01-001.0	Solid	03/30/22 11:45	03/31/22 09:30
580-112035-6	Trip Blank	Solid	03/29/22 00:00	03/31/22 09:30

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

580-112035 Chain of Custody

Chain of Custody Record

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Client Information	Sampler: (b) (6)	Lab PM: (b) (6)	Carrier Tracking No(s):	COC No: 1 -44635
Client Contact: (b) (6)	Phone: (b) (6)	E-Mail: (b) (6) @EurofinsET.com	State of Origin:	Page: Page 1 of 1
Company: AECOM-Honolulu	PWSID:			Job #:
Address: AECOM-Honolulu	Due Date Requested:			
City: 1001 Bishop Street, ASB Tower, Suite 1600	TAT Requested (days): 4			
State, Zip: Honolulu, Hawaii, 96813	Compliance Project: Δ Yes Δ No			
Phone: (b) (6)	PO #: Purchase Order Requested			
Email: (b) (6) @aecom.com/ (b) (6) @aecom.com	WO #:			
Project Name: SiteCharP2Tunnels	Project #:			
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D/	N,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C	(b) (6) 3/30/22			Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3000MISH-SOFT01-000.0	3/29/22	1620	MIS	SO			6-4oz Jar ,TEF	1-GalZiploc								
A3000MISH-SOFT02-000.0	3/29/22	1620	MIS	SO			6-4oz Jar ,TEF	1-GalZiploc								
A3000MISH-SOFT03-000.0	3/29/22	1620	MIS	SO			6-4oz Jar ,TEF	1-GalZiploc								
A3-010-SON01-002.0	3/30/22	1010	GRAB	SO			2-40mlVOA	1-4ozJar								
A3325H-SON01-001.0	3/30/22	1145	GRAB	SO			2-40mlVOA	1-4ozJar								
			(b) (6)				3/30/22									

Therm. ID: A3 Cor: 1.5 ° Unc: 1.7 °
Cooler Dsc: LB
Packing: Bub
Cust. Seal: Yes ___ No ___
Blue Ice, Wet, Dry, None
FedEx: P.O
UPS:
Lab Cour:
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For ___ Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6)	3/30/22 1400	AECOM	(b) (6)	3/30/22 1400	AECOM
(b) (6)	3/30/22 1425	AECOM		3/31/22 0930	EFS

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-112035-1

Login Number: 112035
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Received Trip Blank(s) not listed on COC.
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	N/A	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-112198-1
Client Project/Site: RH Site Characterization JBPHH N62742-17

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
4/14/2022 4:18:22 PM

[redacted], Project Manager II
[redacted]@et.eurofinsus.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-112198-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-112198-1

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
The samples were received on 4/5/2022 9:50 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 3 coolers at receipt time were 1.6º C, 2.3º C and 4.4º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

GASOLINE RANGE ORGANICS (GRO) - WATER
Samples PSCOOLING-WSN01-000.0 (580-112198-1), PSCOOLING-WSFD01-000.0 (580-112198-2), SUMPDRN-WSN01-000.0 (580-112198-3), SUMP-WSN01-000.0 (580-112198-4) and A3015-WGN01-002.0 (580-112198-6) were analyzed for gasoline range organics (GRO) in accordance with 8260B CALUFT. The samples were analyzed on 04/09/2022.

The following samples were analyzed at reduced volume due to high concentrations of non-target analytes: A3015-SON01-002.0 (580-112198-5), (580-112198-B-5-B MS) and (580-112198-B-5-C MSD). The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GASOLINE RANGE ORGANICS (GRO) - SOIL
Sample A3015-SON01-002.0 (580-112198-5) was analyzed for gasoline range organics (GRO) in accordance with 8260B CALUFT. The sample was prepared and analyzed on 04/09/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS) - WATER
Samples PSCOOLING-WSN01-000.0 (580-112198-1), PSCOOLING-WSFD01-000.0 (580-112198-2), SUMPDRN-WSN01-000.0

Job ID: 580-112198-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

(580-112198-3), SUMP-WSN01-000.0 (580-112198-4) and A3015-WGN01-002.0 (580-112198-6) were analyzed for volatile organic compounds (GC-MS) in accordance with 8260D_DOD5. The samples were analyzed on 04/09/2022 and 04/11/2022.

The continuing calibration verification (CCV) associated with batch 580-386906 recovered above the upper control limit for o-Xylene. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The associated samples are impacted: PSCOOLING-WSN01-000.0 (580-112198-1), PSCOOLING-WSFD01-000.0 (580-112198-2), SUMPDRN-WSN01-000.0 (580-112198-3), SUMP-WSN01-000.0 (580-112198-4), A3015-WGN01-002.0 (580-112198-6) and (CCVIS 580-386906/3).

Toluene failed the recovery criteria high for LCS 580-386906/6. Toluene failed the recovery criteria high for LCSD 580-386906/7. The analyte was biased high in the LCS and was not detected in the associated samples; therefore, the data have been reported.

The following sample was diluted to bring the concentration of target analytes within the calibration range: A3015-WGN01-002.0 (580-112198-6). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS) - SOIL

Sample A3015-SON01-002.0 (580-112198-5) was analyzed for volatile organic compounds (GC-MS) in accordance with 8260D_DOD5. The sample was prepared and analyzed on 04/09/2022.

m-Xylene & p-Xylene, o-Xylene and Xylenes, Total were detected in method blank MB 580-386962/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and reanalysis of the samples was not performed.

The following sample was analyzed at reduced volume due to high concentrations of non-target analytes: A3015-SON01-002.0 (580-112198-5). The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) - WATER

Samples PSCOOLING-WSN01-000.0 (580-112198-1), PSCOOLING-WSFD01-000.0 (580-112198-2), SUMPDRN-WSN01-000.0 (580-112198-3), SUMP-WSN01-000.0 (580-112198-4) and A3015-WGN01-002.0 (580-112198-6) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 04/07/2022 and 04/08/2022 and analyzed on 04/08/2022 and 04/09/2022.

Due to sample matrix effect on the internal standard (ISTD), a dilution was required for the following sample: A3015-WGN01-002.0 (580-112198-6).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) - SOIL

Sample A3015-SON01-002.0 (580-112198-5) was analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The sample was prepared on 04/07/2022 and analyzed on 04/08/2022 and 04/09/2022.

2,4,6-Tribromophenol failed the surrogate recovery criteria low for A3015-SON01-002.0 (580-112198-5). Refer to the QC report for details.

The following sample required a dilution due to the nature of the sample matrix: A3015-SON01-002.0 (580-112198-5). Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 580-112198-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

DIESEL RANGE ORGANICS - WATER

Samples PSCOOLING-WSN01-000.0 (580-112198-1), PSCOOLING-WSFD01-000.0 (580-112198-2), SUMPDRN-WSN01-000.0 (580-112198-3), SUMP-WSN01-000.0 (580-112198-4) and A3015-WGN01-002.0 (580-112198-6) were analyzed for Diesel Range Organics in accordance with 8015D DRO. The samples were prepared on 04/06/2022 and 04/11/2022 and analyzed on 04/07/2022 and 04/12/2022.

Surrogate recovery for the following sample was outside control limits: A3015-WGN01-002.0 (580-112198-6). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

The following sample was prepared outside of preparation holding time due to the sample being missed when the rest of this job was prepped on their last day of hold time. It was not noticed until the next day: A3015-WGN01-002.0 (580-112198-6). There is no charge for this DRO sample

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS - SOIL

Sample A3015-SON01-002.0 (580-112198-5) was analyzed for diesel range organics in accordance with 8015DRO. The sample was prepared on 04/06/2022 and analyzed on 04/12/2022.

C10-C24 failed the recovery criteria high for the MS of sample A3015-SON01-002.0MS (580-112198-5) in batch 580-387023. C10-C24 failed the recovery criteria low for the MSD of sample A3015-SON01-002.0MSD (580-112198-5) in batch 580-387023. C10-C24 exceeded the RPD limit. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample / laboratory sample control duplicate (LCS/LCSD) precision was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Sample A3015-SON01-002.0 (580-112198-5) was analyzed for percent solids in accordance with ASTM D2216. The sample was analyzed on 04/12/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Job ID: 580-112198-1
Project/Site: RH Site Characterization JBPHH N62742-17

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
D	The reported value is from a dilution.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

GC/MS Semi VOA

Qualifier	Qualifier Description
D	The reported value is from a dilution.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
D	The reported value is from a dilution.
H	Sample was prepped or analyzed beyond the specified holding time
J	Estimated: The analyte was positively identified; the quantitation is an estimation
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control

Glossary (Continued)

Abbreviation	These commonly used abbreviations may or may not be present in this report.
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-112198-1

Client Sample ID: PSCOOLING-WSN01-000.0

Lab Sample ID: 580-112198-1

Date Collected: 03/31/22 12:15
Matrix: Water
Date Received: 04/05/22 09:50

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	0.080	U	0.10	0.031	mg/L			04/09/22 05:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*81*		*69 - 133*		*04/09/22 05:05*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U M	1.0	0.24	ug/L			04/09/22 05:05	1
Toluene	0.80	U Q M	1.0	0.39	ug/L			04/09/22 05:05	1
Ethylbenzene	0.80	U M	1.0	0.50	ug/L			04/09/22 05:05	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			04/09/22 05:05	1
o-Xylene	0.80	U Q M	1.0	0.39	ug/L			04/09/22 05:05	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			04/09/22 05:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*103*		*89 - 112*		*04/09/22 05:05*	*1*
Dibromofluoromethane (Surr)	*93*		*80 - 119*		*04/09/22 05:05*	*1*
1,2-Dichloroethane-d4 (Surr)	*96*		*81 - 118*		*04/09/22 05:05*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**0.034**	**J**	0.11	0.021	ug/L		04/07/22 13:03	04/08/22 01:54	1
2-Methylnaphthalene	0.087	U	0.22	0.042	ug/L		04/07/22 13:03	04/08/22 01:54	1
Naphthalene	**0.075**	**J**	0.11	0.034	ug/L		04/07/22 13:03	04/08/22 01:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*49*		*46 - 122*	*04/07/22 13:03*	*04/08/22 01:54*	*1*
2-methylnaphthalene-d10	*40*		*40 - 140*	*04/07/22 13:03*	*04/08/22 01:54*	*1*
Fluoranthene-d10 (Surr)	*71*		*40 - 140*	*04/07/22 13:03*	*04/08/22 01:54*	*1*
Terphenyl-d14	*90*		*58 - 132*	*04/07/22 13:03*	*04/08/22 01:54*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C24-C40	320	U	370	190	ug/L		04/06/22 10:17	04/07/22 16:34	1
C10-C24	110	U	120	69	ug/L		04/06/22 10:17	04/07/22 16:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*66*		*56 - 125*	*04/06/22 10:17*	*04/07/22 16:34*	*1*

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-112198-1

Client Sample ID: PSCOOLING-WSFD01-000.0

Lab Sample ID: 580-112198-2

Date Collected: 03/31/22 12:15
Date Received: 04/05/22 09:50

Matrix: Water

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	0.080	U	0.10	0.031	mg/L			04/09/22 05:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*82*		*69 - 133*		*04/09/22 05:29*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U M	1.0	0.24	ug/L			04/09/22 05:29	1
Toluene	0.80	U Q M	1.0	0.39	ug/L			04/09/22 05:29	1
Ethylbenzene	0.80	U M	1.0	0.50	ug/L			04/09/22 05:29	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			04/09/22 05:29	1
o-Xylene	0.80	U Q M	1.0	0.39	ug/L			04/09/22 05:29	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			04/09/22 05:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*102*		*89 - 112*		*04/09/22 05:29*	*1*
Dibromofluoromethane (Surr)	*91*		*80 - 119*		*04/09/22 05:29*	*1*
1,2-Dichloroethane-d4 (Surr)	*92*		*81 - 118*		*04/09/22 05:29*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**0.033**	**J**	0.11	0.021	ug/L		04/07/22 13:03	04/08/22 02:19	1
2-Methylnaphthalene	0.087	U	0.22	0.043	ug/L		04/07/22 13:03	04/08/22 02:19	1
Naphthalene	**0.048**	**J**	0.11	0.034	ug/L		04/07/22 13:03	04/08/22 02:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*63*		*46 - 122*	*04/07/22 13:03*	*04/08/22 02:19*	*1*
2-methylnaphthalene-d10	*48*		*40 - 140*	*04/07/22 13:03*	*04/08/22 02:19*	*1*
Fluoranthene-d10 (Surr)	*80*		*40 - 140*	*04/07/22 13:03*	*04/08/22 02:19*	*1*
Terphenyl-d14	*95*		*58 - 132*	*04/07/22 13:03*	*04/08/22 02:19*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C24-C40	**380**		370	190	ug/L		04/06/22 10:17	04/07/22 16:54	1
C10-C24	**100**	**J**	120	69	ug/L		04/06/22 10:17	04/07/22 16:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*73*		*56 - 125*	*04/06/22 10:17*	*04/07/22 16:54*	*1*

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-112198-1

Client Sample ID: SUMPDRN-WSN01-000.0

Lab Sample ID: 580-112198-3

Date Collected: 03/31/22 11:30
Matrix: Water
Date Received: 04/05/22 09:50

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	0.080	U	0.10	0.031	mg/L			04/09/22 05:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*81*		*69 - 133*		*04/09/22 05:52*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U M	1.0	0.24	ug/L			04/09/22 05:52	1
Toluene	0.80	U Q M	1.0	0.39	ug/L			04/09/22 05:52	1
Ethylbenzene	0.80	U M	1.0	0.50	ug/L			04/09/22 05:52	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			04/09/22 05:52	1
o-Xylene	0.80	U Q M	1.0	0.39	ug/L			04/09/22 05:52	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			04/09/22 05:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*102*		*89 - 112*		*04/09/22 05:52*	*1*
Dibromofluoromethane (Surr)	*93*		*80 - 119*		*04/09/22 05:52*	*1*
1,2-Dichloroethane-d4 (Surr)	*96*		*81 - 118*		*04/09/22 05:52*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**0.056**	**J**	0.11	0.021	ug/L		04/07/22 13:03	04/08/22 02:44	1
2-Methylnaphthalene	**0.057**	**J**	0.22	0.044	ug/L		04/07/22 13:03	04/08/22 02:44	1
Naphthalene	**0.092**	**J**	0.11	0.035	ug/L		04/07/22 13:03	04/08/22 02:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*62*		*46 - 122*	*04/07/22 13:03*	*04/08/22 02:44*	*1*
2-methylnaphthalene-d10	*48*		*40 - 140*	*04/07/22 13:03*	*04/08/22 02:44*	*1*
Fluoranthene-d10 (Surr)	*76*		*40 - 140*	*04/07/22 13:03*	*04/08/22 02:44*	*1*
Terphenyl-d14	*89*		*58 - 132*	*04/07/22 13:03*	*04/08/22 02:44*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C24-C40	310	U	360	190	ug/L		04/06/22 10:17	04/07/22 17:14	1
C10-C24	**81**	**J**	110	68	ug/L		04/06/22 10:17	04/07/22 17:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*67*		*56 - 125*	*04/06/22 10:17*	*04/07/22 17:14*	*1*

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-112198-1

Client Sample ID: SUMP-WSN01-000.0

Lab Sample ID: 580-112198-4

Date Collected: 03/31/22 09:45
Matrix: Water
Date Received: 04/05/22 09:50

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	0.080	U	0.10	0.031	mg/L			04/09/22 06:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*84*		*69 - 133*		*04/09/22 06:16*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U M	1.0	0.24	ug/L			04/09/22 06:16	1
Toluene	0.80	U Q M	1.0	0.39	ug/L			04/09/22 06:16	1
Ethylbenzene	0.80	U M	1.0	0.50	ug/L			04/09/22 06:16	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			04/09/22 06:16	1
o-Xylene	0.80	U Q M	1.0	0.39	ug/L			04/09/22 06:16	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			04/09/22 06:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*101*		*89 - 112*		*04/09/22 06:16*	*1*
Dibromofluoromethane (Surr)	*91*		*80 - 119*		*04/09/22 06:16*	*1*
1,2-Dichloroethane-d4 (Surr)	*91*		*81 - 118*		*04/09/22 06:16*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**0.078**	**J**	0.10	0.020	ug/L		04/07/22 13:03	04/08/22 03:08	1
2-Methylnaphthalene	**0.094**	**J**	0.21	0.041	ug/L		04/07/22 13:03	04/08/22 03:08	1
Naphthalene	**0.17**		0.10	0.032	ug/L		04/07/22 13:03	04/08/22 03:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*61*		*46 - 122*	*04/07/22 13:03*	*04/08/22 03:08*	*1*
2-methylnaphthalene-d10	*49*		*40 - 140*	*04/07/22 13:03*	*04/08/22 03:08*	*1*
Fluoranthene-d10 (Surr)	*81*		*40 - 140*	*04/07/22 13:03*	*04/08/22 03:08*	*1*
Terphenyl-d14	*97*		*58 - 132*	*04/07/22 13:03*	*04/08/22 03:08*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C24-C40	310	U	360	190	ug/L		04/06/22 10:17	04/07/22 17:33	1
C10-C24	**89**	**J**	110	67	ug/L		04/06/22 10:17	04/07/22 17:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*59*		*56 - 125*	*04/06/22 10:17*	*04/07/22 17:33*	*1*

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-112198-1

Client Sample ID: A3015-SON01-002.0

Date Collected: 04/01/22 16:45
Date Received: 04/05/22 09:50

Lab Sample ID: 580-112198-5

Matrix: Solid
Percent Solids: 60.2

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	88	J	91	30	mg/Kg	☼	04/09/22 13:00	04/09/22 16:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*102*		*67 - 134*	*04/09/22 13:00*	*04/09/22 16:57*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.34	U	0.45	0.086	mg/Kg	☼	04/09/22 13:00	04/09/22 16:57	1
Toluene	0.68	U	1.4	0.31	mg/Kg	☼	04/09/22 13:00	04/09/22 16:57	1
Ethylbenzene	0.77	J	0.91	0.21	mg/Kg	☼	04/09/22 13:00	04/09/22 16:57	1
m-Xylene & p-Xylene	1.9		0.91	0.16	mg/Kg	☼	04/09/22 13:00	04/09/22 16:57	1
o-Xylene	2.2		0.91	0.11	mg/Kg	☼	04/09/22 13:00	04/09/22 16:57	1
Xylenes, Total	4100		910	160	ug/Kg	☼	04/09/22 13:00	04/09/22 16:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*97*		*85 - 116*	*04/09/22 13:00*	*04/09/22 16:57*	*1*
4-Bromofluorobenzene (Surr)	*102*		*79 - 119*	*04/09/22 13:00*	*04/09/22 16:57*	*1*
Dibromofluoromethane (Surr)	*97*		*78 - 119*	*04/09/22 13:00*	*04/09/22 16:57*	*1*
1,2-Dichloroethane-d4 (Surr)	*105*		*71 - 136*	*04/09/22 13:00*	*04/09/22 16:57*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	9.5		0.0067	0.0022	mg/Kg	☼	04/07/22 11:14	04/08/22 08:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*52*		*28 - 143*	*04/07/22 11:14*	*04/08/22 08:42*	*1*
2-methylnaphthalene-d10	*105*		*40 - 140*	*04/07/22 11:14*	*04/08/22 08:42*	*1*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*	*04/07/22 11:14*	*04/08/22 08:42*	*1*
Terphenyl-d14	*101*		*58 - 132*	*04/07/22 11:14*	*04/08/22 08:42*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) - DL

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	17	D	0.34	0.042	mg/Kg	☼	04/07/22 11:14	04/09/22 21:22	50
2-Methylnaphthalene	22	D	0.34	0.14	mg/Kg	☼	04/07/22 11:14	04/09/22 21:22	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*0*	*Q*	*28 - 143*	*04/07/22 11:14*	*04/09/22 21:22*	*50*
2-methylnaphthalene-d10	*83*		*40 - 140*	*04/07/22 11:14*	*04/09/22 21:22*	*50*
Fluoranthene-d10 (Surr)	*78*	*M*	*40 - 140*	*04/07/22 11:14*	*04/09/22 21:22*	*50*
Terphenyl-d14	*89*	*M*	*58 - 132*	*04/07/22 11:14*	*04/09/22 21:22*	*50*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C24	3900	J1	61	12	mg/Kg	☼	04/06/22 08:38	04/12/22 08:18	1
C24-C40	37	U	61	24	mg/Kg	☼	04/06/22 08:38	04/12/22 08:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*72*	*M*	*45 - 130*	*04/06/22 08:38*	*04/12/22 08:18*	*1*

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-112198-1

Client Sample ID: A3015-SON01-002.0

Date Collected: 04/01/22 16:45
Date Received: 04/05/22 09:50

Lab Sample ID: 580-112198-5

Matrix: Solid
Percent Solids: 60.2

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	60.2		0.1	0.1	%			04/12/22 12:37	1
Percent Moisture	39.8		0.1	0.1	%			04/12/22 12:37	1

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-112198-1

Client Sample ID: A3015-WGN01-002.0

Date Collected: 04/01/22 16:00
Date Received: 04/05/22 09:50

Lab Sample ID: 580-112198-6

Matrix: Water

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	1.5		0.10	0.031	mg/L			04/09/22 06:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*86*		*69 - 133*		*04/09/22 06:39*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	1.3		1.0	0.24	ug/L			04/09/22 06:39	1
Ethylbenzene	40		1.0	0.50	ug/L			04/09/22 06:39	1
m-Xylene & p-Xylene	99		2.0	0.53	ug/L			04/09/22 06:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*102*		*89 - 112*		*04/09/22 06:39*	*1*
Dibromofluoromethane (Surr)	*96*		*80 - 119*		*04/09/22 06:39*	*1*
1,2-Dichloroethane-d4 (Surr)	*102*		*81 - 118*		*04/09/22 06:39*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS) - DL

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Toluene	3.9	J D	10	3.9	ug/L			04/11/22 13:01	10
o-Xylene	120	D	10	3.9	ug/L			04/11/22 13:01	10
Xylenes, Total	190		20	5.3	ug/L			04/11/22 13:01	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*93*		*85 - 114*		*04/11/22 13:01*	*10*
Toluene-d8 (Surr)	*102*		*89 - 112*		*04/11/22 13:01*	*10*
Dibromofluoromethane (Surr)	*86*		*80 - 119*		*04/11/22 13:01*	*10*
1,2-Dichloroethane-d4 (Surr)	*88*		*81 - 118*		*04/11/22 13:01*	*10*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	660	D	6.1	1.2	ug/L		04/08/22 11:35	04/09/22 20:16	50
2-Methylnaphthalene	930	D	12	2.4	ug/L		04/08/22 11:35	04/09/22 20:16	50
Naphthalene	400	D	6.1	1.9	ug/L		04/08/22 11:35	04/09/22 20:16	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*55*		*46 - 122*	*04/08/22 11:35*	*04/09/22 20:16*	*50*
2-methylnaphthalene-d10	*98*	*M*	*40 - 140*	*04/08/22 11:35*	*04/09/22 20:16*	*50*
Fluoranthene-d10 (Surr)	*79*		*40 - 140*	*04/08/22 11:35*	*04/09/22 20:16*	*50*
Terphenyl-d14	*87*		*58 - 132*	*04/08/22 11:35*	*04/09/22 20:16*	*50*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C24-C40	430	H	390	200	ug/L		04/11/22 09:32	04/12/22 01:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*83*	*M*	*56 - 125*	*04/11/22 09:32*	*04/12/22 01:30*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) - DL

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C24	380000	D H	6200	3700	ug/L		04/11/22 09:32	04/12/22 15:00	50

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 580-386909/5
Matrix: Water
Analysis Batch: 386909

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	0.080	U	0.10	0.031	mg/L			04/08/22 23:11	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*85*		*69 - 133*		*04/08/22 23:11*	*1*

Lab Sample ID: LCS 580-386909/8
Matrix: Water
Analysis Batch: 386909

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics (GRO)-C6-C10	1.00	0.846		mg/L		85	78 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*95*		*69 - 133*

Lab Sample ID: LCSD 580-386909/9
Matrix: Water
Analysis Batch: 386909

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics (GRO)-C6-C10	1.00	0.865		mg/L		86	78 - 122	2	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*94*		*69 - 133*

Lab Sample ID: MB 580-386962/1-A
Matrix: Solid
Analysis Batch: 386968

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386962

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	3.0	U	4.0	1.3	mg/Kg		04/09/22 12:58	04/09/22 15:01	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*104*		*67 - 134*	*04/09/22 12:58*	*04/09/22 15:01*	*1*

Lab Sample ID: LCS 580-386962/4-A
Matrix: Solid
Analysis Batch: 386968

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386962

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics (GRO)-C6-C10	40.0	42.2		mg/Kg		106	79 - 122

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: LCS 580-386962/4-A
Matrix: Solid
Analysis Batch: 386968

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386962

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*102*		*67 - 134*

Lab Sample ID: LCSD 580-386962/5-A
Matrix: Solid
Analysis Batch: 386968

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 386962

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics (GRO)-C6-C10			40.0	41.3		mg/Kg		103	79 - 122	2	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*104*		*67 - 134*

Lab Sample ID: 580-112198-5 MS
Matrix: Solid
Analysis Batch: 386968

Client Sample ID: A3015-SON01-002.0
Prep Type: Total/NA
Prep Batch: 386962

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Gasoline Range Organics (GRO)-C6-C10	88	J	910	1090		mg/Kg	☼	110	79 - 122		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*67 - 134*

Lab Sample ID: 580-112198-5 MSD
Matrix: Solid
Analysis Batch: 386968

Client Sample ID: A3015-SON01-002.0
Prep Type: Total/NA
Prep Batch: 386962

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics (GRO)-C6-C10	88	J	910	1120		mg/Kg	☼	113	79 - 122	3	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*102*		*67 - 134*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 580-386906/5
Matrix: Water
Analysis Batch: 386906

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U M	1.0	0.24	ug/L			04/08/22 23:11	1
Toluene	0.80	U M	1.0	0.39	ug/L			04/08/22 23:11	1
Ethylbenzene	0.80	U M	1.0	0.50	ug/L			04/08/22 23:11	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			04/08/22 23:11	1
o-Xylene	0.80	U M	1.0	0.39	ug/L			04/08/22 23:11	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			04/08/22 23:11	1

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 580-386906/5
Matrix: Water
Analysis Batch: 386906

Client Sample ID: Method Blank
Prep Type: Total/NA

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*101*		*89 - 112*		*04/08/22 23:11*	*1*
Dibromofluoromethane (Surr)	*87*		*80 - 119*		*04/08/22 23:11*	*1*
1,2-Dichloroethane-d4 (Surr)	*92*		*81 - 118*		*04/08/22 23:11*	*1*

Lab Sample ID: LCS 580-386906/6
Matrix: Water
Analysis Batch: 386906

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	10.0	12.0		ug/L		120	79 - 120
Toluene	10.0	12.3	M Q	ug/L		123	80 - 121
Ethylbenzene	10.0	12.0	M	ug/L		120	79 - 121
m-Xylene & p-Xylene	10.0	11.9		ug/L		119	80 - 121
o-Xylene	10.0	12.1		ug/L		121	78 - 122
Xylenes, Total	20.0	24.0		ug/L		120	79 - 121

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Toluene-d8 (Surr)	*103*		*89 - 112*
Dibromofluoromethane (Surr)	*90*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*96*		*81 - 118*

Lab Sample ID: LCSD 580-386906/7
Matrix: Water
Analysis Batch: 386906

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	10.0	11.5		ug/L		115	79 - 120	4	20
Toluene	10.0	12.3	Q	ug/L		123	80 - 121	0	20
Ethylbenzene	10.0	12.0		ug/L		120	79 - 121	0	20
m-Xylene & p-Xylene	10.0	11.8		ug/L		118	80 - 121	1	20
o-Xylene	10.0	12.2	M	ug/L		122	78 - 122	1	20
Xylenes, Total	20.0	24.0		ug/L		120	79 - 121	0	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*104*		*89 - 112*
Dibromofluoromethane (Surr)	*87*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*89*		*81 - 118*

Lab Sample ID: MB 580-386962/1-A
Matrix: Solid
Analysis Batch: 386965

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386962

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U	0.020	0.0038	mg/Kg		04/09/22 12:58	04/09/22 15:01	1
Toluene	0.030	U	0.060	0.014	mg/Kg		04/09/22 12:58	04/09/22 15:01	1
Ethylbenzene	0.030	U	0.040	0.0091	mg/Kg		04/09/22 12:58	04/09/22 15:01	1
m-Xylene & p-Xylene	0.00969	J	0.040	0.0071	mg/Kg		04/09/22 12:58	04/09/22 15:01	1
o-Xylene	0.00720	J	0.040	0.0050	mg/Kg		04/09/22 12:58	04/09/22 15:01	1

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 580-386962/1-A
Matrix: Solid
Analysis Batch: 386965

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386962

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Xylenes, Total	16.9	J	40	7.1	ug/Kg		04/09/22 12:58	04/09/22 15:01	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*104*		*79 - 119*	*04/09/22 12:58*	*04/09/22 15:01*	*1*
Toluene-d8 (Surr)	*99*		*85 - 116*	*04/09/22 12:58*	*04/09/22 15:01*	*1*
Dibromofluoromethane (Surr)	*97*		*78 - 119*	*04/09/22 12:58*	*04/09/22 15:01*	*1*
1,2-Dichloroethane-d4 (Surr)	*106*		*71 - 136*	*04/09/22 12:58*	*04/09/22 15:01*	*1*

Lab Sample ID: LCS 580-386962/2-A
Matrix: Solid
Analysis Batch: 386965

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386962

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	0.800	0.844		mg/Kg		106	77 - 121
Toluene	0.800	0.848		mg/Kg		106	77 - 121
Ethylbenzene	0.800	0.835		mg/Kg		104	76 - 122
m-Xylene & p-Xylene	0.800	0.869		mg/Kg		109	77 - 124
o-Xylene	0.800	0.849		mg/Kg		106	77 - 123
Xylenes, Total	1600	1720		ug/Kg		107	78 - 124

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*103*		*79 - 119*
Toluene-d8 (Surr)	*99*		*85 - 116*
Dibromofluoromethane (Surr)	*103*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*

Lab Sample ID: LCSD 580-386962/3-A
Matrix: Solid
Analysis Batch: 386965

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 386962

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	0.800	0.821	M	mg/Kg		103	77 - 121	3	20
Toluene	0.800	0.820		mg/Kg		102	77 - 121	3	20
Ethylbenzene	0.800	0.816		mg/Kg		102	76 - 122	2	20
m-Xylene & p-Xylene	0.800	0.836		mg/Kg		105	77 - 124	4	20
o-Xylene	0.800	0.815		mg/Kg		102	77 - 123	4	20
Xylenes, Total	1600	1650		ug/Kg		103	78 - 124	4	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*102*		*79 - 119*
Toluene-d8 (Surr)	*98*		*85 - 116*
Dibromofluoromethane (Surr)	*103*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*103*		*71 - 136*

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 580-387050/5
Matrix: Water
Analysis Batch: 387050

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Toluene	0.80	U M	1.0	0.39	ug/L			04/11/22 11:03	1
o-Xylene	0.80	U M	1.0	0.39	ug/L			04/11/22 11:03	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			04/11/22 11:03	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*88*		*85 - 114*		*04/11/22 11:03*	*1*
Toluene-d8 (Surr)	*104*		*89 - 112*		*04/11/22 11:03*	*1*
Dibromofluoromethane (Surr)	*89*		*80 - 119*		*04/11/22 11:03*	*1*
1,2-Dichloroethane-d4 (Surr)	*89*		*81 - 118*		*04/11/22 11:03*	*1*

Lab Sample ID: LCS 580-387050/6
Matrix: Water
Analysis Batch: 387050

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Toluene			10.0	11.8		ug/L		118	80 - 121		
o-Xylene			10.0	11.8	M	ug/L		118	78 - 122		
Xylenes, Total			20.0	23.6		ug/L		118	79 - 121		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*93*		*85 - 114*
Toluene-d8 (Surr)	*105*		*89 - 112*
Dibromofluoromethane (Surr)	*88*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*91*		*81 - 118*

Lab Sample ID: LCSD 580-387050/7
Matrix: Water
Analysis Batch: 387050

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Toluene			10.0	11.6		ug/L		116	80 - 121	2	20
o-Xylene			10.0	11.9		ug/L		119	78 - 122	0	20
Xylenes, Total			20.0	23.6		ug/L		118	79 - 121	0	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*92*		*85 - 114*
Toluene-d8 (Surr)	*102*		*89 - 112*
Dibromofluoromethane (Surr)	*86*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*91*		*81 - 118*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-386688/1-A
Matrix: Solid
Analysis Batch: 386820

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386688

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		04/07/22 11:13	04/08/22 02:39	1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: MB 580-386688/1-A
Matrix: Solid
Analysis Batch: 386820

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386688

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		04/07/22 11:13	04/08/22 02:39	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		04/07/22 11:13	04/08/22 02:39	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*56*		*28 - 143*	*04/07/22 11:13*	*04/08/22 02:39*	*1*
2-methylnaphthalene-d10	*68*		*40 - 140*	*04/07/22 11:13*	*04/08/22 02:39*	*1*
Fluoranthene-d10 (Surr)	*84*		*40 - 140*	*04/07/22 11:13*	*04/08/22 02:39*	*1*
Terphenyl-d14	*85*		*58 - 132*	*04/07/22 11:13*	*04/08/22 02:39*	*1*

Lab Sample ID: LCS 580-386688/2-A
Matrix: Solid
Analysis Batch: 386820

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386688

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.813		mg/Kg		81	43 - 111
2-Methylnaphthalene	1.00	0.791		mg/Kg		79	39 - 114
Naphthalene	1.00	0.814		mg/Kg		81	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol	*76*		*28 - 143*
2-methylnaphthalene-d10	*83*		*40 - 140*
Fluoranthene-d10 (Surr)	*86*		*40 - 140*
Terphenyl-d14	*88*		*58 - 132*

Lab Sample ID: MB 580-386740/1-A
Matrix: Water
Analysis Batch: 386818

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386740

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.032	U	0.10	0.019	ug/L		04/07/22 13:03	04/08/22 00:40	1
2-Methylnaphthalene	0.080	U	0.20	0.039	ug/L		04/07/22 13:03	04/08/22 00:40	1
Naphthalene	0.080	U	0.10	0.031	ug/L		04/07/22 13:03	04/08/22 00:40	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*73*		*46 - 122*	*04/07/22 13:03*	*04/08/22 00:40*	*1*
2-methylnaphthalene-d10	*62*		*40 - 140*	*04/07/22 13:03*	*04/08/22 00:40*	*1*
Fluoranthene-d10 (Surr)	*87*		*40 - 140*	*04/07/22 13:03*	*04/08/22 00:40*	*1*
Terphenyl-d14	*103*		*58 - 132*	*04/07/22 13:03*	*04/08/22 00:40*	*1*

Lab Sample ID: LCS 580-386740/2-A
Matrix: Water
Analysis Batch: 386818

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386740

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	4.00	1.93		ug/L		48	41 - 115
2-Methylnaphthalene	4.00	1.85		ug/L		46	39 - 114
Naphthalene	4.00	1.89		ug/L		47	43 - 114

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCS 580-386740/2-A
Matrix: Water
Analysis Batch: 386818

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386740

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol	*74*		*46 - 122*
2-methylnaphthalene-d10	*62*		*40 - 140*
Fluoranthene-d10 (Surr)	*78*		*40 - 140*
Terphenyl-d14	*90*		*58 - 132*

Lab Sample ID: LCSD 580-386740/3-A
Matrix: Water
Analysis Batch: 386818

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 386740

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	4.00	1.97		ug/L		49	41 - 115	2	20
2-Methylnaphthalene	4.00	1.90		ug/L		47	39 - 114	3	20
Naphthalene	4.00	1.95		ug/L		49	43 - 114	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2,4,6-Tribromophenol	*72*		*46 - 122*
2-methylnaphthalene-d10	*56*		*40 - 140*
Fluoranthene-d10 (Surr)	*79*		*40 - 140*
Terphenyl-d14	*91*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-386480/1-A
Matrix: Solid
Analysis Batch: 386539

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 386480

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C24-C40	30	U	50	20	mg/Kg		04/06/22 08:37	04/06/22 14:46	1
C10-C24	30	U	50	9.9	mg/Kg		04/06/22 08:37	04/06/22 14:46	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*84*		*45 - 130*	*04/06/22 08:37*	*04/06/22 14:46*	*1*

Lab Sample ID: LCS 580-386480/2-A
Matrix: Solid
Analysis Batch: 386539

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386480

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
C24-C40	500	462		mg/Kg		92	39 - 106
C10-C24	500	470		mg/Kg		94	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*98*		*45 - 130*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: LCSD 580-386480/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 386539 — **Prep Batch: 386480**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
C24-C40			500	474		mg/Kg		95	39 - 106	2	20
C10-C24			500	484		mg/Kg		97	75 - 125	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*102*		*45 - 130*

Lab Sample ID: 580-112198-5 MS — **Client Sample ID: A3015-SON01-002.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387023 — **Prep Batch: 386480**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
C24-C40	37	U	692	577		mg/Kg	☼	83	39 - 106		
C10-C24	3900	J1	692	5070	4	mg/Kg	☼	174	75 - 125		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*81*	*M*	*45 - 130*

Lab Sample ID: 580-112198-5 MSD — **Client Sample ID: A3015-SON01-002.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387023 — **Prep Batch: 386480**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
C24-C40	37	U	700	549		mg/Kg	☼	78	39 - 106	5	20
C10-C24	3900	J1	700	3730	4 J1	mg/Kg	☼	-20	75 - 125	30	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*79*	*M*	*45 - 130*

Lab Sample ID: MB 580-386518/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 386676 — **Prep Batch: 386518**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C24-C40	300	U	350	180	ug/L		04/06/22 10:17	04/07/22 10:50	1
C10-C24	100	U	110	65	ug/L		04/06/22 10:17	04/07/22 10:50	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*62*		*56 - 125*	*04/06/22 10:17*	*04/07/22 10:50*	*1*

Lab Sample ID: LCS 580-386518/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 386676 — **Prep Batch: 386518**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
C24-C40			4000	2890		ug/L		72	41 - 113		
C10-C24			4000	2920		ug/L		73	36 - 132		

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: LCS 580-386518/2-A
Matrix: Water
Analysis Batch: 386676

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 386518

Surrogate	LCS %Recovery	LCS Qualifier	Limits
o-Terphenyl	83		56 - 125

Lab Sample ID: LCSD 580-386518/3-A
Matrix: Water
Analysis Batch: 386676

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 386518

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
C24-C40			4000	3050		ug/L		76	41 - 113	5	20
C10-C24			4000	3140		ug/L		78	36 - 132	7	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
o-Terphenyl	87		56 - 125

Lab Sample ID: MB 580-387017/1-A
Matrix: Water
Analysis Batch: 387027

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 387017

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
C24-C40	300	U	350	180	ug/L		04/11/22 09:32	04/12/22 00:30	1
C10-C24	100	U	110	65	ug/L		04/11/22 09:32	04/12/22 00:30	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	83		56 - 125	04/11/22 09:32	04/12/22 00:30	1

Lab Sample ID: LCS 580-387017/2-A
Matrix: Water
Analysis Batch: 387027

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 387017

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
C24-C40			4000	3580		ug/L		89	41 - 113		
C10-C24			4000	3140		ug/L		79	36 - 132		

Surrogate	LCS %Recovery	LCS Qualifier	Limits
o-Terphenyl	83		56 - 125

Lab Sample ID: LCSD 580-387017/3-A
Matrix: Water
Analysis Batch: 387027

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 387017

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
C24-C40			4000	3250		ug/L		81	41 - 113	10	20
C10-C24			4000	2940		ug/L		73	36 - 132	7	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
o-Terphenyl	82		56 - 125

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-112198-1

Client Sample ID: PSCOOLING-WSN01-000.0

Lab Sample ID: 580-112198-1
Date Collected: 03/31/22 12:15
Matrix: Water
Date Received: 04/05/22 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260/CALUFT DOD		1	386909	04/09/22 05:05	B1M	FGS SEA
Total/NA	Analysis	8260D		1	386906	04/09/22 05:05	B1M	FGS SEA
Total/NA	Prep	3510C			386740	04/07/22 13:03	ASL	FGS SEA
Total/NA	Analysis	8270E SIM		1	386818	04/08/22 01:54	JCM	FGS SEA
Total/NA	Prep	3510C			386518	04/06/22 10:17	KLW	FGS SEA
Total/NA	Analysis	8015D DRO		1	386676	04/07/22 16:34	JAE	FGS SEA

Client Sample ID: PSCOOLING-WSFD01-000.0

Lab Sample ID: 580-112198-2
Date Collected: 03/31/22 12:15
Matrix: Water
Date Received: 04/05/22 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260/CALUFT DOD		1	386909	04/09/22 05:29	B1M	FGS SEA
Total/NA	Analysis	8260D		1	386906	04/09/22 05:29	B1M	FGS SEA
Total/NA	Prep	3510C			386740	04/07/22 13:03	ASL	FGS SEA
Total/NA	Analysis	8270E SIM		1	386818	04/08/22 02:19	JCM	FGS SEA
Total/NA	Prep	3510C			386518	04/06/22 10:17	KLW	FGS SEA
Total/NA	Analysis	8015D DRO		1	386676	04/07/22 16:54	JAE	FGS SEA

Client Sample ID: SUMPDRN-WSN01-000.0

Lab Sample ID: 580-112198-3
Date Collected: 03/31/22 11:30
Matrix: Water
Date Received: 04/05/22 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260/CALUFT DOD		1	386909	04/09/22 05:52	B1M	FGS SEA
Total/NA	Analysis	8260D		1	386906	04/09/22 05:52	B1M	FGS SEA
Total/NA	Prep	3510C			386740	04/07/22 13:03	ASL	FGS SEA
Total/NA	Analysis	8270E SIM		1	386818	04/08/22 02:44	JCM	FGS SEA
Total/NA	Prep	3510C			386518	04/06/22 10:17	KLW	FGS SEA
Total/NA	Analysis	8015D DRO		1	386676	04/07/22 17:14	JAE	FGS SEA

Client Sample ID: SUMP-WSN01-000.0

Lab Sample ID: 580-112198-4
Date Collected: 03/31/22 09:45
Matrix: Water
Date Received: 04/05/22 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260/CALUFT DOD		1	386909	04/09/22 06:16	B1M	FGS SEA
Total/NA	Analysis	8260D		1	386906	04/09/22 06:16	B1M	FGS SEA
Total/NA	Prep	3510C			386740	04/07/22 13:03	ASL	FGS SEA
Total/NA	Analysis	8270E SIM		1	386818	04/08/22 03:08	JCM	FGS SEA
Total/NA	Prep	3510C			386518	04/06/22 10:17	KLW	FGS SEA
Total/NA	Analysis	8015D DRO		1	386676	04/07/22 17:33	JAE	FGS SEA

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-112198-1

Client Sample ID: A3015-SON01-002.0

Lab Sample ID: 580-112198-5
Date Collected: 04/01/22 16:45
Matrix: Solid
Date Received: 04/05/22 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1	387191	04/12/22 12:37	TMH	FGS SEA

Client Sample ID: A3015-SON01-002.0

Lab Sample ID: 580-112198-5
Date Collected: 04/01/22 16:45
Matrix: Solid
Date Received: 04/05/22 09:50
Percent Solids: 60.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			386962	04/09/22 13:00	RJL	FGS SEA
Total/NA	Analysis	8260/CALUFT DOD		1	386968	04/09/22 16:57	JBT	FGS SEA
Total/NA	Prep	5035			386962	04/09/22 13:00	RJL	FGS SEA
Total/NA	Analysis	8260D		1	386965	04/09/22 16:57	JBT	FGS SEA
Total/NA	Prep	3546			386688	04/07/22 11:14	TOA	FGS SEA
Total/NA	Analysis	8270E SIM		1	386820	04/08/22 08:42	JCM	FGS SEA
Total/NA	Prep	3546	DL		386688	04/07/22 11:14	TOA	FGS SEA
Total/NA	Analysis	8270E SIM	DL	50	386978	04/09/22 21:22	JCM	FGS SEA
Total/NA	Prep	3546			386480	04/06/22 08:38	TOA	FGS SEA
Total/NA	Analysis	8015D DRO		1	387023	04/12/22 08:18	JAE	FGS SEA

Client Sample ID: A3015-WGN01-002.0

Lab Sample ID: 580-112198-6
Date Collected: 04/01/22 16:00
Matrix: Water
Date Received: 04/05/22 09:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260/CALUFT DOD		1	386909	04/09/22 06:39	B1M	FGS SEA
Total/NA	Analysis	8260D		1	386906	04/09/22 06:39	B1M	FGS SEA
Total/NA	Analysis	8260D	DL	10	387050	04/11/22 13:01	B1M	FGS SEA
Total/NA	Prep	3510C			386864	04/08/22 11:35	KLW	FGS SEA
Total/NA	Analysis	8270E SIM		50	386976	04/09/22 20:16	E1L	FGS SEA
Total/NA	Prep	3510C			387017	04/11/22 09:32	ASL	FGS SEA
Total/NA	Analysis	8015D DRO		1	387027	04/12/22 01:30	JAE	FGS SEA
Total/NA	Prep	3510C	DL		387017	04/11/22 09:32	ASL	FGS SEA
Total/NA	Analysis	8015D DRO	DL	50	387209	04/12/22 15:00	JAE	FGS SEA

Laboratory References:

FGS SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-112198-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Job ID: 580-112198-1
Project/Site: RH Site Characterization JBPHH N62742-17

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-112198-1	PSCOOLING-WSN01-000.0	Water	03/31/22 12:15	04/05/22 09:50
580-112198-2	PSCOOLING-WSFD01-000.0	Water	03/31/22 12:15	04/05/22 09:50
580-112198-3	SUMPDRN-WSN01-000.0	Water	03/31/22 11:30	04/05/22 09:50
580-112198-4	SUMP-WSN01-000.0	Water	03/31/22 09:45	04/05/22 09:50
580-112198-5	A3015-SON01-002.0	Solid	04/01/22 16:45	04/05/22 09:50
580-112198-6	A3015-WGN01-002.0	Water	04/01/22 16:00	04/05/22 09:50

1 of 3

580-112198 Chain of Custody

Chain of Custody Record

eurofins | Environment Testing America

Phone : 253-248-4972

Client Information	Sampler: (b) (6)	Lab PM: (b) (6)	Carrier Tracking No(s):	COC No: 1 -44635
Client Contact: (b) (6)	Phone: (b) (6)	E-Mail: (b) (6) @EurofinsET.com	State of Origin:	Page: Page 1 of 3
Company: AECOM-Honolulu	PWSID:			Job #:
Address: AECOM-Honolulu	Due Date Requested:			
City: 1001 Bishop Street, ASB Tower, Suite 1600	TAT Requested (days): 4			
State, Zip: Honolulu, Hawaii, 96813	Compliance Project: Δ Yes Δ No			
Phone: (b) (6)	PO #: Purchase Order Requested			
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com	WO #:			
Project Name: SiteCharP2Tunnels	Project #:			
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Sample Identification		Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D/	N,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
				Preservation Code:		X	X	F		A						X	
PSCOOLING-WSN01-000.0	1	3/31/22	1215	GRAB	WS					4-40mL	2-250mlAmb	2-250mlAmb					
PSCOOLING-WSFD01-000.0	2	3/31/22	1215	GRAB	WS					4-40mL	2-250mlAmb	2-250mlAmb					
SUMPDRN-WSN01-000.0	3	3/31/22	1130	GRAB	WS					4-40mL	2-250mlAmb	2-250mlAmb					
SUMP-WSN01-000.0	4	3/31/22	945	GRAB	WS					4-40mL	2-250mlAmb	2-250mlAmb					
A3015-SON01-002.0	5	4/1/22	1645	GRAB	SO			2-40mlVOA	1-4ozJar							3	
A3015-WGN01-002.0	6	4/1/22	1600	GRAB	WG					4-40mL	2-250mlAmb	2-250mlAmb				8	
HTE00.0-WGN02-031.0	7	4/1/22	1800	GRAB	WG					4-40mL	2-250mlAmb	2-250mlAmb					
LTW35.0-WGN02-028.0	8	4/1/22	1750	GRAB	WG					4-40mL	2-250mlAmb	2-250mlAmb					
LTW35.0-WGFD02-028.0	9	4/1/22	1750	GRAB	WG					4-40mL	2-250mlAmb	2-250mlAmb					
LTE00.0-WGN02-030.0	10	4/1/22	1645	GRAB	WG					4-40mL	2-250mlAmb	2-250mlAmb				8	
Trip Blank	11				TB					4-40mL							

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For _____ Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by (b) (6)	Date/Time: 4/4/22 1438	Company AECOM	Received by (b) (6)	Date/Time: 4 Apr 22 0950	Company EFGS
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: FedEx LgBlu/wet/bub A2 4.4/4.5 w/cs
LgBlu/wet/bub A2 1.6/1.7 w/cs
LgBlu/wet/bub A2 2.3/2.4 w/cs

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-112198-1

Login Number: 112198
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-112521-1
Client Project/Site: 22F0106
Revision: 3

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/26/2022 5:23:37 PM

[redacted], Project Manager II
[redacted]
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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-112521-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: 22F0106
Report Number: 580-112521-1

REVISION 3 SEPTEMBER 26, 2022
Report has been revised to change the ORO fraction, which has been split out into a separate sample in order to accommodate the EDMS database. The sample IDs had an added -1 appended to end of the client ID for this fraction. In addition, the collection time for the trip blank was updated to 12:00 PM.

REVISION 2 - August 1, 2022
Report has been revised for 8260B CA LUFT GRO results. Chromatographic integrations have been adjusted to forced baseline-baseline integration per Method and SOP.

REVISION 1
This report was revised to correct a quantitation error associated with the results reported for Method 8015D for DRO. The discrepancy stems from an initial calibration performed on 4/11/22 that misidentified the retention time markers used to set the retention time range for the diesel range organics.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
Four samples were received on 4/12/2022 9:45 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.8º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

GASOLINE RANGE ORGANICS WITH INCREMENTAL PREPARATION
Samples A3000MISH-SOFT01-003.0 (580-112521-1), A3000MISH-SOFT02-003.0 (580-112521-2) and A3000MISH-SOFT03-003.0 (580-112521-3) were analyzed for gasoline range organics with incremental preparation in accordance with EPA SW-846 Method 8015B CALUFT - GRO. The samples were leached on 04/16/2022, and prepared and analyzed on 04/16/2022.

Job ID: 580-112521-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GASOLINE RANGE ORGANICS (GRO) - TB
Sample Trip Blank (580-112521-4) was analyzed for gasoline range organics (GRO) in accordance with 8260B CALUFT - GRO. The samples were prepared and analyzed on 04/16/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS) WITH INCREMENTAL PREPARATION
Samples A3000MISH-SOFT01-003.0 (580-112521-1), A3000MISH-SOFT02-003.0 (580-112521-2) and A3000MISH-SOFT03-003.0 (580-112521-3) were analyzed for volatile organic compounds (GC-MS) with incremental preparation in accordance with 8260D_DOD5. The samples were leached on 04/16/2022, and prepared and analyzed on 04/16/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS) - TB
Sample Trip Blank (580-112521-4) was analyzed for volatile organic compounds (GC-MS) in accordance with 8260D_DOD5. The samples were prepared and analyzed on 04/16/2022.

m-Xylene & p-Xylene, o-Xylene and Xylenes, Total were detected in method blank MB 580-387661/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. This target analyte concentration was less than 1/2 the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) WITH INCREMENTAL PREPARATION
Samples A3000MISH-SOFT01-003.0 (580-112521-1), A3000MISH-SOFT02-003.0 (580-112521-2) and A3000MISH-SOFT03-003.0 (580-112521-3) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) with incremental preparation in accordance with 8270E SIM. The samples were leached on 04/13/2022, prepared on 04/13/2022 and analyzed on 04/18/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS WITH INCREMENTAL PREPARATION
Samples A3000MISH-SOFT01-003.0 (580-112521-1), A3000MISH-SOFT02-003.0 (580-112521-2) and A3000MISH-SOFT03-003.0 (580-112521-3) were analyzed for diesel range organics with Incremental preparation in accordance with 8015D DRO. The samples were leached on 04/13/2022 and 04/14/2022, prepared on 04/14/2022 and analyzed on 04/18/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

MOISTURE CONTENT WITH INCREMENTAL PREPARATION
Samples A3000MISH-SOFT01-003.0 (580-112521-1), A3000MISH-SOFT02-003.0 (580-112521-2) and A3000MISH-SOFT03-003.0 (580-112521-3) were analyzed for moisture content with incremental preparation in accordance with ASTM D2216. The samples were leached on 04/13/2022 and analyzed on 04/16/2022.

Percent Moisture exceeded the RPD limit for the duplicate of sample A3000MISH-SOFT03-003.0DU (580-112521-3).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

General Chemistry

Qualifier	Qualifier Description
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: A3000MISH-SOFT01-003.0

Date Collected: 04/06/22 15:30
Date Received: 04/12/22 09:45

Lab Sample ID: 580-112521-1

Matrix: Solid
Percent Solids: 80.1

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	5.1	U M	6.8	2.2	mg/Kg	☼	04/16/22 14:26	04/16/22 19:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*102*		*67 - 134*	*04/16/22 14:26*	*04/16/22 19:07*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.026	U	0.034	0.0065	mg/Kg	☼	04/16/22 14:26	04/16/22 19:07	1
Toluene	0.051	U	0.10	0.023	mg/Kg	☼	04/16/22 14:26	04/16/22 19:07	1
Ethylbenzene	0.051	U	0.068	0.015	mg/Kg	☼	04/16/22 14:26	04/16/22 19:07	1
m-Xylene & p-Xylene	0.026	U	0.068	0.012	mg/Kg	☼	04/16/22 14:26	04/16/22 19:07	1
o-Xylene	0.026	U	0.068	0.0085	mg/Kg	☼	04/16/22 14:26	04/16/22 19:07	1
Xylenes, Total	0.026	U	0.068	0.012	mg/Kg	☼	04/16/22 14:26	04/16/22 19:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*95*		*85 - 116*	*04/16/22 14:26*	*04/16/22 19:07*	*1*
4-Bromofluorobenzene (Surr)	*99*		*79 - 119*	*04/16/22 14:26*	*04/16/22 19:07*	*1*
Dibromofluoromethane (Surr)	*98*		*78 - 119*	*04/16/22 14:26*	*04/16/22 19:07*	*1*
1,2-Dichloroethane-d4 (Surr)	*102*		*71 - 136*	*04/16/22 14:26*	*04/16/22 19:07*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0042	U M	0.0053	0.0017	mg/Kg	☼	04/13/22 19:48	04/18/22 13:19	1
2-Methylnaphthalene	0.0032	U M	0.0053	0.0022	mg/Kg	☼	04/13/22 19:48	04/18/22 13:19	1
1-Methylnaphthalene	0.0016	U M	0.0053	0.00067	mg/Kg	☼	04/13/22 19:48	04/18/22 13:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*109*		*58 - 132*	*04/13/22 19:48*	*04/18/22 13:19*	*1*
2-methylnaphthalene-d10	*77*		*40 - 140*	*04/13/22 19:48*	*04/18/22 13:19*	*1*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*	*04/13/22 19:48*	*04/18/22 13:19*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**380**		42	8.4	mg/Kg	☼	04/14/22 14:52	04/18/22 13:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*97*		*45 - 130*	*04/14/22 14:52*	*04/18/22 13:18*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**80.1**		0.1	0.1	%			04/16/22 13:06	1
Percent Moisture	**19.9**		0.1	0.1	%			04/16/22 13:06	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: A3000MISH-SOFT02-003.0

Date Collected: 04/06/22 15:30
Date Received: 04/12/22 09:45

Lab Sample ID: 580-112521-2

Matrix: Solid
Percent Solids: 83.8

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	35	M	6.1	2.0	mg/Kg	☼	04/16/22 14:29	04/16/22 19:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*105*		*67 - 134*	*04/16/22 14:29*	*04/16/22 19:31*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.023	U	0.030	0.0058	mg/Kg	☼	04/16/22 14:29	04/16/22 19:31	1
Toluene	0.046	U M	0.091	0.021	mg/Kg	☼	04/16/22 14:29	04/16/22 19:31	1
Ethylbenzene	0.046	U M	0.061	0.014	mg/Kg	☼	04/16/22 14:29	04/16/22 19:31	1
m-Xylene & p-Xylene	0.023	U M	0.061	0.011	mg/Kg	☼	04/16/22 14:29	04/16/22 19:31	1
o-Xylene	0.023	U M	0.061	0.0076	mg/Kg	☼	04/16/22 14:29	04/16/22 19:31	1
Xylenes, Total	0.023	U	0.061	0.011	mg/Kg	☼	04/16/22 14:29	04/16/22 19:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*97*		*85 - 116*	*04/16/22 14:29*	*04/16/22 19:31*	*1*
4-Bromofluorobenzene (Surr)	*102*		*79 - 119*	*04/16/22 14:29*	*04/16/22 19:31*	*1*
Dibromofluoromethane (Surr)	*97*		*78 - 119*	*04/16/22 14:29*	*04/16/22 19:31*	*1*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*	*04/16/22 14:29*	*04/16/22 19:31*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.011		0.0054	0.0017	mg/Kg	☼	04/13/22 19:48	04/18/22 13:43	1
2-Methylnaphthalene	0.0063		0.0054	0.0022	mg/Kg	☼	04/13/22 19:48	04/18/22 13:43	1
1-Methylnaphthalene	0.0063		0.0054	0.00068	mg/Kg	☼	04/13/22 19:48	04/18/22 13:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*116*		*58 - 132*	*04/13/22 19:48*	*04/18/22 13:43*	*1*
2-methylnaphthalene-d10	*79*		*40 - 140*	*04/13/22 19:48*	*04/18/22 13:43*	*1*
Fluoranthene-d10 (Surr)	*103*		*40 - 140*	*04/13/22 19:48*	*04/18/22 13:43*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	180		32	6.3	mg/Kg	☼	04/14/22 14:52	04/18/22 13:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*84*		*45 - 130*	*04/14/22 14:52*	*04/18/22 13:59*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83.8		0.1	0.1	%			04/16/22 13:06	1
Percent Moisture	16.2		0.1	0.1	%			04/16/22 13:06	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: A3000MISH-SOFT03-003.0

Date Collected: 04/06/22 15:30
Date Received: 04/12/22 09:45

Lab Sample ID: 580-112521-3

Matrix: Solid
Percent Solids: 72.1

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	**69**	**M**	7.9	2.6	mg/Kg	☼	04/16/22 14:33	04/16/22 19:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*67 - 134*	*04/16/22 14:33*	*04/16/22 19:54*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.030	U	0.040	0.0075	mg/Kg	☼	04/16/22 14:33	04/16/22 19:54	1
Toluene	0.059	U M	0.12	0.027	mg/Kg	☼	04/16/22 14:33	04/16/22 19:54	1
Ethylbenzene	0.059	U M	0.079	0.018	mg/Kg	☼	04/16/22 14:33	04/16/22 19:54	1
m-Xylene & p-Xylene	0.030	U M	0.079	0.014	mg/Kg	☼	04/16/22 14:33	04/16/22 19:54	1
o-Xylene	0.030	U	0.079	0.0099	mg/Kg	☼	04/16/22 14:33	04/16/22 19:54	1
Xylenes, Total	0.030	U	0.079	0.014	mg/Kg	☼	04/16/22 14:33	04/16/22 19:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*95*		*85 - 116*	*04/16/22 14:33*	*04/16/22 19:54*	*1*
4-Bromofluorobenzene (Surr)	*98*		*79 - 119*	*04/16/22 14:33*	*04/16/22 19:54*	*1*
Dibromofluoromethane (Surr)	*99*		*78 - 119*	*04/16/22 14:33*	*04/16/22 19:54*	*1*
1,2-Dichloroethane-d4 (Surr)	*102*		*71 - 136*	*04/16/22 14:33*	*04/16/22 19:54*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**0.017**		0.0067	0.0022	mg/Kg	☼	04/13/22 19:48	04/18/22 14:58	1
2-Methylnaphthalene	0.0040	U	0.0067	0.0027	mg/Kg	☼	04/13/22 19:48	04/18/22 14:58	1
1-Methylnaphthalene	**0.0060**	**J M**	0.0067	0.00084	mg/Kg	☼	04/13/22 19:48	04/18/22 14:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*110*		*58 - 132*	*04/13/22 19:48*	*04/18/22 14:58*	*1*
2-methylnaphthalene-d10	*81*		*40 - 140*	*04/13/22 19:48*	*04/18/22 14:58*	*1*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*	*04/13/22 19:48*	*04/18/22 14:58*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**170**		39	7.7	mg/Kg	☼	04/14/22 14:53	04/18/22 14:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*96*		*45 - 130*	*04/14/22 14:53*	*04/18/22 14:39*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**72.1**		0.1	0.1	%			04/16/22 13:06	1
Percent Moisture	**27.9**		0.1	0.1	%			04/16/22 13:06	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: Trip Blank

Date Collected: 04/06/22 12:00
Date Received: 04/12/22 09:45

Lab Sample ID: 580-112521-4

Matrix: Solid

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	**24**	**M**	4.0	1.3	mg/Kg		04/16/22 14:33	04/16/22 20:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*107*		*67 - 134*	*04/16/22 14:33*	*04/16/22 20:17*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U	0.020	0.0038	mg/Kg		04/16/22 14:33	04/16/22 20:17	1
Toluene	0.030	U M	0.060	0.014	mg/Kg		04/16/22 14:33	04/16/22 20:17	1
Ethylbenzene	0.030	U M	0.040	0.0091	mg/Kg		04/16/22 14:33	04/16/22 20:17	1
m-Xylene & p-Xylene	0.015	U M	0.040	0.0071	mg/Kg		04/16/22 14:33	04/16/22 20:17	1
o-Xylene	0.015	U	0.040	0.0050	mg/Kg		04/16/22 14:33	04/16/22 20:17	1
Xylenes, Total	0.015	U	0.040	0.0071	mg/Kg		04/16/22 14:33	04/16/22 20:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*96*		*85 - 116*	*04/16/22 14:33*	*04/16/22 20:17*	*1*
4-Bromofluorobenzene (Surr)	*104*		*79 - 119*	*04/16/22 14:33*	*04/16/22 20:17*	*1*
Dibromofluoromethane (Surr)	*101*		*78 - 119*	*04/16/22 14:33*	*04/16/22 20:17*	*1*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*	*04/16/22 14:33*	*04/16/22 20:17*	*1*

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: A3000MISH-SOFT01-003.0-1

Lab Sample ID: 580-112521-5

Date Collected: 04/06/22 15:30
Matrix: Solid
Date Received: 04/12/22 09:45

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	120		46	18	mg/Kg		04/14/22 14:53	04/18/22 13:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*98*		*45 - 130*	*04/14/22 14:53*	*04/18/22 13:39*	*1*

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: A3000MISH-SOFT02-003.0-1

Lab Sample ID: 580-112521-6

Date Collected: 04/06/22 15:30
Matrix: Solid
Date Received: 04/12/22 09:45

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	100		48	19	mg/Kg		04/14/22 14:53	04/18/22 14:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*102*		*45 - 130*	*04/14/22 14:53*	*04/18/22 14:19*	*1*

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: A3000MISH-SOFT03-003.0-1

Lab Sample ID: 580-112521-7

Date Collected: 04/06/22 15:30
Matrix: Solid
Date Received: 04/12/22 09:45

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	120		46	18	mg/Kg		04/14/22 14:53	04/18/22 14:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*100*		*45 - 130*	*04/14/22 14:53*	*04/18/22 14:59*	*1*

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 580-387661/1-A
Matrix: Solid
Analysis Batch: 387675

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 387661

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	3.0	U M	4.0	1.3	mg/Kg		04/16/22 13:00	04/16/22 14:29	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*67 - 134*	*04/16/22 13:00*	*04/16/22 14:29*	*1*

Lab Sample ID: LCS 580-387661/4-A
Matrix: Solid
Analysis Batch: 387675

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 387661

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics (GRO)-C6-C10	40.0	37.9	M	mg/Kg		95	79 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*99*		*67 - 134*

Lab Sample ID: LCSD 580-387661/5-A
Matrix: Solid
Analysis Batch: 387675

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 387661

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics (GRO)-C6-C10	40.0	37.1	M	mg/Kg		93	79 - 122	2	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*67 - 134*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 580-387661/1-A
Matrix: Solid
Analysis Batch: 387672

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 387661

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U	0.020	0.0038	mg/Kg		04/16/22 13:00	04/16/22 14:29	1
Toluene	0.030	U	0.060	0.014	mg/Kg		04/16/22 13:00	04/16/22 14:29	1
Ethylbenzene	0.030	U	0.040	0.0091	mg/Kg		04/16/22 13:00	04/16/22 14:29	1
m-Xylene & p-Xylene	0.00857	J	0.040	0.0071	mg/Kg		04/16/22 13:00	04/16/22 14:29	1
o-Xylene	0.00665	J	0.040	0.0050	mg/Kg		04/16/22 13:00	04/16/22 14:29	1
Xylenes, Total	0.0152	J	0.040	0.0071	mg/Kg		04/16/22 13:00	04/16/22 14:29	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*96*		*85 - 116*	*04/16/22 13:00*	*04/16/22 14:29*	*1*
4-Bromofluorobenzene (Surr)	*100*		*79 - 119*	*04/16/22 13:00*	*04/16/22 14:29*	*1*
Dibromofluoromethane (Surr)	*100*		*78 - 119*	*04/16/22 13:00*	*04/16/22 14:29*	*1*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*	*04/16/22 13:00*	*04/16/22 14:29*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 580-387661/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387672 — **Prep Batch: 387661**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	0.800	0.815		mg/Kg		102	77 - 121
Toluene	0.800	0.824		mg/Kg		103	77 - 121
Ethylbenzene	0.800	0.824		mg/Kg		103	76 - 122
m-Xylene & p-Xylene	0.800	0.839		mg/Kg		105	77 - 124
o-Xylene	0.800	0.832		mg/Kg		104	77 - 123
Xylenes, Total	1.60	1.67		mg/Kg		104	78 - 124

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Toluene-d8 (Surr)	*99*		*85 - 116*
4-Bromofluorobenzene (Surr)	*100*		*79 - 119*
Dibromofluoromethane (Surr)	*106*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 136*

Lab Sample ID: LCSD 580-387661/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387672 — **Prep Batch: 387661**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	0.800	0.848		mg/Kg		106	77 - 121	4	20
Toluene	0.800	0.848		mg/Kg		106	77 - 121	3	20
Ethylbenzene	0.800	0.847		mg/Kg		106	76 - 122	3	20
m-Xylene & p-Xylene	0.800	0.870		mg/Kg		109	77 - 124	4	20
o-Xylene	0.800	0.853		mg/Kg		107	77 - 123	3	20
Xylenes, Total	1.60	1.72		mg/Kg		108	78 - 124	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*98*		*85 - 116*
4-Bromofluorobenzene (Surr)	*101*		*79 - 119*
Dibromofluoromethane (Surr)	*105*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*102*		*71 - 136*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-387403/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387732 — **Prep Batch: 387403**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		04/13/22 19:48	04/18/22 12:30	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		04/13/22 19:48	04/18/22 12:30	1
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		04/13/22 19:48	04/18/22 12:30	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*118*		*58 - 132*	*04/13/22 19:48*	*04/18/22 12:30*	*1*
2-methylnaphthalene-d10	*83*		*40 - 140*	*04/13/22 19:48*	*04/18/22 12:30*	*1*
Fluoranthene-d10 (Surr)	*104*		*40 - 140*	*04/13/22 19:48*	*04/18/22 12:30*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCS 580-387403/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387732 — **Prep Batch: 387403**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Naphthalene	1.00	0.874		mg/Kg		87	38 - 111
2-Methylnaphthalene	1.00	0.938		mg/Kg		94	39 - 114
1-Methylnaphthalene	1.00	0.922		mg/Kg		92	43 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Terphenyl-d14	*113*		*58 - 132*
2-methylnaphthalene-d10	*122*		*40 - 140*
Fluoranthene-d10 (Surr)	*99*		*40 - 140*

Lab Sample ID: 580-112521-2 MS — **Client Sample ID: A3000MISH-SOFT02-003.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387732 — **Prep Batch: 387403**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Naphthalene	0.011		0.979	0.854		mg/Kg	☼	86	38 - 111
2-Methylnaphthalene	0.0063		0.979	0.882		mg/Kg	☼	89	39 - 114
1-Methylnaphthalene	0.0063		0.979	0.871		mg/Kg	☼	88	43 - 111

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Terphenyl-d14	*107*		*58 - 132*
2-methylnaphthalene-d10	*91*		*40 - 140*
Fluoranthene-d10 (Surr)	*95*		*40 - 140*

Lab Sample ID: 580-112521-2 MSD — **Client Sample ID: A3000MISH-SOFT02-003.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387732 — **Prep Batch: 387403**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Naphthalene	0.011		1.09	0.960		mg/Kg	☼	87	38 - 111	12	20
2-Methylnaphthalene	0.0063		1.09	1.01		mg/Kg	☼	93	39 - 114	14	20
1-Methylnaphthalene	0.0063		1.09	0.992		mg/Kg	☼	91	43 - 111	13	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Terphenyl-d14	*106*		*58 - 132*
2-methylnaphthalene-d10	*93*		*40 - 140*
Fluoranthene-d10 (Surr)	*96*		*40 - 140*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-387509/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387706 — **Prep Batch: 387509**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		04/14/22 14:52	04/18/22 09:37	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		04/14/22 14:52	04/18/22 09:37	1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: MB 580-387509/1-A
Matrix: Solid
Analysis Batch: 387706

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 387509

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	102		45 - 130	04/14/22 14:52	04/18/22 09:37	1

Lab Sample ID: LCS 580-387509/2-A
Matrix: Solid
Analysis Batch: 387706

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 387509

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)			500	491		mg/Kg		98	75 - 125		
Motor Oil Range Organics (C24-C40)			500	519		mg/Kg		104	39 - 106		

Surrogate	LCS %Recovery	LCS Qualifier	Limits
o-Terphenyl	105		45 - 130

Lab Sample ID: LCSD 580-387509/3-A
Matrix: Solid
Analysis Batch: 387706

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 387509

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			500	489		mg/Kg		98	75 - 125	0	20
Motor Oil Range Organics (C24-C40)			500	514		mg/Kg		103	39 - 106	1	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
o-Terphenyl	104		45 - 130

Method: 2540G - SM 2540G

Lab Sample ID: 580-112521-3 DU
Matrix: Solid
Analysis Batch: 387659

Client Sample ID: A3000MISH-SOFT03-003.0
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	72.1			75.0		%				15	20
Percent Moisture	27.9			25.0	J1	%				67	20

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: A3000MISH-SOFT01-003.0 — Lab Sample ID: 580-112521-1

Date Collected: 04/06/22 15:30 — **Matrix: Solid**
Date Received: 04/12/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387320	ASL	EET SEA	04/13/22 11:04
Total/NA	Analysis	2540G		1	387659	TOA	EET SEA	04/16/22 13:06

Client Sample ID: A3000MISH-SOFT01-003.0 — Lab Sample ID: 580-112521-1

Date Collected: 04/06/22 15:30 — **Matrix: Solid**
Date Received: 04/12/22 09:45 — **Percent Solids: 80.1**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			387665	RJL	EET SEA	04/16/22 12:00
Total/NA	Prep	5035			387661	RJL	EET SEA	04/16/22 14:26
Total/NA	Analysis	8260/CALUFT DOD		1	387675	JSM	EET SEA	04/16/22 19:07
Total/NA	ISM Prep	Increment, Prep			387665	RJL	EET SEA	04/16/22 12:00
Total/NA	Prep	5035			387661	RJL	EET SEA	04/16/22 14:26
Total/NA	Analysis	8260D		1	387672	JSM	EET SEA	04/16/22 19:07
Total/NA	ISM Prep	Increment, prep			387320	ASL	EET SEA	04/13/22 11:04
Total/NA	Prep	3546			387403	DH	EET SEA	04/13/22 19:48
Total/NA	Analysis	8270E SIM		1	387732	T1L	EET SEA	04/18/22 13:19
Total/NA	ISM Prep	Increment, prep			387320	ASL	EET SEA	04/13/22 11:04
Total/NA	Prep	3546			387509	TOA	EET SEA	04/14/22 14:52
Total/NA	Analysis	8015D DRO		1	387706	Y1F	EET SEA	04/18/22 13:18

Client Sample ID: A3000MISH-SOFT02-003.0 — Lab Sample ID: 580-112521-2

Date Collected: 04/06/22 15:30 — **Matrix: Solid**
Date Received: 04/12/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387320	ASL	EET SEA	04/13/22 11:04
Total/NA	Analysis	2540G		1	387659	TOA	EET SEA	04/16/22 13:06

Client Sample ID: A3000MISH-SOFT02-003.0 — Lab Sample ID: 580-112521-2

Date Collected: 04/06/22 15:30 — **Matrix: Solid**
Date Received: 04/12/22 09:45 — **Percent Solids: 83.8**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			387665	RJL	EET SEA	04/16/22 12:00
Total/NA	Prep	5035			387661	RJL	EET SEA	04/16/22 14:29
Total/NA	Analysis	8260/CALUFT DOD		1	387675	JSM	EET SEA	04/16/22 19:31
Total/NA	ISM Prep	Increment, Prep			387665	RJL	EET SEA	04/16/22 12:00
Total/NA	Prep	5035			387661	RJL	EET SEA	04/16/22 14:29
Total/NA	Analysis	8260D		1	387672	JSM	EET SEA	04/16/22 19:31
Total/NA	ISM Prep	Increment, prep			387320	ASL	EET SEA	04/13/22 11:04
Total/NA	Prep	3546			387403	DH	EET SEA	04/13/22 19:48
Total/NA	Analysis	8270E SIM		1	387732	T1L	EET SEA	04/18/22 13:43
Total/NA	ISM Prep	Increment, prep			387320	ASL	EET SEA	04/13/22 11:04
Total/NA	Prep	3546			387509	TOA	EET SEA	04/14/22 14:52
Total/NA	Analysis	8015D DRO		1	387706	Y1F	EET SEA	04/18/22 13:59

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: A3000MISH-SOFT03-003.0 — Lab Sample ID: 580-112521-3

Date Collected: 04/06/22 15:30 — **Matrix: Solid**
Date Received: 04/12/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387320	ASL	EET SEA	04/13/22 11:04
Total/NA	Analysis	2540G		1	387659	TOA	EET SEA	04/16/22 13:06

Client Sample ID: A3000MISH-SOFT03-003.0 — Lab Sample ID: 580-112521-3

Date Collected: 04/06/22 15:30 — **Matrix: Solid**
Date Received: 04/12/22 09:45 — **Percent Solids: 72.1**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			387665	RJL	EET SEA	04/16/22 12:00
Total/NA	Prep	5035			387661	RJL	EET SEA	04/16/22 14:33
Total/NA	Analysis	8260/CALUFT DOD		1	387675	JSM	EET SEA	04/16/22 19:54
Total/NA	ISM Prep	Increment, Prep			387665	RJL	EET SEA	04/16/22 12:00
Total/NA	Prep	5035			387661	RJL	EET SEA	04/16/22 14:33
Total/NA	Analysis	8260D		1	387672	JSM	EET SEA	04/16/22 19:54
Total/NA	ISM Prep	Increment, prep			387320	ASL	EET SEA	04/13/22 11:04
Total/NA	Prep	3546			387403	DH	EET SEA	04/13/22 19:48
Total/NA	Analysis	8270E SIM		1	387732	T1L	EET SEA	04/18/22 14:58
Total/NA	ISM Prep	Increment, prep			387320	ASL	EET SEA	04/13/22 11:04
Total/NA	Prep	3546			387509	TOA	EET SEA	04/14/22 14:53
Total/NA	Analysis	8015D DRO		1	387706	Y1F	EET SEA	04/18/22 14:39

Client Sample ID: Trip Blank — Lab Sample ID: 580-112521-4

Date Collected: 04/06/22 12:00 — **Matrix: Solid**
Date Received: 04/12/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	5035			387661	RJL	EET SEA	04/16/22 14:33
Total/NA	Analysis	8260/CALUFT DOD		1	387675	JSM	EET SEA	04/16/22 20:17
Total/NA	Prep	5035			387661	RJL	EET SEA	04/16/22 14:33
Total/NA	Analysis	8260D		1	387672	JSM	EET SEA	04/16/22 20:17

Client Sample ID: A3000MISH-SOFT01-003.0-1 — Lab Sample ID: 580-112521-5

Date Collected: 04/06/22 15:30 — **Matrix: Solid**
Date Received: 04/12/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387424	ASL	EET SEA	04/14/22 08:51
Total/NA	Prep	3546			387509	TOA	EET SEA	04/14/22 14:53
Total/NA	Analysis	8015D DRO		1	387706	Y1F	EET SEA	04/18/22 13:39

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Client Sample ID: A3000MISH-SOFT02-003.0-1

Lab Sample ID: 580-112521-6

Date Collected: 04/06/22 15:30
Matrix: Solid
Date Received: 04/12/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387424	ASL	EET SEA	04/14/22 08:51
Total/NA	Prep	3546			387509	TOA	EET SEA	04/14/22 14:53
Total/NA	Analysis	8015D DRO		1	387706	Y1F	EET SEA	04/18/22 14:19

Client Sample ID: A3000MISH-SOFT03-003.0-1

Lab Sample ID: 580-112521-7

Date Collected: 04/06/22 15:30
Matrix: Solid
Date Received: 04/12/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387424	ASL	EET SEA	04/14/22 08:51
Total/NA	Prep	3546			387509	TOA	EET SEA	04/14/22 14:53
Total/NA	Analysis	8015D DRO		1	387706	Y1F	EET SEA	04/18/22 14:59

Laboratory References:

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112521-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-112521-1	A3000MISH-SOFT01-003.0	Solid	04/06/22 15:30	04/12/22 09:45
580-112521-2	A3000MISH-SOFT02-003.0	Solid	04/06/22 15:30	04/12/22 09:45
580-112521-3	A3000MISH-SOFT03-003.0	Solid	04/06/22 15:30	04/12/22 09:45
580-112521-4	Trip Blank	Solid	04/06/22 12:00	04/12/22 09:45
580-112521-5	A3000MISH-SOFT01-003.0-1	Solid	04/06/22 15:30	04/12/22 09:45
580-112521-6	A3000MISH-SOFT02-003.0-1	Solid	04/06/22 15:30	04/12/22 09:45
580-112521-7	A3000MISH-SOFT03-003.0-1	Solid	04/06/22 15:30	04/12/22 09:45

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

Client Information

Client Contact: (b) (6) [redacted]
Company: AECOM-Honolulu
Address: AECOM-Honolulu
City: 1001 Bishop Street, ASB Tower, Suite 1600
State, Zip: Honolulu, Hawaii, 96813
Phone: (b) (6) [redacted]
Email: (b) [redacted] @aecom.com/ (b) (6) [redacted] @aecom.com
Project Name: SiteCharP2Tunnels
Site: Red Hill Bulk Fuel Storage Facility

Sampler: (b) (6) [redacted]
Phone: (b) (6) [redacted]
PWSID:
Due Date Requested:
TAT Requested (days): 4
Compliance Project: Δ Yes Δ No
PO #: Purchase Order Requested
WO #:
Project #:
SSOW#:

Lab PM: (b) (6) [redacted]
E-Mail: (b) (6) [redacted] @EurofinsET.com
Carrier Tracking No(s):
State of Origin:

COC No: 1 -44635
Page: Page 1 of 1
Job #: 112521

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (WG=Groundwater, SO=soil, PR=product GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D/	N,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3000MISH-SOFT01-003.0	4/6/22	15:30	MIS	SO			6-4oz Jar ,TEF	1-GalZiploc								
A3000MISH-SOFT02-003.0	4/6/22	15:30	MIS	SO			6-4oz Jar ,TEF	1-GalZiploc								
A3000MISH-SOFT03-003.0	4/6/22	15:30	MIS	SO			6-4oz Jar ,TEF	1-GalZiploc								
Trip Blank			TB	SO			1-Vial									

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - Methanol

Other:

580-112521 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Deliverable Requested: I, II, III, IV, Other (specify)

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For ____ Months ☐

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by: Date: Time: Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6) [redacted]	4-11-22 1215	AECOM	(b) (6) [redacted]	4/12/22 0945	EFGS
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Fed70 LgBlk/wet/Bub
A2 0.8/0.9 w/CS

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-112521-1

Login Number: 112521
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-112657-1
Client Project/Site: 22F0106
Revision: 2

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/26/2022 9:08:15 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-112657-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-112657-1

REVISION 1 SEPTEMBER 26, 2022
Report has been revised to change the ORO fraction, which has been split out into a separate sample in order to accommodate the EDMS database. The sample IDs had an added -1 appended to end of the client ID for this fraction. In addition, the collection time for the trip blank has been changed to 12:00 PM.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

Revision 1 - August 1, 2022
Report has been revised for 8260B CA LUFT GRO results. Chromatographic integrations have been adjusted to forced baseline-baseline integration per Method and SOP.

RECEIPT
Four samples were received on 4/14/2022 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.0º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

GASOLINE RANGE ORGANICS WITH INCREMENTAL PREPARATION
Samples A3000MISH-SOFT01-003.2 (580-112657-1), A3000MISH-SOFT02-003.2 (580-112657-2) and A3000MISH-SOFT03-003.2 (580-112657-3) were analyzed for gasoline range organics with incremental preparation in accordance with EPA SW-846 Method 8015B - GRO with incremental preparation. The samples were leached on 04/20/2022, and prepared and analyzed on 04/20/2022.

Middle bracketing CCV fails high (123.1%) for Gasoline Range Organics (GRO)-C6-C10 due to carry over from previous client sample. The following CCVs as well as all other QC are within criteria. The following are impacted A3000MISH-SOFT01-003.2 (580-112657-1), A3000MISH-SOFT02-003.2 (580-112657-2), A3000MISH-SOFT03-003.2 (580-112657-3), Trip Blank-1 (580-112657-4), (CCV

Job ID: 580-112657-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

580-388036/14), (580-112657-B-3-D MS) and (580-112657-B-3-E MSD)

The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 580-387998 and analytical batch 580-388036 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GASOLINE RANGE ORGANICS (GRO) - TB

Sample Trip Blank-1 (580-112657-4) was analyzed for gasoline range organics (GRO) in accordance with 8260B CALUFT. The sample was prepared and analyzed on 04/20/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS)

Samples A3000MISH-SOFT01-003.2 (580-112657-1), A3000MISH-SOFT02-003.2 (580-112657-2) and A3000MISH-SOFT03-003.2 (580-112657-3) were analyzed for volatile organic compounds (GC-MS) in accordance with 8260D_DOD5. The samples were leached on 04/20/2022, and prepared and analyzed on 04/20/2022.

m-Xylene & p-Xylene, o-Xylene and Xylenes, Total were detected in method blank MB 580-387999/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. The result concentrations were less than ½ the reporting limit.
The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 580-387998 and 580-387999 and analytical batch 580-388033 were outside control limits. The associated laboratory control sample/laboratory control sample duplicate (LCS/LCSD) recoveries were within acceptance limits.

Several analytes exceeded the RPD limit for the MSD of sample A3000MISH-SOFT02-003.2MSD (580-112657-2) in batch 580-388033.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS) - TB

Sample Trip Blank-1 (580-112657-4) was analyzed for volatile organic compounds (GC-MS) in accordance with 8260D_DOD5. The sample was prepared and analyzed on 04/20/2022.

m-Xylene & p-Xylene, o-Xylene and Xylenes, Total were detected in method blank MB 580-387999/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. The result concentrations were less than ½ the reporting limit.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) WITH INCREMENTAL PREPARATION

Samples A3000MISH-SOFT01-003.2 (580-112657-1), A3000MISH-SOFT02-003.2 (580-112657-2) and A3000MISH-SOFT03-003.2 (580-112657-3) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) with incremental preparation in accordance with 8270E SIM. The samples were leached on 04/19/2022, prepared on 04/19/2022 and analyzed on 04/20/2022.

Six surrogates are used for this analysis. The laboratory's SOP allows two of these surrogates to be outside acceptance criteria without performing re-extraction/re-analysis. The following sample contained an allowable number of surrogate compounds outside limits and associated samples were ND: (MB 580-387916/1-A). These results have been reported and qualified.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS WITH INCREMENTAL PREPARATION

Samples A3000MISH-SOFT01-003.2 (580-112657-1), A3000MISH-SOFT02-003.2 (580-112657-2) and A3000MISH-SOFT03-003.2 (580-112657-3) were analyzed for diesel range organics with Incremental preparation in accordance with 8015D DRO. The samples were leached on 04/19/2022 and 04/20/2022, prepared on 04/19/2022 and 04/20/2022 and analyzed on 04/20/2022 and 04/22/2022.

Job ID: 580-112657-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

The laboratory control sample duplicate (LCSD) for preparation batch 580-387946 and 580-388061 and analytical batch 580-388299 recovered outside control limits for the following analytes: C24-C40. These analytes were biased high in the LCSD and were not detected in the associated samples; therefore, the data have been reported.

C10-C24 failed the recovery criteria high for the MSD of sample A3000MISH-SOFT01-003.2MSD (580-112657-1) in batch 580-388003. Sample matrix interference due to high targets is suspected because the MS and associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

MOISTURE CONTENT WITH INCREMENTAL PREPARATION

Samples A3000MISH-SOFT01-003.2 (580-112657-1), A3000MISH-SOFT02-003.2 (580-112657-2) and A3000MISH-SOFT03-003.2 (580-112657-3) were analyzed for moisture content with incremental preparation in accordance with ASTM D2216. The samples were leached on 04/19/2022 and analyzed on 04/22/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

GC/MS Semi VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: A3000MISH-SOFT01-003.2

Date Collected: 04/12/22 13:30
Date Received: 04/14/22 09:30

Lab Sample ID: 580-112657-1

Matrix: Solid
Percent Solids: 83.2

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	**31**	**M Q**	6.0	1.9	mg/Kg	☼	04/20/22 12:51	04/20/22 13:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*109*		*67 - 134*	*04/20/22 12:51*	*04/20/22 13:59*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.022	U	0.030	0.0057	mg/Kg	☼	04/20/22 12:51	04/20/22 13:59	1
Toluene	0.045	U	0.090	0.020	mg/Kg	☼	04/20/22 12:51	04/20/22 13:59	1
Ethylbenzene	0.045	U	0.060	0.014	mg/Kg	☼	04/20/22 12:51	04/20/22 13:59	1
m-Xylene & p-Xylene	**0.020**	**J**	0.060	0.011	mg/Kg	☼	04/20/22 12:51	04/20/22 13:59	1
o-Xylene	**0.013**	**J**	0.060	0.0075	mg/Kg	☼	04/20/22 12:51	04/20/22 13:59	1
Xylenes, Total	**0.033**	**J**	0.060	0.011	mg/Kg	☼	04/20/22 12:51	04/20/22 13:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*98*		*85 - 116*	*04/20/22 12:51*	*04/20/22 13:59*	*1*
4-Bromofluorobenzene (Surr)	*106*		*79 - 119*	*04/20/22 12:51*	*04/20/22 13:59*	*1*
Dibromofluoromethane (Surr)	*101*		*78 - 119*	*04/20/22 12:51*	*04/20/22 13:59*	*1*
1,2-Dichloroethane-d4 (Surr)	*99*		*71 - 136*	*04/20/22 12:51*	*04/20/22 13:59*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0048	U M	0.0060	0.0019	mg/Kg	☼	04/19/22 17:47	04/20/22 12:25	1
2-Methylnaphthalene	0.0036	U M	0.0060	0.0025	mg/Kg	☼	04/19/22 17:47	04/20/22 12:25	1
1-Methylnaphthalene	0.0018	U	0.0060	0.00076	mg/Kg	☼	04/19/22 17:47	04/20/22 12:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*94*		*58 - 132*	*04/19/22 17:47*	*04/20/22 12:25*	*1*
2-methylnaphthalene-d10	*66*	*M*	*40 - 140*	*04/19/22 17:47*	*04/20/22 12:25*	*1*
Fluoranthene-d10 (Surr)	*86*		*40 - 140*	*04/19/22 17:47*	*04/20/22 12:25*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**810**	**J1**	57	11	mg/Kg	☼	04/19/22 18:14	04/20/22 18:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*83*		*45 - 130*	*04/19/22 18:14*	*04/20/22 18:52*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**83.2**		0.1	0.1	%			04/22/22 09:31	1
Percent Moisture	**16.8**		0.1	0.1	%			04/22/22 09:31	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: A3000MISH-SOFT02-003.2

Date Collected: 04/12/22 13:30
Date Received: 04/14/22 09:30

Lab Sample ID: 580-112657-2

Matrix: Solid
Percent Solids: 84.0

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	**19**	**M Q**	1.2	0.38	mg/Kg	☼	04/20/22 12:51	04/20/22 14:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*108*		*67 - 134*	*04/20/22 12:51*	*04/20/22 14:22*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.0044	U J1	0.0059	0.0011	mg/Kg	☼	04/20/22 12:51	04/20/22 14:22	1
Toluene	0.0088	U M J1	0.018	0.0040	mg/Kg	☼	04/20/22 12:51	04/20/22 14:22	1
Ethylbenzene	0.0088	U J1	0.012	0.0027	mg/Kg	☼	04/20/22 12:51	04/20/22 14:22	1
m-Xylene & p-Xylene	0.0044	U M J1	0.012	0.0021	mg/Kg	☼	04/20/22 12:51	04/20/22 14:22	1
o-Xylene	0.0044	U M J1	0.012	0.0015	mg/Kg	☼	04/20/22 12:51	04/20/22 14:22	1
Xylenes, Total	0.0044	U J1	0.012	0.0021	mg/Kg	☼	04/20/22 12:51	04/20/22 14:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*93*		*85 - 116*	*04/20/22 12:51*	*04/20/22 14:22*	*1*
4-Bromofluorobenzene (Surr)	*105*		*79 - 119*	*04/20/22 12:51*	*04/20/22 14:22*	*1*
Dibromofluoromethane (Surr)	*101*		*78 - 119*	*04/20/22 12:51*	*04/20/22 14:22*	*1*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 136*	*04/20/22 12:51*	*04/20/22 14:22*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0046	U M	0.0058	0.0019	mg/Kg	☼	04/19/22 17:47	04/20/22 12:50	1
2-Methylnaphthalene	0.0035	U M	0.0058	0.0024	mg/Kg	☼	04/19/22 17:47	04/20/22 12:50	1
1-Methylnaphthalene	0.0017	U M	0.0058	0.00073	mg/Kg	☼	04/19/22 17:47	04/20/22 12:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*94*		*58 - 132*	*04/19/22 17:47*	*04/20/22 12:50*	*1*
2-methylnaphthalene-d10	*79*		*40 - 140*	*04/19/22 17:47*	*04/20/22 12:50*	*1*
Fluoranthene-d10 (Surr)	*87*		*40 - 140*	*04/19/22 17:47*	*04/20/22 12:50*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**730**		59	12	mg/Kg	☼	04/19/22 18:14	04/20/22 19:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*78*		*45 - 130*	*04/19/22 18:14*	*04/20/22 19:51*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**84.0**		0.1	0.1	%			04/22/22 09:31	1
Percent Moisture	**16.0**		0.1	0.1	%			04/22/22 09:31	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: A3000MISH-SOFT03-003.2

Date Collected: 04/12/22 13:30
Date Received: 04/14/22 09:30

Lab Sample ID: 580-112657-3

Matrix: Solid
Percent Solids: 84.3

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	**140**	**M J1 Q**	6.4	2.1	mg/Kg	☼	04/20/22 13:06	04/20/22 15:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*110*		*67 - 134*	*04/20/22 13:06*	*04/20/22 15:31*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.024	U	0.032	0.0060	mg/Kg	☼	04/20/22 13:06	04/20/22 15:31	1
Toluene	0.048	U M	0.095	0.021	mg/Kg	☼	04/20/22 13:06	04/20/22 15:31	1
Ethylbenzene	0.048	U M	0.064	0.014	mg/Kg	☼	04/20/22 13:06	04/20/22 15:31	1
m-Xylene & p-Xylene	0.024	U M	0.064	0.011	mg/Kg	☼	04/20/22 13:06	04/20/22 15:31	1
o-Xylene	0.024	U M	0.064	0.0079	mg/Kg	☼	04/20/22 13:06	04/20/22 15:31	1
Xylenes, Total	0.024	U	0.064	0.011	mg/Kg	☼	04/20/22 13:06	04/20/22 15:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*96*		*85 - 116*	*04/20/22 13:06*	*04/20/22 15:31*	*1*
4-Bromofluorobenzene (Surr)	*107*		*79 - 119*	*04/20/22 13:06*	*04/20/22 15:31*	*1*
Dibromofluoromethane (Surr)	*100*		*78 - 119*	*04/20/22 13:06*	*04/20/22 15:31*	*1*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 136*	*04/20/22 13:06*	*04/20/22 15:31*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0043	U M	0.0053	0.0017	mg/Kg	☼	04/19/22 17:47	04/20/22 14:03	1
2-Methylnaphthalene	0.0032	U M	0.0053	0.0022	mg/Kg	☼	04/19/22 17:47	04/20/22 14:03	1
1-Methylnaphthalene	0.0016	U M	0.0053	0.00067	mg/Kg	☼	04/19/22 17:47	04/20/22 14:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*99*		*58 - 132*	*04/19/22 17:47*	*04/20/22 14:03*	*1*
2-methylnaphthalene-d10	*81*		*40 - 140*	*04/19/22 17:47*	*04/20/22 14:03*	*1*
Fluoranthene-d10 (Surr)	*88*		*40 - 140*	*04/19/22 17:47*	*04/20/22 14:03*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**650**		57	11	mg/Kg	☼	04/19/22 18:14	04/20/22 20:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*81*		*45 - 130*	*04/19/22 18:14*	*04/20/22 20:10*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**84.3**		0.1	0.1	%			04/22/22 09:31	1
Percent Moisture	**15.7**		0.1	0.1	%			04/22/22 09:31	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: Trip Blank-1

Date Collected: 04/12/22 12:00
Date Received: 04/14/22 09:30

Lab Sample ID: 580-112657-4

Matrix: Solid

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	**50**	**M Q**	4.0	1.3	mg/Kg		04/20/22 13:06	04/20/22 17:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*109*		*67 - 134*	*04/20/22 13:06*	*04/20/22 17:05*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U	0.020	0.0038	mg/Kg		04/20/22 13:06	04/20/22 17:05	1
Toluene	0.030	U	0.060	0.014	mg/Kg		04/20/22 13:06	04/20/22 17:05	1
Ethylbenzene	0.030	U M	0.040	0.0091	mg/Kg		04/20/22 13:06	04/20/22 17:05	1
m-Xylene & p-Xylene	0.015	U M	0.040	0.0071	mg/Kg		04/20/22 13:06	04/20/22 17:05	1
o-Xylene	0.015	U M	0.040	0.0050	mg/Kg		04/20/22 13:06	04/20/22 17:05	1
Xylenes, Total	0.015	U	0.040	0.0071	mg/Kg		04/20/22 13:06	04/20/22 17:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*96*		*85 - 116*	*04/20/22 13:06*	*04/20/22 17:05*	*1*
4-Bromofluorobenzene (Surr)	*106*		*79 - 119*	*04/20/22 13:06*	*04/20/22 17:05*	*1*
Dibromofluoromethane (Surr)	*97*		*78 - 119*	*04/20/22 13:06*	*04/20/22 17:05*	*1*
1,2-Dichloroethane-d4 (Surr)	*99*		*71 - 136*	*04/20/22 13:06*	*04/20/22 17:05*	*1*

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: A3000MISH-SOFT01-003.2-1

Lab Sample ID: 580-112657-5

Date Collected: 04/12/22 13:30
Matrix: Solid
Date Received: 04/14/22 09:30

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	110		36	14	mg/Kg		04/20/22 17:12	04/22/22 16:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*81*		*45 - 130*	*04/20/22 17:12*	*04/22/22 16:27*	*1*

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: A3000MISH-SOFT02-003.2-1

Lab Sample ID: 580-112657-6

Date Collected: 04/12/22 13:30
Matrix: Solid
Date Received: 04/14/22 09:30

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	110		41	17	mg/Kg		04/20/22 17:12	04/22/22 17:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*91*		*45 - 130*	*04/20/22 17:12*	*04/22/22 17:45*	*1*

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: A3000MISH-SOFT03-003.2-1

Lab Sample ID: 580-112657-7

Date Collected: 04/12/22 13:30
Matrix: Solid
Date Received: 04/14/22 09:30

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	150		40	16	mg/Kg		04/20/22 17:12	04/22/22 18:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*87*		*45 - 130*	*04/20/22 17:12*	*04/22/22 18:05*	*1*

QC Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 580-387999/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388036 — **Prep Batch: 387999**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO)-C6-C10	3.0	U M	4.0	1.3	mg/Kg		04/20/22 12:00	04/20/22 12:02	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*67 - 134*	*04/20/22 12:00*	*04/20/22 12:02*	*1*

Lab Sample ID: LCS 580-387999/4-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388036 — **Prep Batch: 387999**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics (GRO)-C6-C10	40.0	39.4	M	mg/Kg		99	79 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*104*		*67 - 134*

Lab Sample ID: LCSD 580-387999/5-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388036 — **Prep Batch: 387999**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics (GRO)-C6-C10	40.0	38.0	M	mg/Kg		95	79 - 122	4	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*103*		*67 - 134*

Lab Sample ID: 580-112657-3 MS — **Client Sample ID: A3000MISH-SOFT03-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388036 — **Prep Batch: 387999**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics (GRO)-C6-C10	140	M J1 Q	63.5	172	M J1	mg/Kg	☼	53	79 - 122

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*109*		*67 - 134*

Lab Sample ID: 580-112657-3 MSD — **Client Sample ID: A3000MISH-SOFT03-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388036 — **Prep Batch: 387999**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics (GRO)-C6-C10	140	M J1 Q	63.5	219	M J1	mg/Kg	☼	127	79 - 122	24	30

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: 580-112657-3 MSD
Matrix: Solid
Analysis Batch: 388036

Client Sample ID: A3000MISH-SOFT03-003.2
Prep Type: Total/NA
Prep Batch: 387999

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*114*		*67 - 134*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 580-387999/1-A
Matrix: Solid
Analysis Batch: 388033

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 387999

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.015	U	0.020	0.0038	mg/Kg		04/20/22 12:00	04/20/22 12:02	1
Toluene	0.030	U M	0.060	0.014	mg/Kg		04/20/22 12:00	04/20/22 12:02	1
Ethylbenzene	0.030	U	0.040	0.0091	mg/Kg		04/20/22 12:00	04/20/22 12:02	1
m-Xylene & p-Xylene	0.0101	J	0.040	0.0071	mg/Kg		04/20/22 12:00	04/20/22 12:02	1
o-Xylene	0.00695	J	0.040	0.0050	mg/Kg		04/20/22 12:00	04/20/22 12:02	1
Xylenes, Total	0.0171	J	0.040	0.0071	mg/Kg		04/20/22 12:00	04/20/22 12:02	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*97*		*85 - 116*	*04/20/22 12:00*	*04/20/22 12:02*	*1*
4-Bromofluorobenzene (Surr)	*100*		*79 - 119*	*04/20/22 12:00*	*04/20/22 12:02*	*1*
Dibromofluoromethane (Surr)	*100*		*78 - 119*	*04/20/22 12:00*	*04/20/22 12:02*	*1*
1,2-Dichloroethane-d4 (Surr)	*103*		*71 - 136*	*04/20/22 12:00*	*04/20/22 12:02*	*1*

Lab Sample ID: LCS 580-387999/2-A
Matrix: Solid
Analysis Batch: 388033

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 387999

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	0.800	0.850		mg/Kg		106	77 - 121
Toluene	0.800	0.853		mg/Kg		107	77 - 121
Ethylbenzene	0.800	0.858		mg/Kg		107	76 - 122
m-Xylene & p-Xylene	0.800	0.868		mg/Kg		109	77 - 124
o-Xylene	0.800	0.862		mg/Kg		108	77 - 123
Xylenes, Total	1.60	1.73		mg/Kg		108	78 - 124

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Toluene-d8 (Surr)	*97*		*85 - 116*
4-Bromofluorobenzene (Surr)	*103*		*79 - 119*
Dibromofluoromethane (Surr)	*103*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 136*

Lab Sample ID: LCSD 580-387999/3-A
Matrix: Solid
Analysis Batch: 388033

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 387999

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	0.800	0.815		mg/Kg		102	77 - 121	4	20
Toluene	0.800	0.827		mg/Kg		103	77 - 121	3	20
Ethylbenzene	0.800	0.835		mg/Kg		104	76 - 122	3	20

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 580-387999/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388033 — **Prep Batch: 387999**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
m-Xylene & p-Xylene			0.800	0.851		mg/Kg		106	77 - 124	2	20
o-Xylene			0.800	0.848		mg/Kg		106	77 - 123	2	20
Xylenes, Total			1.60	1.70		mg/Kg		106	78 - 124	2	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*98*		*85 - 116*
4-Bromofluorobenzene (Surr)	*103*		*79 - 119*
Dibromofluoromethane (Surr)	*104*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*100*		*71 - 136*

Lab Sample ID: 580-112657-2 MS — **Client Sample ID: A3000MISH-SOFT02-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388033 — **Prep Batch: 387999**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Benzene	0.0044	U J1	0.118	0.0251	J1	mg/Kg	☼	21	77 - 121		
Toluene	0.0088	U M J1	0.118	0.0266	J1	mg/Kg	☼	23	77 - 121		
Ethylbenzene	0.0088	U J1	0.118	0.0300	J1	mg/Kg	☼	25	76 - 122		
m-Xylene & p-Xylene	0.0044	U M J1	0.118	0.0314	J1	mg/Kg	☼	27	77 - 124		
o-Xylene	0.0044	U M J1	0.118	0.0276	J1	mg/Kg	☼	23	77 - 123		
Xylenes, Total	0.0044	U J1	0.236	0.0590	J1	mg/Kg	☼	25	78 - 124		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Toluene-d8 (Surr)	*98*		*85 - 116*
4-Bromofluorobenzene (Surr)	*108*		*79 - 119*
Dibromofluoromethane (Surr)	*101*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*100*		*71 - 136*

Lab Sample ID: 580-112657-2 MSD — **Client Sample ID: A3000MISH-SOFT02-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388033 — **Prep Batch: 387999**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	0.0044	U J1	0.118	0.0471	J1	mg/Kg	☼	40	77 - 121	61	20
Toluene	0.0088	U M J1	0.118	0.0454	J1	mg/Kg	☼	39	77 - 121	52	20
Ethylbenzene	0.0088	U J1	0.118	0.0447	J1	mg/Kg	☼	38	76 - 122	39	20
m-Xylene & p-Xylene	0.0044	U M J1	0.118	0.0491	J1	mg/Kg	☼	42	77 - 124	44	20
o-Xylene	0.0044	U M J1	0.118	0.0472	J1	mg/Kg	☼	40	77 - 123	53	20
Xylenes, Total	0.0044	U J1	0.236	0.0963	J1	mg/Kg	☼	41	78 - 124	48	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*95*		*85 - 116*
4-Bromofluorobenzene (Surr)	*99*		*79 - 119*
Dibromofluoromethane (Surr)	*100*		*78 - 119*
1,2-Dichloroethane-d4 (Surr)	*96*		*71 - 136*

QC Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-387916/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387965 — **Prep Batch: 387916**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0040	U Q	0.0050	0.0016	mg/Kg		04/19/22 17:47	04/20/22 11:36	1
2-Methylnaphthalene	0.0030	U Q	0.0050	0.0021	mg/Kg		04/19/22 17:47	04/20/22 11:36	1
1-Methylnaphthalene	0.0015	U Q	0.0050	0.00063	mg/Kg		04/19/22 17:47	04/20/22 11:36	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*142*	*Q*	*58 - 132*	*04/19/22 17:47*	*04/20/22 11:36*	*1*
2-methylnaphthalene-d10	*94*		*40 - 140*	*04/19/22 17:47*	*04/20/22 11:36*	*1*
Fluoranthene-d10 (Surr)	*113*	*M*	*40 - 140*	*04/19/22 17:47*	*04/20/22 11:36*	*1*

Lab Sample ID: LCS 580-387916/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387965 — **Prep Batch: 387916**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Naphthalene	1.00	0.942		mg/Kg		94	38 - 111
2-Methylnaphthalene	1.00	1.01		mg/Kg		101	39 - 114
1-Methylnaphthalene	1.00	0.990		mg/Kg		99	43 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Terphenyl-d14	*110*		*58 - 132*
2-methylnaphthalene-d10	*130*	*M*	*40 - 140*
Fluoranthene-d10 (Surr)	*99*		*40 - 140*

Lab Sample ID: 580-112657-2 MS — **Client Sample ID: A3000MISH-SOFT02-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387965 — **Prep Batch: 387916**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Naphthalene	0.0046	U M	1.16	0.954		mg/Kg	☼	78	38 - 111
2-Methylnaphthalene	0.0035	U M	1.16	0.988		mg/Kg	☼	73	39 - 114
1-Methylnaphthalene	0.0017	U M	1.16	0.976		mg/Kg	☼	70	43 - 111

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Terphenyl-d14	*97*		*58 - 132*
2-methylnaphthalene-d10	*92*		*40 - 140*
Fluoranthene-d10 (Surr)	*88*		*40 - 140*

Lab Sample ID: 580-112657-2 MSD — **Client Sample ID: A3000MISH-SOFT02-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387965 — **Prep Batch: 387916**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Naphthalene	0.0046	U M	1.10	0.846		mg/Kg	☼	73	38 - 111	12	20
2-Methylnaphthalene	0.0035	U M	1.10	0.888		mg/Kg	☼	68	39 - 114	11	20
1-Methylnaphthalene	0.0017	U M	1.10	0.869		mg/Kg	☼	64	43 - 111	12	20

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: 580-112657-2 MSD — **Client Sample ID: A3000MISH-SOFT02-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 387965 — **Prep Batch: 387916**

Surrogate	MSD %Recovery	MSD Qualifier	Limits
Terphenyl-d14	89		58 - 132
2-methylnaphthalene-d10	84		40 - 140
Fluoranthene-d10 (Surr)	83		40 - 140

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-387925/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388003 — **Prep Batch: 387925**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		04/19/22 18:14	04/20/22 17:54	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	87		45 - 130	04/19/22 18:14	04/20/22 17:54	1

Lab Sample ID: LCS 580-387925/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388003 — **Prep Batch: 387925**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	500	464		mg/Kg		93	75 - 125

Surrogate	LCS %Recovery	LCS Qualifier	Limits
o-Terphenyl	96		45 - 130

Lab Sample ID: LCSD 580-387925/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388003 — **Prep Batch: 387925**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	500	464		mg/Kg		93	75 - 125	0	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
o-Terphenyl	96		45 - 130

Lab Sample ID: 580-112657-1 MS — **Client Sample ID: A3000MISH-SOFT01-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388003 — **Prep Batch: 387925**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	810	J1	571	1440		mg/Kg	☼	111	75 - 125

Surrogate	MS %Recovery	MS Qualifier	Limits
o-Terphenyl	94		45 - 130

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: 580-112657-1 MSD — **Client Sample ID: A3000MISH-SOFT01-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388003 — **Prep Batch: 387925**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	810	J1	564	1680	J1	mg/Kg	☼	155	75 - 125	15	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*93*		*45 - 130*

Lab Sample ID: MB 580-388061/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388164 — **Prep Batch: 388061**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		04/20/22 17:12	04/21/22 22:20	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*97*		*45 - 130*	*04/20/22 17:12*	*04/21/22 22:20*	*1*

Lab Sample ID: LCS 580-388061/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388164 — **Prep Batch: 388061**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Motor Oil Range Organics (C24-C40)			500	508		mg/Kg		102	39 - 106		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*108*		*45 - 130*

Lab Sample ID: LCSD 580-388061/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388164 — **Prep Batch: 388061**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Motor Oil Range Organics (C24-C40)			500	518		mg/Kg		104	39 - 106	2	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*108*		*45 - 130*

Lab Sample ID: 580-112657-5 MS — **Client Sample ID: A3000MISH-SOFT01-003.2-1**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388299 — **Prep Batch: 388061**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Motor Oil Range Organics (C24-C40)	110		401	479		mg/Kg		93	39 - 106		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*91*		*45 - 130*

QC Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: 580-112657-5 MSD — **Client Sample ID: A3000MISH-SOFT01-003.2-1**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388299 — **Prep Batch: 388061**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Motor Oil Range Organics (C24-C40)	110		358	442		mg/Kg		94	39 - 106	8	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*91*		*45 - 130*

Method: 2540G - SM 2540G

Lab Sample ID: 580-112657-2 DU — **Client Sample ID: A3000MISH-SOFT02-003.2**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 388246

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	84.0			84.5		%				0.6	20
Percent Moisture	16.0			15.5		%				3	20

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: A3000MISH-SOFT01-003.2 — Lab Sample ID: 580-112657-1

Date Collected: 04/12/22 13:30 — **Matrix: Solid**
Date Received: 04/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387888	CLC	EET SEA	04/19/22 14:00
Total/NA	Analysis	2540G		1	388246	TOA	EET SEA	04/22/22 09:31

Client Sample ID: A3000MISH-SOFT01-003.2 — Lab Sample ID: 580-112657-1

Date Collected: 04/12/22 13:30 — **Matrix: Solid**
Date Received: 04/14/22 09:30 — **Percent Solids: 83.2**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			387998	RJL	EET SEA	04/20/22 10:00
Total/NA	Prep	5035			387999	RJL	EET SEA	04/20/22 12:51
Total/NA	Analysis	8260/CALUFT DOD		1	388036	JSM	EET SEA	04/20/22 13:59
Total/NA	ISM Prep	Increment, Prep			387998	RJL	EET SEA	04/20/22 10:00
Total/NA	Prep	5035			387999	RJL	EET SEA	04/20/22 12:51
Total/NA	Analysis	8260D		1	388033	JSM	EET SEA	04/20/22 13:59
Total/NA	ISM Prep	Increment, prep			387888	CLC	EET SEA	04/19/22 14:00
Total/NA	Prep	3546			387916	TOA	EET SEA	04/19/22 17:47
Total/NA	Analysis	8270E SIM		1	387965	E1L	EET SEA	04/20/22 12:25
Total/NA	ISM Prep	Increment, prep			387888	CLC	EET SEA	04/19/22 14:00
Total/NA	Prep	3546			387925	TOA	EET SEA	04/19/22 18:14
Total/NA	Analysis	8015D DRO		1	388003	Y1F	EET SEA	04/20/22 18:52

Client Sample ID: A3000MISH-SOFT02-003.2 — Lab Sample ID: 580-112657-2

Date Collected: 04/12/22 13:30 — **Matrix: Solid**
Date Received: 04/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387888	CLC	EET SEA	04/19/22 14:00
Total/NA	Analysis	2540G		1	388246	TOA	EET SEA	04/22/22 09:31

Client Sample ID: A3000MISH-SOFT02-003.2 — Lab Sample ID: 580-112657-2

Date Collected: 04/12/22 13:30 — **Matrix: Solid**
Date Received: 04/14/22 09:30 — **Percent Solids: 84.0**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			387998	RJL	EET SEA	04/20/22 10:00
Total/NA	Prep	5035			387999	RJL	EET SEA	04/20/22 12:51
Total/NA	Analysis	8260/CALUFT DOD		1	388036	JSM	EET SEA	04/20/22 14:22
Total/NA	ISM Prep	Increment, Prep			387998	RJL	EET SEA	04/20/22 10:00
Total/NA	Prep	5035			387999	RJL	EET SEA	04/20/22 12:51
Total/NA	Analysis	8260D		1	388033	JSM	EET SEA	04/20/22 14:22
Total/NA	ISM Prep	Increment, prep			387888	CLC	EET SEA	04/19/22 14:00
Total/NA	Prep	3546			387916	TOA	EET SEA	04/19/22 17:47
Total/NA	Analysis	8270E SIM		1	387965	E1L	EET SEA	04/20/22 12:50
Total/NA	ISM Prep	Increment, prep			387888	CLC	EET SEA	04/19/22 14:00
Total/NA	Prep	3546			387925	TOA	EET SEA	04/19/22 18:14
Total/NA	Analysis	8015D DRO		1	388003	Y1F	EET SEA	04/20/22 19:51

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: A3000MISH-SOFT03-003.2 — Lab Sample ID: 580-112657-3

Date Collected: 04/12/22 13:30 — **Matrix: Solid**
Date Received: 04/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387888	CLC	EET SEA	04/19/22 14:00
Total/NA	Analysis	2540G		1	388246	TOA	EET SEA	04/22/22 09:31

Client Sample ID: A3000MISH-SOFT03-003.2 — Lab Sample ID: 580-112657-3

Date Collected: 04/12/22 13:30 — **Matrix: Solid**
Date Received: 04/14/22 09:30 — **Percent Solids: 84.3**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, Prep			387998	RJL	EET SEA	04/20/22 10:00
Total/NA	Prep	5035			387999	RJL	EET SEA	04/20/22 13:06
Total/NA	Analysis	8260/CALUFT DOD		1	388036	JSM	EET SEA	04/20/22 15:31
Total/NA	ISM Prep	Increment, Prep			387998	RJL	EET SEA	04/20/22 10:00
Total/NA	Prep	5035			387999	RJL	EET SEA	04/20/22 13:06
Total/NA	Analysis	8260D		1	388033	JSM	EET SEA	04/20/22 15:31
Total/NA	ISM Prep	Increment, prep			387888	CLC	EET SEA	04/19/22 14:00
Total/NA	Prep	3546			387916	TOA	EET SEA	04/19/22 17:47
Total/NA	Analysis	8270E SIM		1	387965	E1L	EET SEA	04/20/22 14:03
Total/NA	ISM Prep	Increment, prep			387888	CLC	EET SEA	04/19/22 14:00
Total/NA	Prep	3546			387925	TOA	EET SEA	04/19/22 18:14
Total/NA	Analysis	8015D DRO		1	388003	Y1F	EET SEA	04/20/22 20:10

Client Sample ID: Trip Blank-1 — Lab Sample ID: 580-112657-4

Date Collected: 04/12/22 12:00 — **Matrix: Solid**
Date Received: 04/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	5035			387999	RJL	EET SEA	04/20/22 13:06
Total/NA	Analysis	8260/CALUFT DOD		1	388036	JSM	EET SEA	04/20/22 17:05
Total/NA	Prep	5035			387999	RJL	EET SEA	04/20/22 13:06
Total/NA	Analysis	8260D		1	388033	JSM	EET SEA	04/20/22 17:05

Client Sample ID: A3000MISH-SOFT01-003.2-1 — Lab Sample ID: 580-112657-5

Date Collected: 04/12/22 13:30 — **Matrix: Solid**
Date Received: 04/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387946	ASL	EET SEA	04/20/22 08:37
Total/NA	Prep	3546			388061	S1B	EET SEA	04/20/22 17:12
Total/NA	Analysis	8015D DRO		1	388299	Y1F	EET SEA	04/22/22 16:27

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Client Sample ID: A3000MISH-SOFT02-003.2-1

Lab Sample ID: 580-112657-6

Date Collected: 04/12/22 13:30
Date Received: 04/14/22 09:30

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387946	ASL	EET SEA	04/20/22 08:37
Total/NA	Prep	3546			388061	S1B	EET SEA	04/20/22 17:12
Total/NA	Analysis	8015D DRO		1	388299	Y1F	EET SEA	04/22/22 17:45

Client Sample ID: A3000MISH-SOFT03-003.2-1

Lab Sample ID: 580-112657-7

Date Collected: 04/12/22 13:30
Date Received: 04/14/22 09:30

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	ISM Prep	Increment, prep			387946	ASL	EET SEA	04/20/22 08:37
Total/NA	Prep	3546			388061	S1B	EET SEA	04/20/22 17:12
Total/NA	Analysis	8015D DRO		1	388299	Y1F	EET SEA	04/22/22 18:05

Laboratory References:

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-112657-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-112657-1	A3000MISH-SOFT01-003.2	Solid	04/12/22 13:30	04/14/22 09:30
580-112657-2	A3000MISH-SOFT02-003.2	Solid	04/12/22 13:30	04/14/22 09:30
580-112657-3	A3000MISH-SOFT03-003.2	Solid	04/12/22 13:30	04/14/22 09:30
580-112657-4	Trip Blank-1	Solid	04/12/22 12:00	04/14/22 09:30
580-112657-5	A3000MISH-SOFT01-003.2-1	Solid	04/12/22 13:30	04/14/22 09:30
580-112657-6	A3000MISH-SOFT02-003.2-1	Solid	04/12/22 13:30	04/14/22 09:30
580-112657-7	A3000MISH-SOFT03-003.2-1	Solid	04/12/22 13:30	04/14/22 09:30

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

580-112657 Chain of Custody

Chain of Custody Record

eurofins | Environment Testing America

Client Information	Sampler: (b) (6)	Lab PM: (b) (6)	Carrier Tracking No(s):	COC No: 1 -44635
Client Contact: (b) (6)	Phone: (b) (6)	E-Mail: (b) (6) @EurofinsET.com	State of Origin:	Page: Page 1 of 1
Company: AECOM-Honolulu	PWSID:			Job #:
Address: AECOM-Honolulu	Due Date Requested:			
City: 1001 Bishop Street, ASB Tower, Suite 1600	TAT Requested (days): 4			
State, Zip: Honolulu, Hawaii, 96813	Compliance Project: Δ Yes Δ No			
Phone: (b) (6)	PO #: Purchase Order Requested			
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com	WO #			
Project Name: SiteCharP2Tunnels	Project #:			
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=Groundwater, S=soil, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D/	N,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3000MISH-SOFT01-003.2	4/12/22	13:30	MIS	SO			6-4oz Jar ,TEF	1-GalZiploc								
A3000MISH-SOFT02-003.2	4/12/22	13:30	MIS	SO			6-4oz Jar ,TEF	1-GalZiploc								
A3000MISH-SOFT03-003.2	4/12/22	13:30	MIS	SO			6-4oz Jar ,TEF	1-GalZiploc								
Trip Blank-1							2x40mL vial									

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For _____ Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: (b) (6)	Date/Time: 4/13/22 1255	Company: AECOM	Received by: (b) (6)	Date/Time: 4/14/22 0930	Company: EETN
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks: Fed Ex Lg Blw/wet/none 1.9 on/0.4 wt/ice

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-112657-1

Login Number: 112657
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-114114-1
Client Project/Site: 22F0106
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
8/31/2022 12:46:08 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-114114-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-114114-1

REVISON 1: AUGUST 31, 2022
Report was revised to reprocess the GRO analysis to reintegrate data, remove one of the PAH surrogates and change the collection time for sample 2..

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
Two samples were received on 5/24/2022 12:20 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.6º C.

Receipt Exceptions

The container labels for the following samples did not match the information listed on the Chain-of-Custody (COC):
A3015-WGN01-052322 (580-114114-1) and A3015-TN01-052322 (580-114114-2). The container labels list the suffix for both samples as -44704, while the COC lists -52322. The -44704 suffix appears to be crossed out on the COC for sample -1. The COC was used for login.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

GASOLINE RANGE ORGANICS (GRO)
Samples A3015-WGN01-052322 (580-114114-1) and A3015-TN01-052322 (580-114114-2) were analyzed for gasoline range organics (GRO) in accordance with 8260B CALUFT. The samples were analyzed on 05/30/2022 and 05/31/2022.

The method requirement for no headspace was not met. The following volatile sample was analyzed with significant headspace in the sample container(s): A3015-TN01-052322 (580-114114-2). Significant headspace is defined as a bubble greater than 6 mm in diameter.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 580-114114-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

VOLATILE ORGANIC COMPOUNDS (GC-MS)

Samples A3015-WGN01-052322 (580-114114-1) and A3015-TN01-052322 (580-114114-2) were analyzed for volatile organic compounds (GC-MS) in accordance with 8260D_DOD5. The samples were analyzed on 05/27/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)

Sample A3015-WGN01-052322 (580-114114-1) was analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 05/27/2022 and analyzed on 05/28/2022 and 05/29/2022.

The following sample formed emulsions during the extraction procedure: A3015-WGN01-052322 (580-114114-1). The emulsions were broken up using additional sodium sulfate filtrations and DCM rinsing as needed.

The following sample was diluted to bring the concentration of target analytes within the calibration range: A3015-WGN01-052322 (580-114114-1). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS

Sample A3015-WGN01-052322 (580-114114-1) was analyzed for Diesel Range Organics in accordance with 8015D DRO. The samples were prepared on 05/27/2022 and analyzed on 05/31/2022.

The following sample was diluted to bring the concentration of target analytes within the calibration range: A3015-WGN01-052322 (580-114114-1). Elevated reporting limits (RLs) are provided.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-114114-1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC/MS Semi VOA

Qualifier	Qualifier Description
D	The reported value is from a dilution.
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
D	The reported value is from a dilution.
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-114114-1

Client Sample ID: A3015-WGN01-052322

Date Collected: 05/23/22 10:00
Date Received: 05/24/22 12:20

Lab Sample ID: 580-114114-1

Matrix: Water

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	**360**		50	15	ug/L			05/31/22 01:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*102*		*73 - 115*		*05/31/22 01:53*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U	1.0	0.24	ug/L			05/27/22 14:15	1
Toluene	0.80	U	1.0	0.39	ug/L			05/27/22 14:15	1
Ethylbenzene	**1.3**		1.0	0.50	ug/L			05/27/22 14:15	1
m-Xylene & p-Xylene	**7.4**		2.0	0.53	ug/L			05/27/22 14:15	1
o-Xylene	**19**		1.0	0.39	ug/L			05/27/22 14:15	1
Xylenes, Total	**26**		2.0	0.53	ug/L			05/27/22 14:15	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*107*		*85 - 114*		*05/27/22 14:15*	*1*
Toluene-d8 (Surr)	*93*		*89 - 112*		*05/27/22 14:15*	*1*
Dibromofluoromethane (Surr)	*108*		*80 - 119*		*05/27/22 14:15*	*1*
1,2-Dichloroethane-d4 (Surr)	*92*		*81 - 118*		*05/27/22 14:15*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**140**	**D**	1.0	0.34	ug/L		05/27/22 09:59	05/29/22 22:00	10
2-Methylnaphthalene	**170**	**D**	2.1	0.40	ug/L		05/27/22 09:59	05/29/22 22:00	10
Naphthalene	**81**	**D**	5.2	1.7	ug/L		05/27/22 09:59	05/29/22 22:00	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*73*	*M*	*40 - 140*	*05/27/22 09:59*	*05/29/22 22:00*	*10*
Fluoranthene-d10 (Surr)	*88*		*40 - 140*	*05/27/22 09:59*	*05/29/22 22:00*	*10*
Terphenyl-d14	*117*		*58 - 132*	*05/27/22 09:59*	*05/29/22 22:00*	*10*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**130000**	**D**	230	140	ug/L		05/27/22 09:55	05/31/22 04:09	2
Motor Oil Range Organics (C24-C40)	**1100**	**D**	730	380	ug/L		05/27/22 09:55	05/31/22 04:09	2

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*74*		*56 - 125*	*05/27/22 09:55*	*05/31/22 04:09*	*2*

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-114114-1

Client Sample ID: A3015-TN01-052322

Lab Sample ID: 580-114114-2

Date Collected: 05/23/22 09:55

Matrix: Water

Date Received: 05/24/22 12:20

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	30	U	50	15	ug/L			05/30/22 23:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*73 - 115*		*05/30/22 23:10*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U	1.0	0.24	ug/L			05/27/22 14:40	1
Toluene	0.80	U	1.0	0.39	ug/L			05/27/22 14:40	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			05/27/22 14:40	1
m-Xylene & p-Xylene	0.80	U	2.0	0.53	ug/L			05/27/22 14:40	1
o-Xylene	0.80	U	1.0	0.39	ug/L			05/27/22 14:40	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			05/27/22 14:40	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*85 - 114*		*05/27/22 14:40*	*1*
Toluene-d8 (Surr)	*97*		*89 - 112*		*05/27/22 14:40*	*1*
Dibromofluoromethane (Surr)	*100*		*80 - 119*		*05/27/22 14:40*	*1*
1,2-Dichloroethane-d4 (Surr)	*82*		*81 - 118*		*05/27/22 14:40*	*1*

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 320-591344/10
Matrix: Water
Analysis Batch: 591344

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	30	U	50	15	ug/L			05/30/22 22:24	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*73 - 115*		*05/30/22 22:24*	*1*

Lab Sample ID: LCS 320-591344/7
Matrix: Water
Analysis Batch: 591344

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Gasoline Range Organics [C6 - C10]			1000	912		ug/L		91	78 - 118		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*100*		*73 - 115*

Lab Sample ID: LCSD 320-591344/8
Matrix: Water
Analysis Batch: 591344

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics [C6 - C10]			1000	911		ug/L		91	78 - 118	0	23

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*100*		*73 - 115*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 580-392136/6
Matrix: Water
Analysis Batch: 392136

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U	1.0	0.24	ug/L			05/27/22 13:51	1
Toluene	0.80	U	1.0	0.39	ug/L			05/27/22 13:51	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			05/27/22 13:51	1
m-Xylene & p-Xylene	0.80	U	2.0	0.53	ug/L			05/27/22 13:51	1
o-Xylene	0.80	U	1.0	0.39	ug/L			05/27/22 13:51	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			05/27/22 13:51	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*85 - 114*		*05/27/22 13:51*	*1*
Toluene-d8 (Surr)	*90*		*89 - 112*		*05/27/22 13:51*	*1*
Dibromofluoromethane (Surr)	*103*		*80 - 119*		*05/27/22 13:51*	*1*
1,2-Dichloroethane-d4 (Surr)	*86*		*81 - 118*		*05/27/22 13:51*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 580-392136/3
Matrix: Water
Analysis Batch: 392136

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	5.00	4.08		ug/L		82	79 - 120
Toluene	5.00	4.26		ug/L		85	80 - 121
Ethylbenzene	5.00	4.46		ug/L		89	79 - 121
m-Xylene & p-Xylene	5.00	4.22		ug/L		84	80 - 121
o-Xylene	5.00	4.19	M	ug/L		84	78 - 122
Xylenes, Total	10.0	8.41		ug/L		84	79 - 121

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*104*		*85 - 114*
Toluene-d8 (Surr)	*96*		*89 - 112*
Dibromofluoromethane (Surr)	*102*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*89*		*81 - 118*

Lab Sample ID: LCSD 580-392136/4
Matrix: Water
Analysis Batch: 392136

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	5.00	4.11	M	ug/L		82	79 - 120	1	20
Toluene	5.00	4.11		ug/L		82	80 - 121	4	20
Ethylbenzene	5.00	4.21		ug/L		84	79 - 121	6	20
m-Xylene & p-Xylene	5.00	4.24	M	ug/L		85	80 - 121	1	20
o-Xylene	5.00	4.01	M	ug/L		80	78 - 122	4	20
Xylenes, Total	10.0	8.25		ug/L		83	79 - 121	2	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*104*		*85 - 114*
Toluene-d8 (Surr)	*96*		*89 - 112*
Dibromofluoromethane (Surr)	*98*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*86*		*81 - 118*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-392094/1-A
Matrix: Water
Analysis Batch: 392254

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 392094

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.080	U	0.10	0.033	ug/L		05/27/22 09:59	05/29/22 18:44	1
2-Methylnaphthalene	0.080	U	0.20	0.039	ug/L		05/27/22 09:59	05/29/22 18:44	1
Naphthalene	0.40	U M	0.50	0.16	ug/L		05/27/22 09:59	05/29/22 18:44	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*132*		*58 - 132*	*05/27/22 09:59*	*05/29/22 18:44*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCS 580-392094/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 392254 — **Prep Batch: 392094**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
1-Methylnaphthalene			4.00	2.39		ug/L		60	41 - 115		
2-Methylnaphthalene			4.00	2.29		ug/L		57	39 - 114		
Naphthalene			4.00	2.28		ug/L		57	43 - 114		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Terphenyl-d14	*122*		*58 - 132*

Lab Sample ID: LCSD 580-392094/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 392254 — **Prep Batch: 392094**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene			4.00	2.27		ug/L		57	41 - 115	5	20
2-Methylnaphthalene			4.00	2.17		ug/L		54	39 - 114	5	20
Naphthalene			4.00	2.20		ug/L		55	43 - 114	4	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Terphenyl-d14	*114*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-392093/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 392287 — **Prep Batch: 392093**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	100	U	110	65	ug/L		05/27/22 09:55	05/31/22 04:29	1
Motor Oil Range Organics (C24-C40)	300	U	350	180	ug/L		05/27/22 09:55	05/31/22 04:29	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*104*		*56 - 125*	*05/27/22 09:55*	*05/31/22 04:29*	*1*

Lab Sample ID: LCS 580-392093/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 392287 — **Prep Batch: 392093**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)			4000	3220		ug/L		81	36 - 132		
Motor Oil Range Organics (C24-C40)			4000	3930		ug/L		98	41 - 113		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*88*		*56 - 125*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: LCSD 580-392093/3-A
Matrix: Water
Analysis Batch: 392287

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 392093

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			4000	2940		ug/L		74	36 - 132	9	20
Motor Oil Range Organics (C24-C40)			4000	3530		ug/L		88	41 - 113	11	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*80*	*M*	*56 - 125*

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-114114-1

Client Sample ID: A3015-WGN01-052322

Lab Sample ID: 580-114114-1
Date Collected: 05/23/22 10:00
Matrix: Water
Date Received: 05/24/22 12:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260/CALUFT DOD		1	591344	EMJ	EET SAC	05/31/22 01:53
Total/NA	Analysis	8260D		1	392136	BNM	EET SEA	05/27/22 14:15
Total/NA	Prep	3510C			392094	JJY	EET SEA	05/27/22 09:59
Total/NA	Analysis	8270E SIM		10	392254	E1L	EET SEA	05/29/22 22:00
Total/NA	Prep	3510C			392093	JJY	EET SEA	05/27/22 09:55
Total/NA	Analysis	8015D DRO		2	392287	Y1F	EET SEA	05/31/22 04:09

Client Sample ID: A3015-TN01-052322

Lab Sample ID: 580-114114-2
Date Collected: 05/23/22 09:55
Matrix: Water
Date Received: 05/24/22 12:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260/CALUFT DOD		1	591344	EMJ	EET SAC	05/30/22 23:10
Total/NA	Analysis	8260D		1	392136	BNM	EET SEA	05/27/22 14:40

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-114114-1

Laboratory: Eurofins Seattle

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

Laboratory: Eurofins Sacramento

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	17-020	06-19-22
ANAB	Dept. of Defense ELAP	L2468	07-13-22
ANAB	Dept. of Energy	L2468.01	01-20-24
ANAB	ISO/IEC 17025	L2468	01-20-24
Arizona	State	AZ0708	08-11-22
Arkansas DEQ	State	88-0691	06-17-22
California	State	2897	01-31-23
Colorado	State	CA0004	08-31-22
Florida	NELAP	E87570	06-30-22
Georgia	State	4040	01-30-23
Hawaii	State	<cert No.>	01-29-23
Illinois	NELAP	200060	03-17-24
Kansas	NELAP	E-10375	10-31-22
Louisiana	NELAP	01944	06-30-22
Louisiana (All)	NELAP	01944	06-30-22
Maine	State	CA00004	04-14-24
Michigan	State	9947	01-31-23
Nevada	State	CA00044	07-31-22
New Hampshire	NELAP	2997	04-18-23
New Jersey	NELAP	CA005	06-30-22
New York	NELAP	11666	06-02-22
Ohio	State	41252	01-29-23
Oregon	NELAP	4040	01-29-23
Texas	NELAP	T104704399-19-13	05-31-22
US Fish & Wildlife	US Federal Programs	58448	04-30-23
USDA	US Federal Programs	P330-18-00239	01-23-23
Utah	NELAP	CA000442021-12	02-28-23
Virginia	NELAP	460278	03-14-23
Washington	State	C581	05-05-23
West Virginia (DW)	State	9930C	12-31-22
Wisconsin	State	998204680	08-12-22
Wyoming	State Program	8TMS-L	01-28-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-114114-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-114114-1	A3015-WGN01-052322	Water	05/23/22 10:00	05/24/22 12:20
580-114114-2	A3015-TN01-052322	Water	05/23/22 09:55	05/24/22 12:20

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

580-114114 Chain of Custody

Chain of Custody Record

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Client Information	Sampler: (b) (6)	Lab PM: (b) (6)	Carrier Tracking No(s):	COC No: 1 -44635
Client Contact: (b) (6)	Phone: (b) (6) (b) (6)	E-Mail: (b) (6) @EurofinsET.com	State of Origin:	Page: Page 1 of 1
Company: AECOM-Honolulu	PWSID:			Job #:
Address: AECOM-Honolulu	Due Date Requested:			
City: 1001 Bishop Street, ASB Tower, Suite 1600	TAT Requested (days): 4			
State, Zip: Honolulu, Hawaii, 96813	Compliance Project: Δ Yes Δ No			
Phone: (b) (6)	PO #: Purchase Order Requested			
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com	WO #:			
Project Name: SiteCharP2Tunnels	Project #:			
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecanydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (WG=Groundwater, SO=soil, PR=product GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D/	N,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:		X	X	F		A						X	
A3015-WGN01-~~44704~~052322	5/23/22	10:00	GRAB	WG	N	N			4-40mL	2-250mlAmb	2-250mlAmb					
A3015-TN01-052322	05/23/22	09:5	—	—	N	N			2-40mL							TRIP BLANKS
							(b) (6)	05/23/2022								

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For _____ Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: (b) (6)	Date/Time: 05/23/2022 1750	Company: AECOM	Received by: (b) (6)	Date/Time: 5/24/22 1220	Company: GetSea
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks: TBS 0.6/0.8

Lg Blue
Private Courier
Bub/Gel

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Phone: 253-922-2310

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler:	Lab PM: [redacted] (b) (6)	Carrier Tracking No(s):	COC No: 580-104340.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: [redacted] (b) (6) @et.eurofinsus.com	State of Origin: Hawaii	Page: Page 1 of 1
Company: Eurofins Environment Testing Northern Ca		Accreditations Required (See note): Dept. of Defense ELAP - A2LA; Dept. of Defense ELAP - A ...		Job #: 580-114114-1
Address: 880 Riverside Parkway, ,	Due Date Requested: 5/31/2022			
City: West Sacramento	TAT Requested (days):			
State, Zip: CA, 95605				
Phone: 916-373-5600(Tel) 916-372-1059(Fax)	PO #:			
Email:	WO #:			
Project Name: RH Site Characterization JBPHH N62742-17	Project #: 58017373			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8260_CALUFT_DOD/5030B GRO	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
A3015-WGN01-052322 (580-114114-1)	5/23/22	10:00 Hawaiian		Water			X	2	
A3015-TN01-052322 (580-114114-2)	5/23/22	09:50 Hawaiian		Water			X	1	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northwest, LLC places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northwest, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northwest, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins Environment Testing Northwest, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 1	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
[redacted] (b) (6)	Date/Time: 5/26/22 1600	Company: EETN	[redacted] (b) (6)	Date/Time: 5/27/22 9:40	Company: GESAL
	Date/Time:	Company		Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.: 188363		Cooler Temperature(s) °C and Other Remarks: 5.4c		

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-114114-1

Login Number: 114114
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	IDs on containers do not match the COC. Logged in per COC.
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	False	Narrative to indicate if headspace container used for analysis.
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-114114-1

Login Number: 114114
List Number: 2
Creator: [redacted]

List Source: Eurofins Sacramento
List Creation: 05/27/22 03:03 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	1880363
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	5.4c
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes

580-114114 Field Sheet

Job:

Tracking # : 5812 3868 5806

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier
GSO / OnTrac / Goldstreak / USPS / Other

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations. File in the job folder with the COC.

Therm. ID: L-03 Corr. Factor: (+ / -) — °C

Ice ✓ Wet ✓ Gel ____ Other ____

Cooler Custody Seal: 1880363

Cooler ID: ____

Temp Observed: 5.4 °C Corrected: 5.4 °C

From: Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials: (b) (6) Date: 5.27.22

Unpacking/Labeling The Samples	Yes	No	NA
COC is complete w/o discrepancies?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
Containers are not broken or leaking?	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples require splitting/compositing?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials: (b) (6) Date: 5.27.22

Notes:

Trizma Lot #(s):

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
Samples received within hold time?	☑	☐	☐
NCM Filed?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials: (b) (6) Date: 5.27.22

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-115329-1
Client Project/Site: 22F0106
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
8/31/2022 2:59:47 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

Review your project results through my EOL

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-115329-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-115329-1

REVISION 2: AUGUST 31, 2022
Report revised to remove one of the 8270E SIM surrogates that was not required for the method.

REVISION 1: AUGUST 17, 2022
Report revised to correct the client ID for sample.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
Three samples were received on 6/28/2022 9:40 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 2.9º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) - SOIL
Sample A3210BH-SON01-002.0-003.0 (580-115329-1) was analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The sample was prepared on 06/29/2022 and analyzed on 07/02/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM) - WATER
Sample A3200-WQEB01-2206WK3 (580-115329-2) was analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The sample was prepared on 06/30/2022 and analyzed on 07/01/2022.

The RPD of the laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 580-395472 and analytical batch 580-395622 recovered outside control limits for the following analytes: 1-Methylnaphthalene and 2-Methylnaphthalene.

Job ID: 580-115329-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

The LCS and LCSD recoveries were in control.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS - SOIL

Sample A3210BH-SON01-002.0-003.0 (580-115329-1) was analyzed for diesel range organics in accordance with 8015DRO. The sample was prepared on 06/30/2022 and analyzed on 07/02/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS - WATER

Sample A3200-WQEB01-2206WK3 (580-115329-2) was analyzed for Diesel Range Organics in accordance with 8015D DRO. The sample was prepared on 06/30/2022 and analyzed on 07/05/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Sample A3210BH-SON01-002.0-003.0 (580-115329-1) was analyzed for percent solids in accordance with Method 2540G. The sample was analyzed on 07/01/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115329-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115329-1

Client Sample ID: A3210BH-SON01-002.0-003.0

Lab Sample ID: 580-115329-1
Date Collected: 06/24/22 15:10
Matrix: Solid
Date Received: 06/28/22 09:40
Percent Solids: 61.4

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**0.0057**	**J M**	0.0068	0.00086	mg/Kg	☼	06/29/22 15:18	07/02/22 05:38	1
2-Methylnaphthalene	**0.0066**	**J**	0.0068	0.0028	mg/Kg	☼	06/29/22 15:18	07/02/22 05:38	1
Naphthalene	0.0054	U M	0.0068	0.0022	mg/Kg	☼	06/29/22 15:18	07/02/22 05:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*79*		*40 - 140*	*06/29/22 15:18*	*07/02/22 05:38*	*1*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*	*06/29/22 15:18*	*07/02/22 05:38*	*1*
Terphenyl-d14	*119*		*58 - 132*	*06/29/22 15:18*	*07/02/22 05:38*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	45	U	76	15	mg/Kg	☼	06/30/22 11:53	07/02/22 09:14	1
Motor Oil Range Organics (C24-C40)	45	U	76	30	mg/Kg	☼	06/30/22 11:53	07/02/22 09:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*59*		*45 - 130*	*06/30/22 11:53*	*07/02/22 09:14*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**61.4**		0.1	0.1	%			07/01/22 11:45	1
Percent Moisture	**38.6**		0.1	0.1	%			07/01/22 11:45	1

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115329-1

Client Sample ID: A3200-WQEB01-2206WK3

Lab Sample ID: 580-115329-2

Date Collected: 06/24/22 10:40

Matrix: Water

Date Received: 06/28/22 09:40

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.083	U M Q	0.10	0.034	ug/L		06/30/22 09:15	07/01/22 18:54	1
2-Methylnaphthalene	0.083	U Q	0.21	0.041	ug/L		06/30/22 09:15	07/01/22 18:54	1
Naphthalene	0.42	U M	0.52	0.17	ug/L		06/30/22 09:15	07/01/22 18:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*60*		*40 - 140*	*06/30/22 09:15*	*07/01/22 18:54*	*1*
Fluoranthene-d10 (Surr)	*101*		*40 - 140*	*06/30/22 09:15*	*07/01/22 18:54*	*1*
Terphenyl-d14	*112*		*58 - 132*	*06/30/22 09:15*	*07/01/22 18:54*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	310	U	370	190	ug/L		06/30/22 09:06	07/05/22 16:26	1
Diesel Range Organics (C10-C24)	100	U	120	68	ug/L		06/30/22 09:06	07/05/22 16:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*57*		*56 - 125*	*06/30/22 09:06*	*07/05/22 16:26*	*1*

QC Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115329-1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-395417/1-A
Matrix: Solid
Analysis Batch: 395779

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 395417

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		06/29/22 15:18	07/01/22 22:41	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		06/29/22 15:18	07/01/22 22:41	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		06/29/22 15:18	07/01/22 22:41	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*88*		*40 - 140*	*06/29/22 15:18*	*07/01/22 22:41*	*1*
Fluoranthene-d10 (Surr)	*102*		*40 - 140*	*06/29/22 15:18*	*07/01/22 22:41*	*1*
Terphenyl-d14	*117*		*58 - 132*	*06/29/22 15:18*	*07/01/22 22:41*	*1*

Lab Sample ID: MB 580-395417/1-A
Matrix: Solid
Analysis Batch: 396262

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 395417

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		06/29/22 15:18	07/07/22 19:19	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		06/29/22 15:18	07/07/22 19:19	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		06/29/22 15:18	07/07/22 19:19	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*98*		*40 - 140*	*06/29/22 15:18*	*07/07/22 19:19*	*1*
Fluoranthene-d10 (Surr)	*117*		*40 - 140*	*06/29/22 15:18*	*07/07/22 19:19*	*1*
Terphenyl-d14	*125*	*M*	*58 - 132*	*06/29/22 15:18*	*07/07/22 19:19*	*1*

Lab Sample ID: LCS 580-395417/2-A
Matrix: Solid
Analysis Batch: 395779

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 395417

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.960		mg/Kg		96	43 - 111
2-Methylnaphthalene	1.00	0.951		mg/Kg		95	39 - 114
Naphthalene	1.00	0.920		mg/Kg		92	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*119*		*40 - 140*
Fluoranthene-d10 (Surr)	*102*		*40 - 140*
Terphenyl-d14	*111*		*58 - 132*

Lab Sample ID: MB 580-395472/1-A
Matrix: Water
Analysis Batch: 395622

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 395472

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.080	U M	0.10	0.033	ug/L		06/30/22 09:15	07/01/22 17:15	1
2-Methylnaphthalene	0.080	U M	0.20	0.039	ug/L		06/30/22 09:15	07/01/22 17:15	1
Naphthalene	0.40	U M	0.50	0.16	ug/L		06/30/22 09:15	07/01/22 17:15	1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: MB 580-395472/1-A
Matrix: Water
Analysis Batch: 395622

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 395472

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
2-methylnaphthalene-d10	78		40 - 140	06/30/22 09:15	07/01/22 17:15	1
Fluoranthene-d10 (Surr)	99		40 - 140	06/30/22 09:15	07/01/22 17:15	1
Terphenyl-d14	118		58 - 132	06/30/22 09:15	07/01/22 17:15	1

Lab Sample ID: LCS 580-395472/2-A
Matrix: Water
Analysis Batch: 395622

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 395472

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	4.00	2.91		ug/L		73	41 - 115
2-Methylnaphthalene	4.00	2.84		ug/L		71	39 - 114
Naphthalene	4.00	2.72		ug/L		68	43 - 114

Surrogate	LCS %Recovery	LCS Qualifier	Limits
2-methylnaphthalene-d10	70		40 - 140
Fluoranthene-d10 (Surr)	93		40 - 140
Terphenyl-d14	102		58 - 132

Lab Sample ID: LCSD 580-395472/3-A
Matrix: Water
Analysis Batch: 395622

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 395472

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	4.00	2.31	Q	ug/L		58	41 - 115	23	20
2-Methylnaphthalene	4.00	2.23	Q	ug/L		56	39 - 114	24	20
Naphthalene	4.00	2.24		ug/L		56	43 - 114	20	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
2-methylnaphthalene-d10	60		40 - 140
Fluoranthene-d10 (Surr)	76		40 - 140
Terphenyl-d14	85		58 - 132

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-395462/1-A
Matrix: Water
Analysis Batch: 395630

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 395462

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	300	U	350	180	ug/L		06/30/22 09:06	07/01/22 12:18	1
Diesel Range Organics (C10-C24)	100	U	110	65	ug/L		06/30/22 09:06	07/01/22 12:18	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	65		56 - 125	06/30/22 09:06	07/01/22 12:18	1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: LCS 580-395462/2-A
Matrix: Water
Analysis Batch: 395630

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 395462

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Motor Oil Range Organics (C24-C40)	4000	3570		ug/L		89	41 - 113
Diesel Range Organics (C10-C24)	4000	3200		ug/L		80	36 - 132

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*85*		*56 - 125*

Lab Sample ID: LCSD 580-395462/3-A
Matrix: Water
Analysis Batch: 395630

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 395462

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Motor Oil Range Organics (C24-C40)	4000	3590		ug/L		90	41 - 113	1	20
Diesel Range Organics (C10-C24)	4000	3110		ug/L		78	36 - 132	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*85*		*56 - 125*

Lab Sample ID: MB 580-395492/1-A
Matrix: Solid
Analysis Batch: 395783

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 395492

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		06/30/22 11:53	07/02/22 08:15	1
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		06/30/22 11:53	07/02/22 08:15	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*63*		*45 - 130*	*06/30/22 11:53*	*07/02/22 08:15*	*1*

Lab Sample ID: LCS 580-395492/2-A
Matrix: Solid
Analysis Batch: 395783

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 395492

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Motor Oil Range Organics (C24-C40)	500	483		mg/Kg		97	39 - 106
Diesel Range Organics (C10-C24)	500	452		mg/Kg		90	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*90*		*45 - 130*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: LCSD 580-395492/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 395783 — **Prep Batch: 395492**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Motor Oil Range Organics (C24-C40)			500	492		mg/Kg		98	39 - 106	2	20
Diesel Range Organics (C10-C24)			500	466		mg/Kg		93	75 - 125	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*92*		*45 - 130*

Lab Sample ID: 580-115329-1 MS — **Client Sample ID: A3210BH-SON01-002.0-003.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 395783 — **Prep Batch: 395492**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Motor Oil Range Organics (C24-C40)	45	U	774	707		mg/Kg	☼	91	39 - 106
Diesel Range Organics (C10-C24)	45	U	774	660		mg/Kg	☼	85	75 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*79*		*45 - 130*

Lab Sample ID: 580-115329-1 MSD — **Client Sample ID: A3210BH-SON01-002.0-003.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 395783 — **Prep Batch: 395492**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Motor Oil Range Organics (C24-C40)	45	U	811	725		mg/Kg	☼	89	39 - 106	3	20
Diesel Range Organics (C10-C24)	45	U	811	683		mg/Kg	☼	84	75 - 125	3	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*80*		*45 - 130*

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115329-1

Client Sample ID: A3210BH-SON01-002.0-003.0 — Lab Sample ID: 580-115329-1

Date Collected: 06/24/22 15:10 — **Matrix: Solid**
Date Received: 06/28/22 09:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	395684	NJ	EET SEA	07/01/22 11:45

Client Sample ID: A3210BH-SON01-002.0-003.0 — Lab Sample ID: 580-115329-1

Date Collected: 06/24/22 15:10 — **Matrix: Solid**
Date Received: 06/28/22 09:40 — **Percent Solids: 61.4**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			395417	S1B	EET SEA	06/29/22 15:18
Total/NA	Analysis	8270E SIM		1	395779	TL1	EET SEA	07/02/22 05:38
Total/NA	Prep	3546			395492	TOA	EET SEA	06/30/22 11:53
Total/NA	Analysis	8015D DRO		1	395783	DH	EET SEA	07/02/22 09:14

Client Sample ID: A3200-WQEB01-2206WK3 — Lab Sample ID: 580-115329-2

Date Collected: 06/24/22 10:40 — **Matrix: Water**
Date Received: 06/28/22 09:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3510C			395472	JJY	EET SEA	06/30/22 09:15
Total/NA	Analysis	8270E SIM		1	395622	E1L	EET SEA	07/01/22 18:54
Total/NA	Prep	3510C			395462	JJY	EET SEA	06/30/22 09:06
Total/NA	Analysis	8015D DRO		1	395945	DH	EET SEA	07/05/22 16:26

Laboratory References:
EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115329-1

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115329-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-115329-1	A3210BH-SON01-002.0-003.0	Solid	06/24/22 15:10	06/28/22 09:40
580-115329-2	A3200-WQEB01-2206WK3	Water	06/24/22 10:40	06/28/22 09:40

580-115329 Chain of Custody

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

Client Information	Sampler: (b) (6)	Lab PM: (b) (6)	Carrier Tracking No(s):
Client Contact: (b) (6)	Phone: (b) (6)	E-Mail: (b) (6) @EurofinsET.com	State of Origin:
Company: AECOM-Honolulu	PWSID:		
Address: AECOM-Honolulu	Due Date Requested:		
City: 1001 Bishop Street, ASB Tower, Suite 1600	TAT Requested (days): 4		
State, Zip: Honolulu, Hawaii, 96813	Compliance Project: Δ Yes Δ No		
Phone: (b) (6)	PO #: Purchase Order Requested		
Email: (b) (6) @aecom.com/ (b) (6) @aecom.com	WO #:		
Project Name: Adit 3 Shallow Borings	Project #:		
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:		

COC No.: 01-06272022SIT-SEA
Page
Job #:

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - Di Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab, M=MIS)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3 210 -SON01-002.0-003.0	6/24/22	1510	G	SO	N	N	~~4-40mlVOA~~	1-4ozJar							1	
~~A3 -SON01~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~4-40mlVOA~~	~~1-4ozJar~~								
~~A3 -SON01~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~4-40mlVOA~~	~~1-4ozJar~~								
~~A3 -SOFD01~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~4-40mlVOA~~	~~1-4ozJar~~								
~~A3 -SQTB01-2206WK3~~	~~6/24/22~~		~~G~~	~~SQ~~	N	N	~~2-40mlVOA~~									
~~A3 -WQFB01-2206WK3~~	~~6/24/22~~			~~WQ~~	N	N			~~3-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
A3 200 -WQEB01-2206WK3	6/24/22	1040	G	WQ	N	N			3-40mL	2-250mlAmb	2-250mlAmb				6	
~~A3 -WGN01B-2206WK3~~	~~6/24/22~~			~~WG~~	N	N			~~3-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
~~A3 -WGN01B-2206WK3~~	~~6/24/22~~			~~WG~~	N	N			~~3-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
A3 -WQTB01-2206WK3	6/24/22	1035	—	WQ	N	N			3-40mL						3	

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For _____ Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment
Relinquished by: (b) (6)	Date/Time: 06/24/2022 1652	Company: AECOM	(b) (6) Date/Time: 6/24/22 1652 Company: AECOM
Relinquished by: (b) (6)	Date/Time: 6/27/22 1150	Company: AECOM	Date/Time: 6/28/22 0940 Company: EETN
Relinquished by:	Date/Time:	Company:	Received by: Date/Time: Company:

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Therm. ID: A2 Cor: 2.9 ° Unc: 2.3 °
Cooler Dsc: LG
Packing: Bub
Cust. Seal: Yes ✓ No____
Blue Ice: Wet, Dry, None
FedEx: P.O
UPS:
Lab Cour:
Other:

580-115329 Chain of Custody

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

Client Information

Client Contact: (b) (6) [redacted]
Company: AECOM-Honolulu
Address: AECOM-Honolulu
City: 1001 Bishop Street, ASB Tower, Suite 1600
State, Zip: Honolulu, Hawaii, 96813
Phone: (b) (6) [redacted]
E-mail: (b) (6) [redacted]@aecom.com/ (b) (6) [redacted]@aecom.com
Project Name: Adit 3 Shallow Borings
Site: Red Hill Bulk Fuel Storage Facility

Sampler: (b) (6) [redacted]
Phone: (b) (6) [redacted]
PWSID:
Due Date Requested:
TAT Requested (days): 4
Compliance Project: Δ Yes Δ No
PO #: Purchase Order Requested
WO #:
Project #:
SSOW#:

Lab PM: Elaine Walker
E-Mail: M.Elaine.Walker@EurofinsET.com
Carrier Tracking No(s):
State of Origin:

COC No: 01-06272022.SIT-SEA
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab, M=MIS)	Matrix (WG=Groundwater, SO=soil, PR=product GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3 210 -SON01-002.0-003.0	6/24/22	1510	G	SO	N	N	~~4-40mlVOA~~	1-4ozJar							1	
~~A3 -SON01~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~4-40mlVOA~~	~~1-4ozJar~~								
~~A3 -SON01~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~4-40mlVOA~~	~~1-4ozJar~~								
~~A3 -SOFD01~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~4-40mlVOA~~	~~1-4ozJar~~								
~~A3 -SOTB01-2206WK3~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~2-40mlVOA~~									
~~A3 -WQFB01-2206WK3~~	~~6/24/22~~			~~WQ~~	N	N			~~3-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
A3 200 -WQEB01-2206WK3	6/24/22	1040	G	WQ	N	N			3-40mL	2-250mlAmb	2-250mlAmb				6	
~~A3 -WGN01B-2206WK3~~	~~6/24/22~~			~~WG~~	N	N			~~3-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
~~A3 -WGN01B-2206WK3~~	~~6/24/22~~			~~WG~~	N	N			~~3-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
A3 -WQTB01-2206WK3	6/24/22	1035	—	WQ	N	N			3-40mL						3	

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For ____ Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by: (b) (6) [redacted] Date: Time: Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6) [redacted]	06/24/2022 1652	AECOM	(b) (6) [redacted]	6/24/22 1652	AECOM
(b) (6) [redacted]	6/27/22 1150	AECOM		6/28/22 0940	EETN

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Therm. ID: A2 Cor: 2.9 ° Unc: 2.3 °
Cooler Dsc: LG
Packing: Bub
Cust. Seal: Yes ✓ No
Blue Ice: Wet, Dry, None
FedEx: P.O
UPS:
Lab Courier:
Other:

REVISED

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing Solutions

Client Information

Client Contact: (b) (6)
Company: AECOM-Honolulu
Address: AECOM-Honolulu
City: 1001 Bishop Street, ASB Tower, Suite 1600
State, Zip: Honolulu, Hawaii, 96813
Phone: (b) (6)
Email: (b) (6)@aecom.com/ (b) (6)@aecom.com
Project Name: Adit 3 Shallow Borings
Site: Red Hill Bulk Fuel Storage Facility

Sampler: (b) (6)
Phone: (b) (6)
PWSID:
Due Date Requested:
TAT Requested (days): 4
Compliance Project: Δ Yes Δ No
PO #: Purchase Order Requested
WO #:
Project #:
SSOW#:

Lab PM: (b) (6)
E-Mail: (b) (6)@EurofinsET.com
Carrier Tracking No(s):
State of Origin:

COC No: 01-06272022SIT-SEA
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, M=MIS)	Matrix (W=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-gx, 8260D/5035B (F)	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-gx, SW-846 8260D (A)	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:													
A3 210-SOR01-002.0-003.0	6/24/22	1510	G	SO	N	N	~~4-40mlVOA~~	1-4ozJar							6	
A3 ~~SON01~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~4-40mlVOA~~	~~1-4ozJar~~								
~~A3 SON01~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~4-40mlVOA~~	~~1-4ozJar~~								
A3 ~~SOFD01~~	~~6/24/22~~		~~G~~	~~SO~~	N	N	~~4-40mlVOA~~	~~1-4ozJar~~								
A3 ~~SOTB01-2206WK3~~	(b) (6) 06/29/22		~~G~~	~~SO~~	N	N	~~2-40mlVOA~~									
~~A3 WQFB01-2206WK3~~	~~6/24/22~~			~~WG~~	N	N			~~3-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
A3 200-WQEB01-2206WK3	6/24/22	1040	G	WQ	N	N			~~3-40mL~~	2-250mlAmb	2-250mlAmb				6	
~~A3 WGN01B-2206WK3~~	~~6/24/22~~			~~WG~~	N	N			~~3-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
~~A3 WGN01B-2206WK3~~	~~6/24/22~~			~~WG~~	N	N			~~3-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
~~A3 WGTB01-2206WK3~~	~~6/24/22~~	1035	—	~~WG~~	N	N			~~3-40mL~~						3	

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - Methanol

Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Deliverable Requested: I, II, III, IV, Other (specify)

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For Months ☐

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by: (b) (6) Date: Time: Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6)	06/24/2022 1652	AECOM	(b) (6)	6/24/22 1652	AECOM
Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Relinquished by	Date/Time	Company	Received by	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-115329-1

Login Number: 115329
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-115366-1
Client Project/Site: RH Site Characterization JBPHH N62742-17
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
8/26/2022 5:43:18 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-115366-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-115366-1

REVISION 1: AUGUST 26, 2022
Report revised to remove one of the surrogates from the 8270E SIM analysis, which was not needed. In addition, the collection time for sample was was incorrect and has been changed.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
The samples were received on 06/29/2022; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 1.2 C.

Receipt Exceptions
The following samples appear to have been collected in MeOH jars which have been rinsed out: A3150BH-SON01-000.0-001.0 (580-115366-1) and A3050BH-SON01-004.0-004.0 (580-115366-2)

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)
Samples A3150BH-SON01-000.0-001.0 (580-115366-1) and A3050BH-SON01-004.0-005.0 (580-115366-2) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 06/30/2022 and analyzed on 07/02/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS
Samples A3150BH-SON01-000.0-001.0 (580-115366-1) and A3050BH-SON01-004.0-005.0 (580-115366-2) were analyzed for diesel range organics in accordance with 8015DRO. The samples were prepared on 06/30/2022 and analyzed on 07/02/2022.

Job ID: 580-115366-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Samples A3150BH-SON01-000.0-001.0 (580-115366-1) and A3050BH-SON01-004.0-005.0 (580-115366-2) were analyzed for percent solids in accordance with ASTM D2216. The samples were analyzed on 07/08/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Job ID: 580-115366-1
Project/Site: RH Site Characterization JBPHH N62742-17

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-115366-1

Client Sample ID: A3150BH-SON01-000.0-001.0

Lab Sample ID: 580-115366-1
Date Collected: 06/27/22 10:50
Matrix: Solid
Date Received: 06/29/22 09:45
Percent Solids: 80.4

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.012		0.0058	0.00074	mg/Kg	☼	06/30/22 15:19	07/02/22 22:11	1
2-Methylnaphthalene	0.013		0.0058	0.0024	mg/Kg	☼	06/30/22 15:19	07/02/22 22:11	1
Naphthalene	0.0037	J M	0.0058	0.0019	mg/Kg	☼	06/30/22 15:19	07/02/22 22:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*84*		*40 - 140*	*06/30/22 15:19*	*07/02/22 22:11*	*1*
Fluoranthene-d10 (Surr)	*106*		*40 - 140*	*06/30/22 15:19*	*07/02/22 22:11*	*1*
Terphenyl-d14	*120*		*58 - 132*	*06/30/22 15:19*	*07/02/22 22:11*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	27	J	57	11	mg/Kg	☼	06/30/22 11:53	07/02/22 10:13	1
Motor Oil Range Organics (C24-C40)	130		57	23	mg/Kg	☼	06/30/22 11:53	07/02/22 10:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*63*		*45 - 130*	*06/30/22 11:53*	*07/02/22 10:13*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	80.4		0.1	0.1	%			07/08/22 21:06	1
Percent Moisture	19.6		0.1	0.1	%			07/08/22 21:06	1

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-115366-1

Client Sample ID: A3050BH-SON01-004.0-005.0

Date Collected: 06/27/22 15:29
Date Received: 06/29/22 09:45

Lab Sample ID: 580-115366-2

Matrix: Solid
Percent Solids: 71.5

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**0.14**		0.0067	0.00084	mg/Kg	☼	06/30/22 15:19	07/02/22 23:25	1
2-Methylnaphthalene	**0.10**		0.0067	0.0027	mg/Kg	☼	06/30/22 15:19	07/02/22 23:25	1
Naphthalene	0.0054	U M	0.0067	0.0022	mg/Kg	☼	06/30/22 15:19	07/02/22 23:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*71*	*M*	*40 - 140*	*06/30/22 15:19*	*07/02/22 23:25*	*1*
Fluoranthene-d10 (Surr)	*99*		*40 - 140*	*06/30/22 15:19*	*07/02/22 23:25*	*1*
Terphenyl-d14	*108*		*58 - 132*	*06/30/22 15:19*	*07/02/22 23:25*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**1200**		64	13	mg/Kg	☼	06/30/22 11:53	07/02/22 10:32	1
Motor Oil Range Organics (C24-C40)	38	U	64	26	mg/Kg	☼	06/30/22 11:53	07/02/22 10:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*63*		*45 - 130*	*06/30/22 11:53*	*07/02/22 10:32*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**71.5**		0.1	0.1	%			07/08/22 21:06	1
Percent Moisture	**28.5**		0.1	0.1	%			07/08/22 21:06	1

QC Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-115366-1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-395549/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 395803 — **Prep Batch: 395549**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		06/30/22 15:19	07/02/22 19:15	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		06/30/22 15:19	07/02/22 19:15	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		06/30/22 15:19	07/02/22 19:15	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*95*		*40 - 140*	*06/30/22 15:19*	*07/02/22 19:15*	*1*
Fluoranthene-d10 (Surr)	*109*		*40 - 140*	*06/30/22 15:19*	*07/02/22 19:15*	*1*
Terphenyl-d14	*115*		*58 - 132*	*06/30/22 15:19*	*07/02/22 19:15*	*1*

Lab Sample ID: LCS 580-395549/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 395803 — **Prep Batch: 395549**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.921		mg/Kg		92	43 - 111
2-Methylnaphthalene	1.00	0.941		mg/Kg		94	39 - 114
Naphthalene	1.00	0.933		mg/Kg		93	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*114*		*40 - 140*
Fluoranthene-d10 (Surr)	*91*		*40 - 140*
Terphenyl-d14	*102*		*58 - 132*

Lab Sample ID: 580-115366-1 MS — **Client Sample ID: A3150BH-SON01-000.0-001.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 395803 — **Prep Batch: 395549**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	0.012		1.20	1.31		mg/Kg	☼	108	43 - 111
2-Methylnaphthalene	0.013		1.20	1.23		mg/Kg	☼	101	39 - 114
Naphthalene	0.0037	J M	1.20	1.08		mg/Kg	☼	89	38 - 111

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
2-methylnaphthalene-d10	*113*		*40 - 140*
Fluoranthene-d10 (Surr)	*94*		*40 - 140*
Terphenyl-d14	*102*		*58 - 132*

Lab Sample ID: 580-115366-1 MSD — **Client Sample ID: A3150BH-SON01-000.0-001.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 395803 — **Prep Batch: 395549**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	0.012		1.22	1.16		mg/Kg	☼	94	43 - 111	12	20
2-Methylnaphthalene	0.013		1.22	1.18		mg/Kg	☼	95	39 - 114	4	20
Naphthalene	0.0037	J M	1.22	1.09		mg/Kg	☼	89	38 - 111	1	20

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: 580-115366-1 MSD
Matrix: Solid
Analysis Batch: 395803

Client Sample ID: A3150BH-SON01-000.0-001.0
Prep Type: Total/NA
Prep Batch: 395549

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*111*		*40 - 140*
Fluoranthene-d10 (Surr)	*95*		*40 - 140*
Terphenyl-d14	*104*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-395492/1-A
Matrix: Solid
Analysis Batch: 395783

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 395492

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		06/30/22 11:53	07/02/22 08:15	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		06/30/22 11:53	07/02/22 08:15	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*63*		*45 - 130*	*06/30/22 11:53*	*07/02/22 08:15*	*1*

Lab Sample ID: LCS 580-395492/2-A
Matrix: Solid
Analysis Batch: 395783

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 395492

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)			500	452		mg/Kg		90	75 - 125		
Motor Oil Range Organics (C24-C40)			500	483		mg/Kg		97	39 - 106		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*90*		*45 - 130*

Lab Sample ID: LCSD 580-395492/3-A
Matrix: Solid
Analysis Batch: 395783

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 395492

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			500	466		mg/Kg		93	75 - 125	3	20
Motor Oil Range Organics (C24-C40)			500	492		mg/Kg		98	39 - 106	2	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*92*		*45 - 130*

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-115366-1

Client Sample ID: A3150BH-SON01-000.0-001.0
Lab Sample ID: 580-115366-1
Date Collected: 06/27/22 10:50
Matrix: Solid
Date Received: 06/29/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	396481	JHR	EET SEA	07/08/22 21:06

Client Sample ID: A3150BH-SON01-000.0-001.0
Lab Sample ID: 580-115366-1
Date Collected: 06/27/22 10:50
Matrix: Solid
Date Received: 06/29/22 09:45
Percent Solids: 80.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			395549	TOA	EET SEA	06/30/22 15:19
Total/NA	Analysis	8270E SIM		1	395803	T1L	EET SEA	07/02/22 22:11
Total/NA	Prep	3546			395492	TOA	EET SEA	06/30/22 11:53
Total/NA	Analysis	8015D DRO		1	395783	DH	EET SEA	07/02/22 10:13

Client Sample ID: A3050BH-SON01-004.0-005.0
Lab Sample ID: 580-115366-2
Date Collected: 06/27/22 15:29
Matrix: Solid
Date Received: 06/29/22 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	396481	JHR	EET SEA	07/08/22 21:06

Client Sample ID: A3050BH-SON01-004.0-005.0
Lab Sample ID: 580-115366-2
Date Collected: 06/27/22 15:29
Matrix: Solid
Date Received: 06/29/22 09:45
Percent Solids: 71.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			395549	TOA	EET SEA	06/30/22 15:19
Total/NA	Analysis	8270E SIM		1	395803	T1L	EET SEA	07/02/22 23:25
Total/NA	Prep	3546			395492	TOA	EET SEA	06/30/22 11:53
Total/NA	Analysis	8015D DRO		1	395783	DH	EET SEA	07/02/22 10:32

Laboratory References:
EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-115366-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-115366-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-115366-1	A3150BH-SON01-000.0-001.0	Solid	06/27/22 10:50	06/29/22 09:45
580-115366-2	A3050BH-SON01-004.0-005.0	Solid	06/27/22 15:29	06/29/22 09:45

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

580-115366 Chain of Custody

Chain of Custody Record

eurofins Environment Testing America

Client Information	Sampler: (b) (6)	Lab PM: (b) (6)	Carrier Tracking No(s):	COC No: 01-06282022 SIT-SEA
Client Contact: (b) (6)	Phone: Jeff Hart (b) (6)	E-Mail: (b) (6) @EurofinsET.com	State of Origin:	Page:
Company: AECOM-Honolulu	PWSID:			Job #:
Address: AECOM-Honolulu	Due Date Requested:			
City: 1001 Bishop Street, ASB Tower, Suite 1600	TAT Requested (days): 7			
State, Zip: Honolulu, Hawaii, 96813	Compliance Project: Δ Yes Δ No			
Phone: (b) (6)	PO #: Purchase Order Requested			
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com	WO #:			
Project Name: Adit 3 Shallow LNAPL Characterization	Project #:			
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol, Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, M=MIS)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3 15 OBH SON01-000-0-001.0	6/27/22	1050	G	SO	N	N		1-4ozJar							1	
A3 OSOBH SON01-0040-005.0	6/27/22	1529	G	SO	N	N		1-4ozJar							1	
~~A3 SON01~~	~~6/27/22~~		~~G~~	~~SO~~	N	N		~~1-4ozJar~~								
~~A3 SOFD01~~	~~6/27/22~~		~~G~~	~~SO~~	N	N		~~1-4ozJar~~								
					N	N										
					N	N										
					N	N										
					N	N										
					N	N										
					N	N										

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For ____ Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6)	06/27/2022 1730	AECOM	(b) (6)	6/27/22 1730	AECOM
(b) (6)	6/28/22 1353	AECOM	(b) (6)	6/29/22 945	ETN
	Date/Time:	Company		Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks: A3 1.2/1.1

Md Red/gd /Bub

Fed XPO

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-115366-1

Login Number: 115366
List Number: 1
Creator: Greene, Ashton R

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-115496-1
Client Project/Site: 22F0106
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
8/31/2022 4:57:07 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-115496-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE

Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-115496-1

REVISION 1: AUGUST 31, 2022
Report revised to remove one of the 8270E SIM surrogates that was not required for the method. The client ID for sample 1 was also corrected.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
The samples were received on 07/01/2022; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 1.1 C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)
Sample A3087BH-SON01-004.0-005.0 (580-115496-1) was analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 07/06/2022 and analyzed on 07/07/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS
Sample A3087BH-SON01-004.0-005.0 (580-115496-1) was analyzed for diesel range organics in accordance with 8015DRO. The samples were prepared on 07/05/2022 and analyzed on 07/08/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Job ID: 580-115496-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

Sample A3087BH-SON01-004.0-005.0 (580-115496-1) was analyzed for percent solids in accordance with ASTM D2216. The samples were analyzed on 07/08/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115496-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115496-1

Client Sample ID: A3087BH-SON01-004.0-005.0

Lab Sample ID: 580-115496-1

Date Collected: 06/29/22 10:01
Date Received: 07/01/22 09:35

Matrix: Solid
Percent Solids: 88.3

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0030	J M	0.0055	0.0018	mg/Kg	☼	07/06/22 14:50	07/07/22 04:10	1
2-Methylnaphthalene	0.032		0.0055	0.0023	mg/Kg	☼	07/06/22 14:50	07/07/22 04:10	1
1-Methylnaphthalene	0.027	M	0.0055	0.00070	mg/Kg	☼	07/06/22 14:50	07/07/22 04:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*110*	*M*	*58 - 132*	*07/06/22 14:50*	*07/07/22 04:10*	*1*
2-methylnaphthalene-d10	*87*		*40 - 140*	*07/06/22 14:50*	*07/07/22 04:10*	*1*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*	*07/06/22 14:50*	*07/07/22 04:10*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	46	J	52	10	mg/Kg	☼	07/05/22 14:06	07/08/22 14:17	1
Motor Oil Range Organics (C24-C40)	92		52	21	mg/Kg	☼	07/05/22 14:06	07/08/22 14:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*72*		*45 - 130*	*07/05/22 14:06*	*07/08/22 14:17*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	88.3		0.1	0.1	%			07/08/22 21:06	1
Percent Moisture	11.7		0.1	0.1	%			07/08/22 21:06	1

QC Sample Results

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115496-1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-396117/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396185 — **Prep Batch: 396117**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		07/06/22 14:50	07/07/22 00:37	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		07/06/22 14:50	07/07/22 00:37	1
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		07/06/22 14:50	07/07/22 00:37	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*119*		*58 - 132*	*07/06/22 14:50*	*07/07/22 00:37*	*1*
2-methylnaphthalene-d10	*89*		*40 - 140*	*07/06/22 14:50*	*07/07/22 00:37*	*1*
Fluoranthene-d10 (Surr)	*101*		*40 - 140*	*07/06/22 14:50*	*07/07/22 00:37*	*1*

Lab Sample ID: LCS 580-396117/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396185 — **Prep Batch: 396117**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Naphthalene	1.00	1.01		mg/Kg		101	38 - 111
2-Methylnaphthalene	1.00	1.05		mg/Kg		105	39 - 114
1-Methylnaphthalene	1.00	1.09		mg/Kg		109	43 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Terphenyl-d14	*122*		*58 - 132*
2-methylnaphthalene-d10	*89*		*40 - 140*
Fluoranthene-d10 (Surr)	*102*		*40 - 140*

Lab Sample ID: 580-115496-1 MS — **Client Sample ID: A3087BH-SON01-004.0-005.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396185 — **Prep Batch: 396117**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Naphthalene	0.0030	J M	1.11	1.12		mg/Kg	☼	101	38 - 111
2-Methylnaphthalene	0.032		1.11	1.21		mg/Kg	☼	106	39 - 114
1-Methylnaphthalene	0.027	M	1.11	1.25		mg/Kg	☼	109	43 - 111

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Terphenyl-d14	*117*		*58 - 132*
2-methylnaphthalene-d10	*91*		*40 - 140*
Fluoranthene-d10 (Surr)	*99*		*40 - 140*

Lab Sample ID: 580-115496-1 MSD — **Client Sample ID: A3087BH-SON01-004.0-005.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396185 — **Prep Batch: 396117**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Naphthalene	0.0030	J M	1.08	1.03		mg/Kg	☼	95	38 - 111	9	20
2-Methylnaphthalene	0.032		1.08	1.10		mg/Kg	☼	99	39 - 114	9	20
1-Methylnaphthalene	0.027	M	1.08	1.11		mg/Kg	☼	101	43 - 111	11	20

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: 580-115496-1 MSD
Matrix: Solid
Analysis Batch: 396185

Client Sample ID: A3087BH-SON01-004.0-005.0
Prep Type: Total/NA
Prep Batch: 396117

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Terphenyl-d14	*112*		*58 - 132*
2-methylnaphthalene-d10	*90*		*40 - 140*
Fluoranthene-d10 (Surr)	*95*		*40 - 140*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-395966/1-A
Matrix: Solid
Analysis Batch: 396348

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 395966

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		07/05/22 14:01	07/08/22 04:52	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		07/05/22 14:01	07/08/22 04:52	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*73*		*45 - 130*	*07/05/22 14:01*	*07/08/22 04:52*	*1*

Lab Sample ID: LCS 580-395966/2-A
Matrix: Solid
Analysis Batch: 396348

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 395966

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)			500	441		mg/Kg		88	75 - 125		
Motor Oil Range Organics (C24-C40)			500	449		mg/Kg		90	39 - 106		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*92*		*45 - 130*

Lab Sample ID: LCSD 580-395966/3-A
Matrix: Solid
Analysis Batch: 396348

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 395966

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			500	440		mg/Kg		88	75 - 125	0	20
Motor Oil Range Organics (C24-C40)			500	449		mg/Kg		90	39 - 106	0	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*92*		*45 - 130*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: 580-115496-1 MS — **Client Sample ID: A3087BH-SON01-004.0-005.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396348 — **Prep Batch: 395966**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	46	J	546	525		mg/Kg	☼	88	75 - 125
Motor Oil Range Organics (C24-C40)	92		546	595		mg/Kg	☼	92	39 - 106

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*85*	*M*	*45 - 130*

Lab Sample ID: 580-115496-1 MSD — **Client Sample ID: A3087BH-SON01-004.0-005.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396348 — **Prep Batch: 395966**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	46	J	530	503		mg/Kg	☼	86	75 - 125	4	20
Motor Oil Range Organics (C24-C40)	92		530	570		mg/Kg	☼	90	39 - 106	4	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*88*		*45 - 130*

Lab Chronicle

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115496-1

Client Sample ID: A3087BH-SON01-004.0-005.0

Lab Sample ID: 580-115496-1
Date Collected: 06/29/22 10:01
Matrix: Solid
Date Received: 07/01/22 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	396481	JHR	EET SEA	07/08/22 21:06

Client Sample ID: A3087BH-SON01-004.0-005.0

Lab Sample ID: 580-115496-1
Date Collected: 06/29/22 10:01
Matrix: Solid
Date Received: 07/01/22 09:35
Percent Solids: 88.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			396117	TOA	EET SEA	07/06/22 14:50
Total/NA	Analysis	8270E SIM		1	396185	E1L	EET SEA	07/07/22 04:10
Total/NA	Prep	3546			395966	TOA	EET SEA	07/05/22 14:06
Total/NA	Analysis	8015D DRO		1	396348	Y1F	EET SEA	07/08/22 14:17

Laboratory References:

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115496-1

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: 22F0106

Job ID: 580-115496-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-115496-1	A3087BH-SON01-004.0-005.0	Solid	06/29/22 10:01	07/01/22 09:35

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

Client Information

Client Contact: (b) (6) [redacted]
Company: AECOM-Honolulu
Address: AECOM-Honolulu
City: 1001 Bishop Street, ASB Tower, Suite 1600
State, Zip: Honolulu, Hawaii, 96813
Phone: (b) (6) [redacted]
Email: (b) (6) [redacted]@aecom.com/ (b) (6) [redacted]@aecom.com
Project Name: Adit 3 Shallow LNAPL Site Characterization
Site: Red Hill Bulk Fuel Storage Facility

Sampler: (b) (6) [redacted]
Phone: Jeff Hart (b) (6) [redacted]
PWSID:
Due Date Requested:
TAT Requested (days): 7
Compliance Project: Δ Yes Δ No
PO #: Purchase Order Requested
WO #:
Project #:
SSOW#:

Lab PM: (b) (6) [redacted]
E-Mail: (b) (6) [redacted]@EurofinsET.com
Carrier Tracking No(s):
State of Origin:

COC No: 01-06302022SIT-SEA
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab, M=MIS)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3 ~~08704~~ SON01 ~~0210-0050~~	~~6/30/22~~ 6/29	1001	G	SO	N	N		1-4ozJar							1	
~~A3 SON01~~	~~6/29/22~~		~~G~~	~~SO~~	N	N		~~1-4ozJar~~								
~~A3 SOED01~~	~~6/29/22~~		~~G~~	~~SO~~	N	N		~~1-4oz Jar~~								
					N	N										
					N	N										
					N	N	(b) (6) [redacted] 6/29/2022									
					N	N										
					N	N										
					N	N										
					N	N										

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Therm. ID: A3 Cor: 1.1 Unc: 1.0
Cooler Dsc: MR
Packing: Bub
Cust. Seal: Yes ___ No ___
Blue Ice, Wet, Dry, None
FedEx: P.O
UPS:
Lab Cour:
Other:

580-115496 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ___ Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by: Date: Time: Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6) [redacted]	06/29/2022 1635 ~~1619~~	AECOM	(b) (6) [redacted]	06/29/2022 1627	AECOM
(b) (6) [redacted]	06/30/2022 1220	AECOM	(b) (6) [redacted]	07/1/22 0935	EETN

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-115496-1

Login Number: 115496

List Source: Eurofins Seattle

List Number: 1

Creator: [redacted] (b) (6)

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-115521-1
Client Project/Site: RH Site Characterization JBPHH N62742-17

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
7/13/2022 1:07:22 PM
[redacted], Client Service Manager
[redacted]
[redacted]@et.eurofinsus.com

Designee for

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

Review your project results through my EOL

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-115521-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE

Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-115521-1

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
The samples were received on 07/02/2022; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 0.9 C.

The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): PS095BH-SON01-003.0-004.0 (580-115521-1). The container labels list PS-095BH-SFD01-003.0-004.0, while the COC lists PS-095BH-SON01-003.0-004.0. The ID on the COC was used for login.

Sample appears to be collected in rinsed out MeOH jars: PS095BH-SON01-003.0-004.0 (580-115521-1).

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)
Samples PS095BH-SON01-003.0-004.0 (580-115521-1) and A3-050BH-SON01-004.0-004.0 (580-115521-2) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 07/06/2022 and analyzed on 07/07/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS
Samples PS095BH-SON01-003.0-004.0 (580-115521-1) and A3-050BH-SON01-004.0-004.0 (580-115521-2) were analyzed for diesel range organics in accordance with 8015DRO. The samples were prepared on 07/06/2022 and analyzed on 07/08/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 580-115521-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

PERCENT SOLIDS

Samples PS095BH-SON01-003.0-004.0 (580-115521-1) and A3-050BH-SON01-004.0-004.0 (580-115521-2) were analyzed for percent solids in accordance with ASTM D2216. The samples were analyzed on 07/08/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Job ID: 580-115521-1
Project/Site: RH Site Characterization JBPHH N62742-17

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-115521-1

Client Sample ID: PS095BH-SON01-003.0-004.0

Lab Sample ID: 580-115521-1

Date Collected: 06/30/22 09:53
Date Received: 07/02/22 13:36

Matrix: Solid
Percent Solids: 85.0

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0017	U M	0.0056	0.00071	mg/Kg	☼	07/06/22 14:50	07/07/22 05:09	1
2-Methylnaphthalene	0.0034	U M	0.0056	0.0023	mg/Kg	☼	07/06/22 14:50	07/07/22 05:09	1
Naphthalene	0.0045	U	0.0056	0.0018	mg/Kg	☼	07/06/22 14:50	07/07/22 05:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*46*	*M*	*28 - 143*	*07/06/22 14:50*	*07/07/22 05:09*	*1*
2-methylnaphthalene-d10	*91*		*40 - 140*	*07/06/22 14:50*	*07/07/22 05:09*	*1*
Fluoranthene-d10 (Surr)	*105*		*40 - 140*	*07/06/22 14:50*	*07/07/22 05:09*	*1*
Terphenyl-d14	*123*		*58 - 132*	*07/06/22 14:50*	*07/07/22 05:09*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	32	U	53	11	mg/Kg	☼	07/06/22 15:46	07/08/22 17:03	1
Motor Oil Range Organics (C24-C40)	32	U	53	21	mg/Kg	☼	07/06/22 15:46	07/08/22 17:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*69*		*45 - 130*	*07/06/22 15:46*	*07/08/22 17:03*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**85.0**		0.1	0.1	%			07/08/22 21:06	1
Percent Moisture	**15.0**		0.1	0.1	%			07/08/22 21:06	1

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-115521-1

Client Sample ID: A3-050BH-SON01-004.0-004.0

Lab Sample ID: 580-115521-2

Date Collected: 06/30/22 14:28
Date Received: 07/02/22 13:36

Matrix: Solid
Percent Solids: 90.4

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.82		0.0052	0.00066	mg/Kg	☼	07/06/22 14:50	07/07/22 05:28	1
2-Methylnaphthalene	1.0		0.0052	0.0021	mg/Kg	☼	07/06/22 14:50	07/07/22 05:28	1
Naphthalene	0.28		0.0052	0.0017	mg/Kg	☼	07/06/22 14:50	07/07/22 05:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*93*		*28 - 143*	*07/06/22 14:50*	*07/07/22 05:28*	*1*
2-methylnaphthalene-d10	*87*		*40 - 140*	*07/06/22 14:50*	*07/07/22 05:28*	*1*
Fluoranthene-d10 (Surr)	*96*		*40 - 140*	*07/06/22 14:50*	*07/07/22 05:28*	*1*
Terphenyl-d14	*113*		*58 - 132*	*07/06/22 14:50*	*07/07/22 05:28*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	270		55	11	mg/Kg	☼	07/06/22 15:46	07/08/22 16:44	1
Motor Oil Range Organics (C24-C40)	33	U	55	22	mg/Kg	☼	07/06/22 15:46	07/08/22 16:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*64*		*45 - 130*	*07/06/22 15:46*	*07/08/22 16:44*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	90.4		0.1	0.1	%			07/08/22 21:06	1
Percent Moisture	9.6		0.1	0.1	%			07/08/22 21:06	1

QC Sample Results

Client: AECOM
Job ID: 580-115521-1
Project/Site: RH Site Characterization JBPHH N62742-17

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-396117/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396185 — **Prep Batch: 396117**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		07/06/22 14:50	07/07/22 00:37	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		07/06/22 14:50	07/07/22 00:37	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		07/06/22 14:50	07/07/22 00:37	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*95*		*28 - 143*	*07/06/22 14:50*	*07/07/22 00:37*	*1*
2-methylnaphthalene-d10	*89*		*40 - 140*	*07/06/22 14:50*	*07/07/22 00:37*	*1*
Fluoranthene-d10 (Surr)	*101*		*40 - 140*	*07/06/22 14:50*	*07/07/22 00:37*	*1*
Terphenyl-d14	*119*		*58 - 132*	*07/06/22 14:50*	*07/07/22 00:37*	*1*

Lab Sample ID: LCS 580-396117/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396185 — **Prep Batch: 396117**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	1.09		mg/Kg		109	43 - 111
2-Methylnaphthalene	1.00	1.05		mg/Kg		105	39 - 114
Naphthalene	1.00	1.01		mg/Kg		101	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol	*119*	*M*	*28 - 143*
2-methylnaphthalene-d10	*89*		*40 - 140*
Fluoranthene-d10 (Surr)	*102*		*40 - 140*
Terphenyl-d14	*122*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-396153/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396352 — **Prep Batch: 396153**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		07/06/22 15:46	07/08/22 15:46	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		07/06/22 15:46	07/08/22 15:46	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*69*		*45 - 130*	*07/06/22 15:46*	*07/08/22 15:46*	*1*

Lab Sample ID: LCS 580-396153/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 396352 — **Prep Batch: 396153**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	500	491		mg/Kg		98	75 - 125
Motor Oil Range Organics (C24-C40)	500	513		mg/Kg		103	39 - 106

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: LCS 580-396153/2-A
Matrix: Solid
Analysis Batch: 396352

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 396153

Surrogate	LCS %Recovery	LCS Qualifier	Limits
o-Terphenyl	98		45 - 130

Lab Sample ID: LCSD 580-396153/3-A
Matrix: Solid
Analysis Batch: 396352

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 396153

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			500	500		mg/Kg		100	75 - 125	2	20
Motor Oil Range Organics (C24-C40)			500	518		mg/Kg		104	39 - 106	1	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
o-Terphenyl	98		45 - 130

Lab Sample ID: 580-115521-1 MS
Matrix: Solid
Analysis Batch: 396352

Client Sample ID: PS095BH-SON01-003.0-004.0
Prep Type: Total/NA
Prep Batch: 396153

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)	32	U	564	572		mg/Kg	☼	102	75 - 125		
Motor Oil Range Organics (C24-C40)	32	U	564	578		mg/Kg	☼	103	39 - 106		

Surrogate	MS %Recovery	MS Qualifier	Limits
o-Terphenyl	97		45 - 130

Lab Sample ID: 580-115521-1 MSD
Matrix: Solid
Analysis Batch: 396352

Client Sample ID: PS095BH-SON01-003.0-004.0
Prep Type: Total/NA
Prep Batch: 396153

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	32	U	562	556		mg/Kg	☼	99	75 - 125	3	20
Motor Oil Range Organics (C24-C40)	32	U	562	565		mg/Kg	☼	101	39 - 106	2	20

Surrogate	MSD %Recovery	MSD Qualifier	Limits
o-Terphenyl	95		45 - 130

Lab Chronicle

Client: AECOM
Job ID: 580-115521-1
Project/Site: RH Site Characterization JBPHH N62742-17

Client Sample ID: PS095BH-SON01-003.0-004.0
Lab Sample ID: 580-115521-1

Date Collected: 06/30/22 09:53
Matrix: Solid
Date Received: 07/02/22 13:36

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1	396481	07/08/22 21:06	JHR	FGS SEA

Client Sample ID: PS095BH-SON01-003.0-004.0
Lab Sample ID: 580-115521-1

Date Collected: 06/30/22 09:53
Matrix: Solid
Date Received: 07/02/22 13:36
Percent Solids: 85.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3546			396117	07/06/22 14:50	TOA	FGS SEA
Total/NA	Analysis	8270E SIM		1	396185	07/07/22 05:09	E1L	FGS SEA
Total/NA	Prep	3546			396153	07/06/22 15:46	S1B	FGS SEA
Total/NA	Analysis	8015D DRO		1	396352	07/08/22 17:03	Y1F	FGS SEA

Client Sample ID: A3-050BH-SON01-004.0-004.0
Lab Sample ID: 580-115521-2

Date Collected: 06/30/22 14:28
Matrix: Solid
Date Received: 07/02/22 13:36

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1	396481	07/08/22 21:06	JHR	FGS SEA

Client Sample ID: A3-050BH-SON01-004.0-004.0
Lab Sample ID: 580-115521-2

Date Collected: 06/30/22 14:28
Matrix: Solid
Date Received: 07/02/22 13:36
Percent Solids: 90.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3546			396117	07/06/22 14:50	TOA	FGS SEA
Total/NA	Analysis	8270E SIM		1	396185	07/07/22 05:28	E1L	FGS SEA
Total/NA	Prep	3546			396153	07/06/22 15:46	S1B	FGS SEA
Total/NA	Analysis	8015D DRO		1	396352	07/08/22 16:44	Y1F	FGS SEA

Laboratory References:

FGS SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-115521-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-115521-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-115521-1	PS095BH-SON01-003.0-004.0	Solid	06/30/22 09:53	07/02/22 13:36
580-115521-2	A3-050BH-SON01-004.0-004.0	Solid	06/30/22 14:28	07/02/22 13:36

580-115521 Chain of Custody

Chain of Custody Record

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

eurofins Environment Testing America

01-07012022SIT-SEA

Client Information	Sampler: (b) (6)	Lab PM: (b) (6)	Carrier Tracking No(s):
Client Contact: (b) (6)	Phone: Jeff Hart (b) (6)	E-Mail: (b) (6) @EurofinsET.com	State of Origin:
Company: AECOM-Honolulu	PWSID:		
Address: AECOM-Honolulu	Due Date Requested:		
City: 1001 Bishop Street, ASB Tower, Suite 1600	TAT Requested (days): 7		
State, Zip: Honolulu, Hawaii, 96813	Compliance Project: Δ Yes Δ No		
Phone: (b) (6)	PO #: Purchase Order Requested		
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com	WO #:		
Project Name: Adit 3 Shallow LNAPL Site Characterization	Project #:		
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:		

COC No: ~~01-06~~
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab, M=MIS)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
~~PS095BH~~ -SON01-003.0-004.0	6/30/22	0953	G	SO	N	N		1-4ozJar							1	ID:PS095BH-SON01-003.0-004.0
A3-050BH-SON01-004.0-004.0	6/30/22	1428	G	SO	N	N		1-4ozJar							1	
~~A3 SOFD01~~	~~6/30/22~~		~~G~~	~~SO~~	N	N		~~1-4ozJar~~								
					N	N										
					N	N										
					N	N										
					N	N	(b) (6)	06/30/2022								
					N	N										
					N	N										
					N	N										

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Z - Methanol
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For _____ Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6)	06/30/2022 1623	AECOM	(b) (6)	6/30/22 1623	AECOM
(b) (6)	~~6/30/22~~ 7/1 1320	AECOM	(b) (6)	7/2/22 1000	ET/N
(b) (6)					

Custody Seals Intact:	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:
Δ Yes Δ No		13 0.9/0.8

FedexPO
MdRed/gel/Bub

7/13/2022

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-115521-1

Login Number: 115521

List Source: Eurofins Seattle

List Number: 1

Creator: [redacted]

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	IDs on containers do not match the COC. Logged in per COC.
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-116547-1
Client Project/Site: RH Site Characterization JBPHH N62742-17
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/12/2022 9:40:07 AM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

Review your project results through my EOL

Have a Question? Ask The Expert

Visit us at: www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-116547-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-116547-1

REVISION 2: SEPTEMBER 12, 2022
Report revised to remove one of the 8270E SIM surrogates that was not needed.

REVISION 1: AUGUST 23, 2022
Report revised because the 8270E SIM samples required re-extraction and reanalysis due to methold blank contamination, with hits in the associated samples.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
Three samples were received on 8/3/2022 9:20 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 5.4º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)
Samples A3-100BH-SON01-003.0--004.0 (580-116547-1), A3-150BH-SON01-001.0-002.0 (580-116547-2) and A3-200BH-SON01-004.0-005.0 (580-116547-3) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 08/08/2022 and analyzed on 08/09/2022.

1-Methylnaphthalene, 2-Methylnaphthalene and Naphthalene were detected in method blank MB 580-399776/1-A at levels that were above the method detection limit and/or the reporting limit. The values should be considered estimates. Samples A3-100BH-SON01-003.0--004.0MS (580-116547-1) and A3-150BH-SON01-001.0-002.0 (580-116547-2) contained 1-Methylnaphthalene and 2-Methylnaphthalene greater than 10X the value found in the method blank. Sample A3-150BH-SON01-001.0-002.0 (580-116547-2) was ND for Naphthalene. Sample A3-200BH-SON01-004.0-005.0 (580-116547-3) contained 2-Methylnaphthalene at a concentration that was greater than 1/2 the reporting limit. The associated samples and method blank have been reanalyzed and both sets of data have

Job ID: 580-116547-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

been reported.

1-Methylnaphthalene, 2-Methylnaphthalene and Naphthalene failed the recovery criteria low for the MS of sample A3-100BH-SON01-003.0--004.0MS (580-116547-1) in batch 580-399912. 1-Methylnaphthalene, 2-Methylnaphthalene and Naphthalene failed the recovery criteria low for the MSD of sample A3-100BH-SON01-003.0--004.0MSD (580-116547-1) in batch 580-399912. The associated LCS was in control.

The presence of the '4' qualifier indicates analytes where the concentration in the unspiked sample exceeded four times the spiking amount.

The following samples were diluted to bring the concentration of target analytes within the calibration range: A3-100BH-SON01-003.0--004.0 (580-116547-1), A3-100BH-SON01-003.0--004.0 MS (580-116547-1 MS), and A3-100BH-SON01-003.0--004.0 MSD (580-116547-1 MSD). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS

Samples A3-100BH-SON01-003.0--004.0 (580-116547-1), A3-150BH-SON01-001.0-002.0 (580-116547-2) and A3-200BH-SON01-004.0-005.0 (580-116547-3) were analyzed for diesel range organics in accordance with 8015DRO. The samples were prepared on 08/08/2022 and analyzed on 08/09/2022.

Diesel Range Organics (C10-C24) failed the recovery criteria low for the MS of sample A3-100BH-SON01-003.0--004.0MS (580-116547-1) in batch 580-399956. Diesel Range Organics (C10-C24) failed the recovery criteria low for the MSD of sample A3-100BH-SON01-003.0--004.0MSD (580-116547-1) in batch 580-399956. The associated LCS and LCSD were in control.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Samples A3-100BH-SON01-003.0--004.0 (580-116547-1), A3-150BH-SON01-001.0-002.0 (580-116547-2) and A3-200BH-SON01-004.0-005.0 (580-116547-3) were analyzed for percent solids in accordance with ASTM D2216. The samples were analyzed on 08/05/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Job ID: 580-116547-1
Project/Site: RH Site Characterization JBPHH N62742-17

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
B	Blank contamination: The analyte was detected above one-half the reporting limit in an associated blank.
D	The reported value is from a dilution.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116547-1

Client Sample ID: A3-100BH-SON01-003.0--004.0

Lab Sample ID: 580-116547-1
Date Collected: 07/29/22 10:14
Matrix: Solid
Date Received: 08/03/22 09:20
Percent Solids: 77.3

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	19	D B J1	0.060	0.0075	mg/Kg	☼	08/08/22 11:52	08/09/22 17:31	10
2-Methylnaphthalene	27	D B J1	0.060	0.024	mg/Kg	☼	08/08/22 11:52	08/09/22 17:31	10
Naphthalene	11	D B J1	0.060	0.019	mg/Kg	☼	08/08/22 11:52	08/09/22 17:31	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*119*		*40 - 140*	*08/08/22 11:52*	*08/09/22 17:31*	*10*
Fluoranthene-d10 (Surr)	*96*		*40 - 140*	*08/08/22 11:52*	*08/09/22 17:31*	*10*
Terphenyl-d14	*104*		*58 - 132*	*08/08/22 11:52*	*08/09/22 17:31*	*10*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) - RA

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	12		0.0060	0.00076	mg/Kg	☼	08/12/22 19:41	08/14/22 05:23	1
Naphthalene	6.8		0.0060	0.0020	mg/Kg	☼	08/12/22 19:41	08/14/22 05:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*83*		*40 - 140*	*08/12/22 19:41*	*08/14/22 05:23*	*1*
Fluoranthene-d10 (Surr)	*94*		*40 - 140*	*08/12/22 19:41*	*08/14/22 05:23*	*1*
Terphenyl-d14	*110*		*58 - 132*	*08/12/22 19:41*	*08/14/22 05:23*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) - RE

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
2-Methylnaphthalene	28	D	0.060	0.025	mg/Kg	☼	08/12/22 19:41	08/18/22 00:25	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*101*		*40 - 140*	*08/12/22 19:41*	*08/18/22 00:25*	*10*
Fluoranthene-d10 (Surr)	*90*		*40 - 140*	*08/12/22 19:41*	*08/18/22 00:25*	*10*
Terphenyl-d14	*109*		*58 - 132*	*08/12/22 19:41*	*08/18/22 00:25*	*10*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	6400	J1	64	13	mg/Kg	☼	08/08/22 11:58	08/09/22 19:19	1
Motor Oil Range Organics (C24-C40)	26	J	64	26	mg/Kg	☼	08/08/22 11:58	08/09/22 19:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*77*		*45 - 130*	*08/08/22 11:58*	*08/09/22 19:19*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77.3		0.1	0.1	%			08/05/22 15:25	1
Percent Moisture	22.7		0.1	0.1	%			08/05/22 15:25	1

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116547-1

Client Sample ID: A3-150BH-SON01-001.0-002.0

Date Collected: 07/29/22 14:08
Date Received: 08/03/22 09:20

Lab Sample ID: 580-116547-2

Matrix: Solid
Percent Solids: 77.9

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.062	B	0.0052	0.00066	mg/Kg	☼	08/08/22 11:52	08/09/22 17:06	1
2-Methylnaphthalene	0.049	B	0.0052	0.0021	mg/Kg	☼	08/08/22 11:52	08/09/22 17:06	1
Naphthalene	0.0042	U M	0.0052	0.0017	mg/Kg	☼	08/08/22 11:52	08/09/22 17:06	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*90*		*40 - 140*	*08/08/22 11:52*	*08/09/22 17:06*	*1*
Fluoranthene-d10 (Surr)	*107*		*40 - 140*	*08/08/22 11:52*	*08/09/22 17:06*	*1*
Terphenyl-d14	*120*		*58 - 132*	*08/08/22 11:52*	*08/09/22 17:06*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) - RA

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.053	M	0.0061	0.00077	mg/Kg	☼	08/12/22 19:41	08/14/22 05:47	1
2-Methylnaphthalene	0.041	M	0.0061	0.0025	mg/Kg	☼	08/12/22 19:41	08/14/22 05:47	1
Naphthalene	0.0049	U	0.0061	0.0020	mg/Kg	☼	08/12/22 19:41	08/14/22 05:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*80*		*40 - 140*	*08/12/22 19:41*	*08/14/22 05:47*	*1*
Fluoranthene-d10 (Surr)	*99*		*40 - 140*	*08/12/22 19:41*	*08/14/22 05:47*	*1*
Terphenyl-d14	*115*		*58 - 132*	*08/12/22 19:41*	*08/14/22 05:47*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	84		61	12	mg/Kg	☼	08/08/22 11:58	08/09/22 20:20	1
Motor Oil Range Organics (C24-C40)	36	U	61	24	mg/Kg	☼	08/08/22 11:58	08/09/22 20:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*71*		*45 - 130*	*08/08/22 11:58*	*08/09/22 20:20*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77.9		0.1	0.1	%			08/05/22 15:25	1
Percent Moisture	22.1		0.1	0.1	%			08/05/22 15:25	1

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116547-1

Client Sample ID: A3-200BH-SON01-004.0-005.0

Lab Sample ID: 580-116547-3

Date Collected: 08/01/22 09:47
Date Received: 08/03/22 09:20

Matrix: Solid
Percent Solids: 88.9

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**0.0022**	**J B**	0.0049	0.00062	mg/Kg	☼	08/08/22 11:52	08/09/22 15:25	1
2-Methylnaphthalene	**0.0033**	**J B**	0.0049	0.0020	mg/Kg	☼	08/08/22 11:52	08/09/22 15:25	1
Naphthalene	**0.0022**	**J B M**	0.0049	0.0016	mg/Kg	☼	08/08/22 11:52	08/09/22 15:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*89*		*40 - 140*	*08/08/22 11:52*	*08/09/22 15:25*	*1*
Fluoranthene-d10 (Surr)	*114*	*M*	*40 - 140*	*08/08/22 11:52*	*08/09/22 15:25*	*1*
Terphenyl-d14	*124*	*M*	*58 - 132*	*08/08/22 11:52*	*08/09/22 15:25*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) - RA

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0017	U	0.0056	0.00071	mg/Kg	☼	08/12/22 19:41	08/14/22 07:25	1
2-Methylnaphthalene	0.0034	U	0.0056	0.0023	mg/Kg	☼	08/12/22 19:41	08/14/22 07:25	1
Naphthalene	0.0045	U M	0.0056	0.0018	mg/Kg	☼	08/12/22 19:41	08/14/22 07:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*85*		*40 - 140*	*08/12/22 19:41*	*08/14/22 07:25*	*1*
Fluoranthene-d10 (Surr)	*105*		*40 - 140*	*08/12/22 19:41*	*08/14/22 07:25*	*1*
Terphenyl-d14	*120*		*58 - 132*	*08/12/22 19:41*	*08/14/22 07:25*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**10**	**J**	49	9.7	mg/Kg	☼	08/08/22 11:58	08/09/22 20:40	1
Motor Oil Range Organics (C24-C40)	29	U	49	20	mg/Kg	☼	08/08/22 11:58	08/09/22 20:40	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*65*		*45 - 130*	*08/08/22 11:58*	*08/09/22 20:40*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**88.9**		0.1	0.1	%			08/05/22 15:25	1
Percent Moisture	**11.1**		0.1	0.1	%			08/05/22 15:25	1

QC Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116547-1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-399776/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 399912 — **Prep Batch: 399776**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.00259	J	0.0050	0.00063	mg/Kg		08/08/22 11:52	08/09/22 14:35	1
2-Methylnaphthalene	0.00393	J	0.0050	0.0021	mg/Kg		08/08/22 11:52	08/09/22 14:35	1
Naphthalene	0.00314	J M	0.0050	0.0016	mg/Kg		08/08/22 11:52	08/09/22 14:35	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*91*		*40 - 140*	*08/08/22 11:52*	*08/09/22 14:35*	*1*
Fluoranthene-d10 (Surr)	*109*		*40 - 140*	*08/08/22 11:52*	*08/09/22 14:35*	*1*
Terphenyl-d14	*121*		*58 - 132*	*08/08/22 11:52*	*08/09/22 14:35*	*1*

Lab Sample ID: LCS 580-399776/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 399912 — **Prep Batch: 399776**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	1.01		mg/Kg		101	43 - 111
2-Methylnaphthalene	1.00	1.01		mg/Kg		101	39 - 114
Naphthalene	1.00	0.901		mg/Kg		90	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*132*		*40 - 140*
Fluoranthene-d10 (Surr)	*108*		*40 - 140*
Terphenyl-d14	*115*		*58 - 132*

Lab Sample ID: 580-116547-1 MS — **Client Sample ID: A3-100BH-SON01-003.0--004.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 399912 — **Prep Batch: 399776**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	19	D B J1	1.20	17.8	D 4	mg/Kg	☼	-120	43 - 111
2-Methylnaphthalene	27	D B J1	1.20	25.7	D 4	mg/Kg	☼	-108	39 - 114
Naphthalene	11	D B J1	1.20	10.3	D 4	mg/Kg	☼	-17	38 - 111

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
2-methylnaphthalene-d10	*100*		*40 - 140*
Fluoranthene-d10 (Surr)	*92*		*40 - 140*
Terphenyl-d14	*96*		*58 - 132*

Lab Sample ID: 580-116547-1 MSD — **Client Sample ID: A3-100BH-SON01-003.0--004.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 399912 — **Prep Batch: 399776**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	19	D B J1	1.25	17.9	D 4	mg/Kg	☼	-105	43 - 111	1	20
2-Methylnaphthalene	27	D B J1	1.25	25.3	D 4	mg/Kg	☼	-138	39 - 114	2	20
Naphthalene	11	D B J1	1.25	10.3	D 4	mg/Kg	☼	-17	38 - 111	0	20

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: 580-116547-1 MSD
Matrix: Solid
Analysis Batch: 399912

Client Sample ID: A3-100BH-SON01-003.0--004.0
Prep Type: Total/NA
Prep Batch: 399776

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*95*		*40 - 140*
Fluoranthene-d10 (Surr)	*99*		*40 - 140*
Terphenyl-d14	*110*		*58 - 132*

Lab Sample ID: MB 580-400460/1-A
Matrix: Solid
Analysis Batch: 400498

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 400460

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		08/12/22 19:41	08/14/22 00:25	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		08/12/22 19:41	08/14/22 00:25	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		08/12/22 19:41	08/14/22 00:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*84*		*40 - 140*	*08/12/22 19:41*	*08/14/22 00:25*	*1*
Fluoranthene-d10 (Surr)	*102*		*40 - 140*	*08/12/22 19:41*	*08/14/22 00:25*	*1*
Terphenyl-d14	*116*		*58 - 132*	*08/12/22 19:41*	*08/14/22 00:25*	*1*

Lab Sample ID: LCS 580-400460/2-A
Matrix: Solid
Analysis Batch: 400498

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 400460

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.918		mg/Kg		92	43 - 111
2-Methylnaphthalene	1.00	0.970		mg/Kg		97	39 - 114
Naphthalene	1.00	0.862		mg/Kg		86	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*115*		*40 - 140*
Fluoranthene-d10 (Surr)	*95*		*40 - 140*
Terphenyl-d14	*111*		*58 - 132*

Lab Sample ID: LCSD 580-400460/20-A
Matrix: Solid
Analysis Batch: 400498

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 400460

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	1.00	0.939		mg/Kg		94	43 - 111	2	20
2-Methylnaphthalene	1.00	0.974		mg/Kg		97	39 - 114	0	20
Naphthalene	1.00	0.873		mg/Kg		87	38 - 111	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*116*		*40 - 140*
Fluoranthene-d10 (Surr)	*92*		*40 - 140*
Terphenyl-d14	*108*		*58 - 132*

QC Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116547-1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-399779/1-A
Matrix: Solid
Analysis Batch: 399956

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 399779

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		08/08/22 11:58	08/09/22 18:19	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		08/08/22 11:58	08/09/22 18:19	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*70*		*45 - 130*	*08/08/22 11:58*	*08/09/22 18:19*	*1*

Lab Sample ID: LCS 580-399779/2-A
Matrix: Solid
Analysis Batch: 399956

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 399779

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	500	469		mg/Kg		94	75 - 125
Motor Oil Range Organics (C24-C40)	500	494		mg/Kg		99	39 - 106

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*95*	*M*	*45 - 130*

Lab Sample ID: LCSD 580-399779/3-A
Matrix: Solid
Analysis Batch: 399956

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 399779

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	500	470		mg/Kg		94	75 - 125	0	20
Motor Oil Range Organics (C24-C40)	500	499		mg/Kg		100	39 - 106	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*95*		*45 - 130*

Lab Sample ID: 580-116547-1 MS
Matrix: Solid
Analysis Batch: 399956

Client Sample ID: A3-100BH-SON01-003.0--004.0
Prep Type: Total/NA
Prep Batch: 399779

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	6400	J1	522	6230	4	mg/Kg	☼	-31	75 - 125
Motor Oil Range Organics (C24-C40)	26	J	522	547		mg/Kg	☼	100	39 - 106

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*101*		*45 - 130*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: 580-116547-1 MSD
Client Sample ID: A3-100BH-SON01-003.0--004.0
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 399956
Prep Batch: 399779

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	6400	J1	533	5880	4	mg/Kg	☼	-95	75 - 125	6	20
Motor Oil Range Organics (C24-C40)	26	J	533	564		mg/Kg	☼	101	39 - 106	3	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*103*		*45 - 130*

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116547-1

Client Sample ID: A3-100BH-SON01-003.0--004.0
Lab Sample ID: 580-116547-1
Date Collected: 07/29/22 10:14
Matrix: Solid
Date Received: 08/03/22 09:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	399621	JHR	EET SEA	08/05/22 15:25

Client Sample ID: A3-100BH-SON01-003.0--004.0
Lab Sample ID: 580-116547-1
Date Collected: 07/29/22 10:14
Matrix: Solid
Date Received: 08/03/22 09:20
Percent Solids: 77.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			399776	S1B	EET SEA	08/08/22 11:52
Total/NA	Analysis	8270E SIM		10	399912	JSM	EET SEA	08/09/22 17:31
Total/NA	Prep	3546	RA		400460	S1B	EET SEA	08/12/22 19:41
Total/NA	Analysis	8270E SIM	RA	1	400498	TL1	EET SEA	08/14/22 05:23
Total/NA	Prep	3546	RE		400460	S1B	EET SEA	08/12/22 19:41
Total/NA	Analysis	8270E SIM	RE	10	400952	E1L	EET SEA	08/18/22 00:25
Total/NA	Prep	3546			399779	S1B	EET SEA	08/08/22 11:58
Total/NA	Analysis	8015D DRO		1	399956	DH	EET SEA	08/09/22 19:19

Client Sample ID: A3-150BH-SON01-001.0-002.0
Lab Sample ID: 580-116547-2
Date Collected: 07/29/22 14:08
Matrix: Solid
Date Received: 08/03/22 09:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	399621	JHR	EET SEA	08/05/22 15:25

Client Sample ID: A3-150BH-SON01-001.0-002.0
Lab Sample ID: 580-116547-2
Date Collected: 07/29/22 14:08
Matrix: Solid
Date Received: 08/03/22 09:20
Percent Solids: 77.9

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			399776	S1B	EET SEA	08/08/22 11:52
Total/NA	Analysis	8270E SIM		1	399912	JSM	EET SEA	08/09/22 17:06
Total/NA	Prep	3546	RA		400460	S1B	EET SEA	08/12/22 19:41
Total/NA	Analysis	8270E SIM	RA	1	400498	TL1	EET SEA	08/14/22 05:47
Total/NA	Prep	3546			399779	S1B	EET SEA	08/08/22 11:58
Total/NA	Analysis	8015D DRO		1	399956	DH	EET SEA	08/09/22 20:20

Client Sample ID: A3-200BH-SON01-004.0-005.0
Lab Sample ID: 580-116547-3
Date Collected: 08/01/22 09:47
Matrix: Solid
Date Received: 08/03/22 09:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	399621	JHR	EET SEA	08/05/22 15:25

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116547-1

Client Sample ID: A3-200BH-SON01-004.0-005.0

Date Collected: 08/01/22 09:47
Date Received: 08/03/22 09:20

Lab Sample ID: 580-116547-3

Matrix: Solid
Percent Solids: 88.9

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			399776	S1B	EET SEA	08/08/22 11:52
Total/NA	Analysis	8270E SIM		1	399912	JSM	EET SEA	08/09/22 15:25
Total/NA	Prep	3546	RA		400460	S1B	EET SEA	08/12/22 19:41
Total/NA	Analysis	8270E SIM	RA	1	400498	TL1	EET SEA	08/14/22 07:25
Total/NA	Prep	3546			399779	S1B	EET SEA	08/08/22 11:58
Total/NA	Analysis	8015D DRO		1	399956	DH	EET SEA	08/09/22 20:40

Laboratory References:
EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-116547-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116547-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-116547-1	A3-100BH-SON01-003.0--004.0	Solid	07/29/22 10:14	08/03/22 09:20
580-116547-2	A3-150BH-SON01-001.0-002.0	Solid	07/29/22 14:08	08/03/22 09:20
580-116547-3	A3-200BH-SON01-004.0-005.0	Solid	08/01/22 09:47	08/03/22 09:20

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

COC No.: 08022022SIT-SEA-01

eurofins Environment Testing America

Client Information				
Client Contact: (b) (6)	Sampler: (b) (6)	Lab PM: (b) (6)	Carrier Tracking No(s):	COC No: 08022022SIT-SEA-01
Company: AECOM-Honolulu	Phone: (b) (6)	E-Mail: (b) (6) @EurofinsET.com	State of Origin: Hawaii	Page:
Address: 1001 Bishop Street, ASB Tower, Suite 1600	PWSID:			Job #:
City: Honolulu	Due Date Requested:			
State, Zip: Hawaii, 96813	TAT Requested (days): 4			
Phone: (b) (6)	Compliance Project: Δ Yes Δ No			
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com	PO #: 141286			
Project Name: LNAPL Characterization	WO #:			
Site: Red Hill Bulk Fuel Storage Facility	Project #: 60674414			
	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, MS/MSD, L=flow-flow, B=bailer)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3-100 BH-SON01-003.0-004.0	7/29/22	1014	G	SO	N	N		1-4ozJar								
A3-150 BH-SON01-001.0-002.0	7/29/22	1405	G	SO	N	N		1-4ozJar								
~~A3 BH-SON01-~~ (b) (6)	~~7/29/22~~		~~G~~	~~SO~~	~~N~~	~~N~~	7/29/22	~~1-4ozJar~~								
~~A3-SOTB01-2207WK4~~	~~7/29/22~~			~~SO~~												
					N	N										
					N	N										
					N	N										
					N	N										

580-116547 Chain of Custody

Therm. ID: 1R9 Cor: 5.4 ° Unc: 5.0 °
Cooler Dsc: MB
Packing: Bw
Cust. Seal: Yes ___ No ___
Blue Ice, Wet, Dry, None
FedEx: P.O
UPS:
Lab Cour:
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return To Client X Disposal By Lab Archive For ___ Months

Deliverable Requested: I, II, III, IV, Other (specify) IV

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
(b) (6)			

Relinquished by	Date/Time	Company	Relinquished by	Date/Time	Company
(b) (6)	7/29/22 1647	AECOM	(b) (6)	7/29/22 1647	AECOM
(b) (6)	8/2/2022 1320	AECOM		8/3/22 0920	EETN
(b) (6)					

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

COC No: 08022022SIT-SEA-02

eurofins Environment Testing America

Client Information

Client Contact: (b) (6)
Company: AECOM-Honolulu
Address: 1001 Bishop Street, ASB Tower, Suite 1600
City: Honolulu
State, Zip: Hawaii, 96813
Phone: (b) (6)
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com
Project Name: LNAPL Characterization
Site: Red Hill Bulk Fuel Storage Facility

Sampler: (b) (6)
Phone: (b) (6)
PWSID:
Due Date Requested:
TAT Requested (days): 4
Compliance Project: Δ Yes Δ No
PO #: 141286
WO #:
Project #: 60674414
SSOW#:

Lab PM: (b) (6)
E-Mail: (b) (6) @EurofinsET.com
Carrier Tracking No(s):
State of Origin: Hawaii

COC No: 08022022SIT-SEA-02
Page:
Job #:

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, M=MS, L=flow-flow, B=bailer)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
	08/01/22															
			Preservation Code:				F		A							
A3-200 BH-SON01-004.0-005.0	8/1/22 RC	0947	G	SO	N	N		1-4ozJar								
~~A3 BH-SON01-~~	~~8/1 7/29/22 RC~~		~~G~~	~~SO~~	~~N~~	~~N~~		~~1-4ozJar~~								
~~A3 BH-SON01-~~	~~7/29/22~~		G	SO	N	N		~~1-4ozJar~~								
~~A3-SQTB01-2207WK4~~	7/29/22			SO												
					N	N										
					N	N										
					N	N										
(b) (6)					N	N										
	8/1/22															

Therm. ID: 1R9 Cor: 5.4 ° Unc: 5.0 °
Cooler Dsc: MB
Packing: Bub
Cust. Seal: Yes ___ No ___
Blue Ice, Wet, Dry, None
FedEx: P.O
UPS:
Lab Cour:
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return To Client X Disposal By Lab Archive For ___ Months

Deliverable Requested: I, II, III, IV, Other (specify) IV

Special Instructions/QC Requirements:

Empty (b) (6) Date: Time: Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
(b) (6)	08/01/2022 / 1550	AECOM	(b) (6)	08/01/2022 / 1600	AECOM
(b) (6)	08/02/2022 / 1318	AECOM		8/3/22 0920	BRN
Relinquished by:	Date/Time:	Company		Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-116547-1

Login Number: 116547
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-116630-1
Client Project/Site: RH Site Characterization JBPHH N62742-17

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
8/11/2022 5:33:24 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-116630-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-116630-1

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT

Two samples were received on 8/4/2022 9:40 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.8º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)

Samples 1S025BH-SON01-005.0-006.0 (580-116630-1) and 2S025BH-SON01-003.0-004.0 (580-116630-2) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 08/09/2022 and analyzed on 08/11/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS

Samples 1S025BH-SON01-005.0-006.0 (580-116630-1) and 2S025BH-SON01-003.0-004.0 (580-116630-2) were analyzed for diesel range organics in accordance with 8015DRO. The samples were prepared on 08/09/2022 and analyzed on 08/10/2022.

The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for preparation batch 580-399999 and analytical batch 580-400086 recovered outside control limits for the following analyte: C24-C40. These analyte was biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Samples 1S025BH-SON01-005.0-006.0 (580-116630-1) and 2S025BH-SON01-003.0-004.0 (580-116630-2) were analyzed for percent

Job ID: 580-116630-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

solids in accordance with Method 2540G. The samples were analyzed on 08/05/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Job ID: 580-116630-1
Project/Site: RH Site Characterization JBPHH N62742-17

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116630-1

Client Sample ID: 1S025BH-SON01-005.0-006.0

Date Collected: 08/02/22 14:48
Date Received: 08/04/22 09:40

Lab Sample ID: 580-116630-1

Matrix: Solid
Percent Solids: 75.5

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0052	0.00065	mg/Kg	☼	08/09/22 15:24	08/11/22 13:28	1
2-Methylnaphthalene	**0.0036**	**J**	0.0052	0.0021	mg/Kg	☼	08/09/22 15:24	08/11/22 13:28	1
Naphthalene	**0.0018**	**J M**	0.0052	0.0017	mg/Kg	☼	08/09/22 15:24	08/11/22 13:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*94*		*28 - 143*	*08/09/22 15:24*	*08/11/22 13:28*	*1*
2-methylnaphthalene-d10	*86*		*40 - 140*	*08/09/22 15:24*	*08/11/22 13:28*	*1*
Fluoranthene-d10 (Surr)	*110*		*40 - 140*	*08/09/22 15:24*	*08/11/22 13:28*	*1*
Terphenyl-d14	*124*		*58 - 132*	*08/09/22 15:24*	*08/11/22 13:28*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	36	U	60	12	mg/Kg	☼	08/09/22 14:52	08/10/22 22:00	1
Motor Oil Range Organics (C24-C40)	36	U Q	60	24	mg/Kg	☼	08/09/22 14:52	08/10/22 22:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*72*		*45 - 130*	*08/09/22 14:52*	*08/10/22 22:00*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**75.5**		0.1	0.1	%			08/05/22 15:25	1
Percent Moisture	**24.5**		0.1	0.1	%			08/05/22 15:25	1

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116630-1

Client Sample ID: 2S025BH-SON01-003.0-004.0

Date Collected: 08/02/22 09:07
Date Received: 08/04/22 09:40

Lab Sample ID: 580-116630-2

Matrix: Solid
Percent Solids: 84.3

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	1.7		0.0058	0.00073	mg/Kg	☼	08/09/22 15:24	08/11/22 13:54	1
2-Methylnaphthalene	1.7		0.0058	0.0024	mg/Kg	☼	08/09/22 15:24	08/11/22 13:54	1
Naphthalene	0.17	M	0.0058	0.0019	mg/Kg	☼	08/09/22 15:24	08/11/22 13:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*61*		*28 - 143*	*08/09/22 15:24*	*08/11/22 13:54*	*1*
2-methylnaphthalene-d10	*78*		*40 - 140*	*08/09/22 15:24*	*08/11/22 13:54*	*1*
Fluoranthene-d10 (Surr)	*107*		*40 - 140*	*08/09/22 15:24*	*08/11/22 13:54*	*1*
Terphenyl-d14	*116*	*M*	*58 - 132*	*08/09/22 15:24*	*08/11/22 13:54*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	720		51	10	mg/Kg	☼	08/09/22 14:52	08/10/22 22:20	1
Motor Oil Range Organics (C24-C40)	31	U Q	51	21	mg/Kg	☼	08/09/22 14:52	08/10/22 22:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*75*		*45 - 130*	*08/09/22 14:52*	*08/10/22 22:20*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84.3		0.1	0.1	%			08/05/22 15:25	1
Percent Moisture	15.7		0.1	0.1	%			08/05/22 15:25	1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-400002/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400170 — **Prep Batch: 400002**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		08/09/22 15:24	08/11/22 11:46	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		08/09/22 15:24	08/11/22 11:46	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		08/09/22 15:24	08/11/22 11:46	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*71*		*28 - 143*	*08/09/22 15:24*	*08/11/22 11:46*	*1*
2-methylnaphthalene-d10	*94*		*40 - 140*	*08/09/22 15:24*	*08/11/22 11:46*	*1*
Fluoranthene-d10 (Surr)	*112*		*40 - 140*	*08/09/22 15:24*	*08/11/22 11:46*	*1*
Terphenyl-d14	*124*		*58 - 132*	*08/09/22 15:24*	*08/11/22 11:46*	*1*

Lab Sample ID: LCS 580-400002/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400170 — **Prep Batch: 400002**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.949		mg/Kg		95	43 - 111
2-Methylnaphthalene	1.00	0.956		mg/Kg		96	39 - 114
Naphthalene	1.00	0.869		mg/Kg		87	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol	*98*		*28 - 143*
2-methylnaphthalene-d10	*115*		*40 - 140*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*
Terphenyl-d14	*111*		*58 - 132*

Lab Sample ID: LCSD 580-400002/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400170 — **Prep Batch: 400002**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	1.00	0.964		mg/Kg		96	43 - 111	2	20
2-Methylnaphthalene	1.00	1.00		mg/Kg		100	39 - 114	5	20
Naphthalene	1.00	0.887		mg/Kg		89	38 - 111	2	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2,4,6-Tribromophenol	*95*		*28 - 143*
2-methylnaphthalene-d10	*120*		*40 - 140*
Fluoranthene-d10 (Surr)	*100*		*40 - 140*
Terphenyl-d14	*113*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-399999/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400086 — **Prep Batch: 399999**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		08/09/22 14:52	08/10/22 19:59	1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: MB 580-399999/1-A
Matrix: Solid
Analysis Batch: 400086

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 399999

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		08/09/22 14:52	08/10/22 19:59	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*75*		*45 - 130*	*08/09/22 14:52*	*08/10/22 19:59*	*1*

Lab Sample ID: LCS 580-399999/2-A
Matrix: Solid
Analysis Batch: 400086

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 399999

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	500	494		mg/Kg		99	75 - 125
Motor Oil Range Organics (C24-C40)	500	538	Q	mg/Kg		108	39 - 106

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*99*	*M*	*45 - 130*

Lab Sample ID: LCSD 580-399999/3-A
Matrix: Solid
Analysis Batch: 400086

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 399999

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	500	499		mg/Kg		100	75 - 125	1	20
Motor Oil Range Organics (C24-C40)	500	541	Q	mg/Kg		108	39 - 106	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*100*	*M*	*45 - 130*

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116630-1

Client Sample ID: 1S025BH-SON01-005.0-006.0 — Lab Sample ID: 580-116630-1

Date Collected: 08/02/22 14:48 — **Matrix: Solid**
Date Received: 08/04/22 09:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	399621	JHR	EET SEA	08/05/22 15:25

Client Sample ID: 1S025BH-SON01-005.0-006.0 — Lab Sample ID: 580-116630-1

Date Collected: 08/02/22 14:48 — **Matrix: Solid**
Date Received: 08/04/22 09:40 — **Percent Solids: 75.5**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			400002	S1B	EET SEA	08/09/22 15:24
Total/NA	Analysis	8270E SIM		1	400170	E1L	EET SEA	08/11/22 13:28
Total/NA	Prep	3546			399999	S1B	EET SEA	08/09/22 14:52
Total/NA	Analysis	8015D DRO		1	400086	DH	EET SEA	08/10/22 22:00

Client Sample ID: 2S025BH-SON01-003.0-004.0 — Lab Sample ID: 580-116630-2

Date Collected: 08/02/22 09:07 — **Matrix: Solid**
Date Received: 08/04/22 09:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	399621	JHR	EET SEA	08/05/22 15:25

Client Sample ID: 2S025BH-SON01-003.0-004.0 — Lab Sample ID: 580-116630-2

Date Collected: 08/02/22 09:07 — **Matrix: Solid**
Date Received: 08/04/22 09:40 — **Percent Solids: 84.3**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			400002	S1B	EET SEA	08/09/22 15:24
Total/NA	Analysis	8270E SIM		1	400170	E1L	EET SEA	08/11/22 13:54
Total/NA	Prep	3546			399999	S1B	EET SEA	08/09/22 14:52
Total/NA	Analysis	8015D DRO		1	400086	DH	EET SEA	08/10/22 22:20

Laboratory References:

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-116630-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116630-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-116630-1	1S025BH-SON01-005.0-006.0	Solid	08/02/22 14:48	08/04/22 09:40
580-116630-2	2S025BH-SON01-003.0-004.0	Solid	08/02/22 09:07	08/04/22 09:40

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

COC No: 08032022SIT-SEA-03

eurofins Environment Testing America

Client Information			
Client Contact: [redacted]	Sampler: [redacted]	Lab PM: Elaine Walker	Carrier Tracking No(s):
	Phone: [redacted]	E-Mail: M.Elaine.Walker@EurofinsET.com	State of Origin: Hawaii
Company: AECOM-Honolulu	PWSID:		
Address: 1001 Bishop Street, ASB Tower, Suite 1600	Due Date Requested:		
City: Honolulu	TAT Requested (days): 4		
State, Zip: Hawaii, 96813	Compliance Project: Δ Yes Δ No		
Phone: [redacted]	PO #: 141286		
Email: [redacted]@aecom.com/ [redacted]@aecom.com	WO #:		
Project Name: LNAPL Characterization	Project #: 60674414		
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:		

COC No: 08032022SIT-SEA-03
Page:
Job #:

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, M=MS, L=flow-flow, B=bailer)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
S1 025 BH-SON01-005.0-006.0	8/2/22	1448	G	SO	N	N		1-4ozJar								
S2 025 BH-SON01-003.8-004.0	8/2/22	0907	G	SO	N	N		1-4ozJar								
~~A3 BH-SON01-~~	~~8/2/22~~		~~G~~	~~SO~~	N	N		1-4ozJar								
~~A3-SQTB01-2208WK4~~	~~8/2/22~~			~~SO~~												
					N	N										
					N	N										
					N	N										
					N	N										

[redacted] 08/02/22

580-116630 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return To Client X Disposal By Lab Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify) IV

Special Instructions/QC Requirements:

Empty Kit Relinquished by: Date: Time: Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
[redacted]	08/02/22 1601	AECOM	[redacted]	8/2/2022 1601	AECOM
[redacted]	8/3/2022 1432	AECOM	[redacted]	8/4/22 0940	~~EEA~~
[redacted]	Date/Time:	Company	Received by: [redacted]	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks: IR9 08/0.4
MR Rd P9
Bub/Gel

Revised

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone 253-248-4972

Chain of Custody Record

eurofins

Client Information	Sampler	Lab PM	Carrier Tracking No(s)	COC No
	(b) (6)	(b) (6)		
Client Contact: (b) (6)	Phone: (b) (6)	E-Mail: (b) (6)	State of Origin: Hawaii	Page
Company: AECOM-Honolulu	PWSID			Job #
Address: 1001 Bishop Street, ASB Tower, Suite 1600	Due Date Requested:			
City: Honolulu	TAT Requested (days): 4			
State, Zip: Hawaii, 96813	Compliance Project: Yes No			
Phone: (b) (6)	PO #: 141286			
Email: (b) (6)@aecom.com/(b) (6)@aecom.com	WO #			
Project Name: LNAPL Characterization	Project #: 60674414			
Site: Red Hill Bulk Fuel Storage Facility	SSOW#			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol, Other:

	Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, M=MS, L=flow-flow, B=bailer)	Matrix (W=Water, S=Solid, O=Oil, P=Product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260B/5035B	N,1MN,2MN TPH-dro, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-dro, 8015C				Total Number of containers	Special Instructions/Note:
				Preservation Code:				F		A							
1S	~~EX~~ 025 BH-SON01-005.0-006.0	8/2/22	1448	G	SO	N	N		1-4ozJar								1S025BH-SON01-005.0-006.0
2S	~~BR~~ 025 BH-SON01-003.6-004.0	8/2/22	0907	G	SO	N	N		1-4ozJar								2S025BH-SON01-003.0-004.0
	~~A3 BH-SON01-~~	~~8/2/22~~		~~G~~	~~SO~~	N	N		1-4ozJar								
	~~A3-SOTB01-2208WK4~~	~~8/2/22~~			~~SO~~												
						N	N										
						N	N										
						N	N										
						N	N										

(b) (6)

08/02/22

Possible Hazard Identification: Non-Hazard, Flammable, Skin Irritant, Poison B, Unknown, Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month): Return To Client, X Disposal By Lab, Archive For ____ Months

Deliverable Requested: I, II, III, IV, Other (specify) IV

Special Instructions/QC Requirements

Empty Kit Relinquished by	Date	Time	Method of Shipment
(b) (6)			

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6)	08/02/22 1601	AECOM	(b) (6)	8/2/2022 1601	AECOM
Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Relinquished by	Date/Time	Company	Received by	Date/Time	Company

Custody Seals Intact: Yes No | Custody Seal No | Cooler Temperature(s) °C and Other Remarks

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-116630-1

Login Number: 116630
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-116666-1
Client Project/Site: RH Site Characterization JBPHH N62742-17
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/12/2022 3:44:44 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-116666-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-116666-1

REVISION 1: SEPTEMBER 12, 2022
Report revised to remove one of the 8270E SIM surrogates that was not needed. Also, the client ID was corrected to match the database. The COC is incorrect.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
One sample was received on 8/5/2022 9:15 AM. Unless otherwise noted below, the sample arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was -1.3º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)
Sample A3-040BH-SON01-005.0-006.0 (580-116666-1) was analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The sample was prepared on 08/12/2022 and analyzed on 08/14/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS
Sample A3-040BH-SON01-005.0-006.0 (580-116666-1) was analyzed for diesel range organics in accordance with 8015DRO. The sample was prepared on 08/12/2022 and analyzed on 08/15/2022.

The matrix spike / matrix spike duplicate (MS/MSD) recoveries and precision for preparation batch 580-400464 and 580-400464 and analytical batch 580-400663 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Job ID: 580-116666-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Sample A3-040BH-SON01-005.0-006.0 (580-116666-1) was analyzed for percent solids in accordance with Method 2540G. The sample was analyzed on 08/12/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Job ID: 580-116666-1
Project/Site: RH Site Characterization JBPHH N62742-17

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116666-1

Client Sample ID: A3-040BH-SON01-005.0-006.0

Lab Sample ID: 580-116666-1
Date Collected: 08/03/22 10:23
Matrix: Solid
Date Received: 08/05/22 15:03
Percent Solids: 70.2

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	6.5		0.0068	0.00085	mg/Kg	☼	08/12/22 19:41	08/14/22 07:01	1
2-Methylnaphthalene	9.1		0.0068	0.0028	mg/Kg	☼	08/12/22 19:41	08/14/22 07:01	1
Naphthalene	3.4		0.0068	0.0022	mg/Kg	☼	08/12/22 19:41	08/14/22 07:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*76*	*M*	*40 - 140*	*08/12/22 19:41*	*08/14/22 07:01*	*1*
Fluoranthene-d10 (Surr)	*99*		*40 - 140*	*08/12/22 19:41*	*08/14/22 07:01*	*1*
Terphenyl-d14	*115*		*58 - 132*	*08/12/22 19:41*	*08/14/22 07:01*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	1800	J1	70	14	mg/Kg	☼	08/12/22 20:07	08/15/22 21:34	1
Motor Oil Range Organics (C24-C40)	34	J J1	70	28	mg/Kg	☼	08/12/22 20:07	08/15/22 21:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*59*		*45 - 130*	*08/12/22 20:07*	*08/15/22 21:34*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	70.2		0.1	0.1	%			08/12/22 11:29	1
Percent Moisture	29.8		0.1	0.1	%			08/12/22 11:29	1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-400460/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400498 — **Prep Batch: 400460**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		08/12/22 19:41	08/14/22 00:25	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		08/12/22 19:41	08/14/22 00:25	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		08/12/22 19:41	08/14/22 00:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*84*		*40 - 140*	*08/12/22 19:41*	*08/14/22 00:25*	*1*
Fluoranthene-d10 (Surr)	*102*		*40 - 140*	*08/12/22 19:41*	*08/14/22 00:25*	*1*
Terphenyl-d14	*116*		*58 - 132*	*08/12/22 19:41*	*08/14/22 00:25*	*1*

Lab Sample ID: LCS 580-400460/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400498 — **Prep Batch: 400460**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.918		mg/Kg		92	43 - 111
2-Methylnaphthalene	1.00	0.970		mg/Kg		97	39 - 114
Naphthalene	1.00	0.862		mg/Kg		86	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*115*		*40 - 140*
Fluoranthene-d10 (Surr)	*95*		*40 - 140*
Terphenyl-d14	*111*		*58 - 132*

Lab Sample ID: LCSD 580-400460/20-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400498 — **Prep Batch: 400460**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	1.00	0.939		mg/Kg		94	43 - 111	2	20
2-Methylnaphthalene	1.00	0.974		mg/Kg		97	39 - 114	0	20
Naphthalene	1.00	0.873		mg/Kg		87	38 - 111	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*116*		*40 - 140*
Fluoranthene-d10 (Surr)	*92*		*40 - 140*
Terphenyl-d14	*108*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-400464/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400663 — **Prep Batch: 400464**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		08/12/22 20:07	08/15/22 19:13	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		08/12/22 20:07	08/15/22 19:13	1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: MB 580-400464/1-A
Matrix: Solid
Analysis Batch: 400663

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 400464

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*73*		*45 - 130*	*08/12/22 20:07*	*08/15/22 19:13*	*1*

Lab Sample ID: LCS 580-400464/2-A
Matrix: Solid
Analysis Batch: 400663

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 400464

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	500	451		mg/Kg		90	75 - 125
Motor Oil Range Organics (C24-C40)	500	484		mg/Kg		97	39 - 106

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*91*	*M*	*45 - 130*

Lab Sample ID: LCSD 580-400464/3-A
Matrix: Solid
Analysis Batch: 400663

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 400464

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	500	444		mg/Kg		89	75 - 125	1	20
Motor Oil Range Organics (C24-C40)	500	476		mg/Kg		95	39 - 106	2	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*90*	*M*	*45 - 130*

Lab Sample ID: 580-116666-1 MS
Matrix: Solid
Analysis Batch: 400663

Client Sample ID: A3-040BH-SON01-005.0-006.0
Prep Type: Total/NA
Prep Batch: 400464

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	1800	J1	596	1350	J1	mg/Kg	☼	-81	75 - 125
Motor Oil Range Organics (C24-C40)	34	J1	596	291		mg/Kg	☼	43	39 - 106

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*49*		*45 - 130*

Lab Sample ID: 580-116666-1 MSD
Matrix: Solid
Analysis Batch: 400663

Client Sample ID: A3-040BH-SON01-005.0-006.0
Prep Type: Total/NA
Prep Batch: 400464

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	1800	J1	612	1050	J1	mg/Kg	☼	-129	75 - 125	25	20
Motor Oil Range Organics (C24-C40)	34	J1	612	207	J1	mg/Kg	☼	28	39 - 106	34	20

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Surrogate	MSD %Recovery	MSD Qualifier	Limits
o-Terphenyl	38	Q	45 - 130

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116666-1

Client Sample ID: A3-040BH-SON01-005.0-006.0

Lab Sample ID: 580-116666-1
Date Collected: 08/03/22 10:23
Matrix: Solid
Date Received: 08/05/22 15:03

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	400388	JSM	EET SEA	08/12/22 11:29

Client Sample ID: A3-040BH-SON01-005.0-006.0

Lab Sample ID: 580-116666-1
Date Collected: 08/03/22 10:23
Matrix: Solid
Date Received: 08/05/22 15:03
Percent Solids: 70.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			400460	S1B	EET SEA	08/12/22 19:41
Total/NA	Analysis	8270E SIM		1	400498	TL1	EET SEA	08/14/22 07:01
Total/NA	Prep	3546			400464	S1B	EET SEA	08/12/22 20:07
Total/NA	Analysis	8015D DRO		1	400663	DH	EET SEA	08/15/22 21:34

Laboratory References:

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-116666-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116666-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-116666-1	A3-040BH-SON01-005.0-006.0	Solid	08/03/22 10:23	08/05/22 15:03

580-116666 Chain of Custody

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

eurofins Environment Testing America

Chain of Custody Record

COC No: 08042022SIT-SEA-01

Client Information

Client Contact: (b) (6) [redacted]
Company: AECOM-Honolulu
Address: AECOM-Honolulu
City: 1001 Bishop Street, ASB Tower, Suite 1600
State, Zip: Honolulu, Hawaii, 96813
Phone: (b) (6) [redacted]
Email: (b) (6) @aecom.com/ (b) (6) [redacted]
Project Name: Adit 3 Shallow LNAPL Characterization
Site: Red Hill Bulk Fuel Storage Facility

Sampler: (b) (6) [redacted]
Phone: (b) (6) (b) (6) [redacted]
PWSID:
Due Date Requested:
TAT Requested (days): 7
Compliance Project: Δ Yes Δ No
PO #: Purchase Order Requested
WO #:
Project #:
SSOW#:

Lab PM: Elaine Walker
E-Mail: M.Elaine.Walker@EurofinsET.com
Carrier Tracking No(s):
State of Origin:

COC No.: 08042022SIT-SEA-01
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab, M=MIS)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3-040-SON01-005.0-006.0	8/3/22	1023	G	SO	N	N		1-4ozJar								
A3 SON01-	8/3/22		G	SO	N	N		1-4ozJar								
A3 SON01-	8/3/22		G	SO	N	N		1-4ozJar								
A3 SOFD01-	8/3/22		G	SO	N	N		1-4ozJar								
					N	N										
					N	N										
					N	N										
					N	N										
					N	N										
					N	N										

(b) (6) [redacted]
08/03/22

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client Disposal By Lab Archive For Months ☐

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: HOLD 1668A + 8290A pending client direction

Empty Kit Relinquished by: Date: Time: Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6) [redacted]	08/03/22 / 1545	AECOM	(b) (6) [redacted]	08/03/22 1545	AECOM
(b) (6) [redacted]	08/03/22 / 1630	AECOM	(b) (6) [redacted]	8/3/22 1630	AECOM
(b) (6) [redacted]	8/4/2022 1132	AECOM	(b) (6) [redacted]	8/5/22 0915	EETN

Δ Yes Δ No

Custody Seals Intact: Δ Yes Δ No Custody Seal No.: Cooler Temp. and Other Remarks:

Therm. ID: IR8 Cor: -1.3 ° Unc: -1.9 °
Cooler Dsc: MR
Packing: Bub
Cust. Seal: Yes ✓ No
Blue Ice, Wet, Dry, None
FedEx: P.O
UPS:
Lab Cour:
Other:

9/12/2022 (Rev. 1)

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-116666-1

Login Number: 116666
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-116684-1
Client Project/Site: RH Site Characterization JBPHH N62742-17
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/12/2022 10:35:22 AM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

Review your project results through my EOL

Have a Question? Ask The Expert

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-116684-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-116684-1

REVISION 1: SEPTEMBER 12, 2022
Report revised to remove one of the 8270E SIM surrogates that was not needed.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
One sample was received on 8/6/2022 9:10 AM. Unless otherwise noted below, the sample arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was -1.9º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)
Sample A3-300BH-SON01-004.0-005.0 (580-116684-1) was analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The sample was prepared on 08/09/2022 and analyzed on 08/11/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS
Sample A3-300BH-SON01-004.0-005.0 (580-116684-1) was analyzed for diesel range organics in accordance with 8015DRO. The sample was prepared on 08/09/2022 and analyzed on 08/10/2022.

The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 580-399999 and analytical batch 580-400086 was outside control limits for DRO. Sample matrix interference and/or non-homogeneity is suspected. The associated LCS/LCSD recoveries were in control.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 580-116684-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

PERCENT SOLIDS

Sample A3-300BH-SON01-004.0-005.0 (580-116684-1) was analyzed for percent solids in accordance with Method 2540G. The sample was analyzed on 08/09/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Job ID: 580-116684-1
Project/Site: RH Site Characterization JBPHH N62742-17

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116684-1

Client Sample ID: A3-300BH-SON01-004.0-005.0

Lab Sample ID: 580-116684-1

Date Collected: 08/04/22 15:00
Date Received: 08/06/22 09:10

Matrix: Solid
Percent Solids: 88.0

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	1.8		0.0044	0.00056	mg/Kg	☼	08/09/22 15:24	08/11/22 13:02	1
2-Methylnaphthalene	2.4		0.0044	0.0018	mg/Kg	☼	08/09/22 15:24	08/11/22 13:02	1
Naphthalene	0.73		0.0044	0.0014	mg/Kg	☼	08/09/22 15:24	08/11/22 13:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*87*		*40 - 140*	*08/09/22 15:24*	*08/11/22 13:02*	*1*
Fluoranthene-d10 (Surr)	*97*		*40 - 140*	*08/09/22 15:24*	*08/11/22 13:02*	*1*
Terphenyl-d14	*108*		*58 - 132*	*08/09/22 15:24*	*08/11/22 13:02*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	300	J1	47	9.3	mg/Kg	☼	08/09/22 14:52	08/10/22 21:00	1
Motor Oil Range Organics (C24-C40)	70		47	19	mg/Kg	☼	08/09/22 14:52	08/10/22 21:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*73*		*45 - 130*	*08/09/22 14:52*	*08/10/22 21:00*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	88.0		0.1	0.1	%			08/09/22 11:11	1
Percent Moisture	12.0		0.1	0.1	%			08/09/22 11:11	1

QC Sample Results

Client: AECOM
Job ID: 580-116684-1
Project/Site: RH Site Characterization JBPHH N62742-17

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-400002/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400170 — **Prep Batch: 400002**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		08/09/22 15:24	08/11/22 11:46	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		08/09/22 15:24	08/11/22 11:46	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		08/09/22 15:24	08/11/22 11:46	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*94*		*40 - 140*	*08/09/22 15:24*	*08/11/22 11:46*	*1*
Fluoranthene-d10 (Surr)	*112*		*40 - 140*	*08/09/22 15:24*	*08/11/22 11:46*	*1*
Terphenyl-d14	*124*		*58 - 132*	*08/09/22 15:24*	*08/11/22 11:46*	*1*

Lab Sample ID: LCS 580-400002/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400170 — **Prep Batch: 400002**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.949		mg/Kg		95	43 - 111
2-Methylnaphthalene	1.00	0.956		mg/Kg		96	39 - 114
Naphthalene	1.00	0.869		mg/Kg		87	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*115*		*40 - 140*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*
Terphenyl-d14	*111*		*58 - 132*

Lab Sample ID: LCSD 580-400002/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400170 — **Prep Batch: 400002**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	1.00	0.964		mg/Kg		96	43 - 111	2	20
2-Methylnaphthalene	1.00	1.00		mg/Kg		100	39 - 114	5	20
Naphthalene	1.00	0.887		mg/Kg		89	38 - 111	2	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*120*		*40 - 140*
Fluoranthene-d10 (Surr)	*100*		*40 - 140*
Terphenyl-d14	*113*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-399999/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400086 — **Prep Batch: 399999**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		08/09/22 14:52	08/10/22 19:59	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		08/09/22 14:52	08/10/22 19:59	1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: MB 580-399999/1-A
Matrix: Solid
Analysis Batch: 400086

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 399999

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*75*		*45 - 130*	*08/09/22 14:52*	*08/10/22 19:59*	*1*

Lab Sample ID: LCS 580-399999/2-A
Matrix: Solid
Analysis Batch: 400128

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 399999

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	500	478		mg/Kg		96	75 - 125
Motor Oil Range Organics (C24-C40)	500	521		mg/Kg		104	39 - 106

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*99*	*M*	*45 - 130*

Lab Sample ID: LCSD 580-399999/3-A
Matrix: Solid
Analysis Batch: 400128

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 399999

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	500	484		mg/Kg		97	75 - 125	1	20
Motor Oil Range Organics (C24-C40)	500	526		mg/Kg		105	39 - 106	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*99*	*M*	*45 - 130*

Lab Sample ID: 580-116684-1 MS
Matrix: Solid
Analysis Batch: 400086

Client Sample ID: A3-300BH-SON01-004.0-005.0
Prep Type: Total/NA
Prep Batch: 399999

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	300	J1	488	659	J1	mg/Kg	☼	73	75 - 125
Motor Oil Range Organics (C24-C40)	70		488	562		mg/Kg	☼	101	39 - 106

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*99*		*45 - 130*

Lab Sample ID: 580-116684-1 MSD
Matrix: Solid
Analysis Batch: 400086

Client Sample ID: A3-300BH-SON01-004.0-005.0
Prep Type: Total/NA
Prep Batch: 399999

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	300	J1	513	681	J1	mg/Kg	☼	74	75 - 125	3	20
Motor Oil Range Organics (C24-C40)	70		513	578		mg/Kg	☼	99	39 - 106	3	20

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Surrogate	MSD %Recovery	MSD Qualifier	Limits
o-Terphenyl	98		45 - 130

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116684-1

Client Sample ID: A3-300BH-SON01-004.0-005.0

Lab Sample ID: 580-116684-1
Date Collected: 08/04/22 15:00
Matrix: Solid
Date Received: 08/06/22 09:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	399867	TOA	EET SEA	08/09/22 11:11

Client Sample ID: A3-300BH-SON01-004.0-005.0

Lab Sample ID: 580-116684-1
Date Collected: 08/04/22 15:00
Matrix: Solid
Date Received: 08/06/22 09:10
Percent Solids: 88.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			400002	S1B	EET SEA	08/09/22 15:24
Total/NA	Analysis	8270E SIM		1	400170	E1L	EET SEA	08/11/22 13:02
Total/NA	Prep	3546			399999	S1B	EET SEA	08/09/22 14:52
Total/NA	Analysis	8015D DRO		1	400086	DH	EET SEA	08/10/22 21:00

Laboratory References:

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-116684-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116684-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-116684-1	A3-300BH-SON01-004.0-005.0	Solid	08/04/22 15:00	08/06/22 09:10

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-246-4972

Chain of Custody Record

eurofins | Environment Testing America

COC # 0805220231T-SEA-01

Client Information			
Sampler: (b) (6)	Lab PM: (b) (6)	Carrier Tracking No(s):	COC No:
Client Contact: (b) (6)	Phone: (b) (6)	E-Mail: (b) (6) @EurofinsET.com	State of Origin: Hawaii	Page:
Company: AECOM-Honolulu	PWSID:		Job #:
Address: 1001 Bishop Street, ASB Tower, Suite 1600	Due Date Requested:		
City: Honolulu	TAT Requested (days): 4		
State, Zip: Hawaii, 96813	Compliance Project: Δ Yes Δ No		
Phone: (b) (6)	PO #: 141286		
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com	WO #:		
Project Name: LNAPL Characterization	Project #: 60674414		
Site: Red Hill Bulk Fuel Storage Facility	SSOW#:		

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, M=MS, LF=low-flow, B=bailer)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN (TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3 ~300 BH-SON01- 004.0 - 005.0	8/4/22	1500	G	SO	N	N		1-4ozJar								
~~A3 BH-SON01-~~	~~8/4/22~~		~~G~~	~~SO~~	~~N~~	~~N~~		1-4ozJar								
~~A3 BH-SON01-~~	~~8/4/22~~		~~G~~	~~SO~~	~~N~~	~~N~~		1-4ozJar								
~~A3-SOTB01-2208WK4~~	~~8/4/22~~			~~SO~~												
					N	N										
					N	N										
					N	N										
					N	N										
(b) (6)		8/4/22														

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return To Client X Disposal By Lab Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify) IV

Special Instructions/QC Requirements:

Empty Kit Relinquished by: (b) (6) Date: Time: Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6)	8/4/22 / 1645	AECOM	(b) (6)	08/04/2022 1645	AECOM
(b) (6)	08/05/2022 1202	AECOM		8/6/22 0910	EETN
	Date/Time:	Company		Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Therm. ID: IR8 Cor: -1.9 ° Unc: -2.5 °
Cooler Dsc: MR
Packing: Bub
Cust. Seal: Yes ___ No ___
Blue Ice, Wet, Dry, None
FedEx: P.D.
UPS:
Lab Cour:
Other:

580-116684 Chain of Custody

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-116684-1

Login Number: 116684
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-116756-1
Client Project/Site: RH Site Characterization JBPHH N62742-17
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/12/2022 4:12:05 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

Review your project results through my EOL

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-116756-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-116756-1

REVISION 1: SEPTEMBER 12, 2022
Report revised to remove one of the 8270E SIM surrogates that was not needed.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
Two samples were received on 8/9/2022 9:40 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.4º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)
Samples A3-240BH-SON01-004.0-005.0 (580-116756-1) and A3-350BH-SON01-002.0-003.0 (580-116756-2) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 08/12/2022 and analyzed on 08/14/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS
Samples A3-240BH-SON01-004.0-005.0 (580-116756-1) and A3-350BH-SON01-002.0-003.0 (580-116756-2) were analyzed for diesel range organics in accordance with 8015DRO. The samples were prepared on 08/12/2022 and analyzed on 08/15/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS
Samples A3-240BH-SON01-004.0-005.0 (580-116756-1) and A3-350BH-SON01-002.0-003.0 (580-116756-2) were analyzed for percent solids in accordance with Method 2540G. The samples were analyzed on 08/12/2022.

Job ID: 580-116756-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Job ID: 580-116756-1
Project/Site: RH Site Characterization JBPHH N62742-17

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116756-1

Client Sample ID: A3-240BH-SON01-004.0-005.0

Lab Sample ID: 580-116756-1

Date Collected: 08/05/22 10:36
Date Received: 08/09/22 09:40

Matrix: Solid
Percent Solids: 82.7

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	1.2		0.0057	0.00072	mg/Kg	☼	08/12/22 19:41	08/14/22 06:36	1
2-Methylnaphthalene	1.6		0.0057	0.0023	mg/Kg	☼	08/12/22 19:41	08/14/22 06:36	1
Naphthalene	0.44		0.0057	0.0018	mg/Kg	☼	08/12/22 19:41	08/14/22 06:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*92*		*40 - 140*	*08/12/22 19:41*	*08/14/22 06:36*	*1*
Fluoranthene-d10 (Surr)	*101*		*40 - 140*	*08/12/22 19:41*	*08/14/22 06:36*	*1*
Terphenyl-d14	*110*		*58 - 132*	*08/12/22 19:41*	*08/14/22 06:36*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	230		53	11	mg/Kg	☼	08/12/22 20:07	08/15/22 20:14	1
Motor Oil Range Organics (C24-C40)	22	J	53	21	mg/Kg	☼	08/12/22 20:07	08/15/22 20:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*68*		*45 - 130*	*08/12/22 20:07*	*08/15/22 20:14*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	82.7		0.1	0.1	%			08/12/22 11:29	1
Percent Moisture	17.3		0.1	0.1	%			08/12/22 11:29	1

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116756-1

Client Sample ID: A3-350BH-SON01-002.0-003.0

Lab Sample ID: 580-116756-2
Date Collected: 08/05/22 14:04
Matrix: Solid
Date Received: 08/09/22 09:40
Percent Solids: 81.8

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.61		0.0053	0.00067	mg/Kg	☼	08/12/22 19:41	08/14/22 06:12	1
2-Methylnaphthalene	0.74		0.0053	0.0022	mg/Kg	☼	08/12/22 19:41	08/14/22 06:12	1
Naphthalene	0.031	M	0.0053	0.0017	mg/Kg	☼	08/12/22 19:41	08/14/22 06:12	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*87*		*40 - 140*	*08/12/22 19:41*	*08/14/22 06:12*	*1*
Fluoranthene-d10 (Surr)	*98*		*40 - 140*	*08/12/22 19:41*	*08/14/22 06:12*	*1*
Terphenyl-d14	*115*		*58 - 132*	*08/12/22 19:41*	*08/14/22 06:12*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	180		59	12	mg/Kg	☼	08/12/22 20:07	08/15/22 20:34	1
Motor Oil Range Organics (C24-C40)	34	J	59	24	mg/Kg	☼	08/12/22 20:07	08/15/22 20:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*72*		*45 - 130*	*08/12/22 20:07*	*08/15/22 20:34*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81.8		0.1	0.1	%			08/12/22 11:29	1
Percent Moisture	18.2		0.1	0.1	%			08/12/22 11:29	1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-400460/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400498 — **Prep Batch: 400460**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		08/12/22 19:41	08/14/22 00:25	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		08/12/22 19:41	08/14/22 00:25	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		08/12/22 19:41	08/14/22 00:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*84*		*40 - 140*	*08/12/22 19:41*	*08/14/22 00:25*	*1*
Fluoranthene-d10 (Surr)	*102*		*40 - 140*	*08/12/22 19:41*	*08/14/22 00:25*	*1*
Terphenyl-d14	*116*		*58 - 132*	*08/12/22 19:41*	*08/14/22 00:25*	*1*

Lab Sample ID: LCS 580-400460/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400498 — **Prep Batch: 400460**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.918		mg/Kg		92	43 - 111
2-Methylnaphthalene	1.00	0.970		mg/Kg		97	39 - 114
Naphthalene	1.00	0.862		mg/Kg		86	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*115*		*40 - 140*
Fluoranthene-d10 (Surr)	*95*		*40 - 140*
Terphenyl-d14	*111*		*58 - 132*

Lab Sample ID: LCSD 580-400460/20-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400498 — **Prep Batch: 400460**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	1.00	0.939		mg/Kg		94	43 - 111	2	20
2-Methylnaphthalene	1.00	0.974		mg/Kg		97	39 - 114	0	20
Naphthalene	1.00	0.873		mg/Kg		87	38 - 111	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*116*		*40 - 140*
Fluoranthene-d10 (Surr)	*92*		*40 - 140*
Terphenyl-d14	*108*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-400464/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 400663 — **Prep Batch: 400464**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		08/12/22 20:07	08/15/22 19:13	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		08/12/22 20:07	08/15/22 19:13	1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: MB 580-400464/1-A
Matrix: Solid
Analysis Batch: 400663

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 400464

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	73		45 - 130	08/12/22 20:07	08/15/22 19:13	1

Lab Sample ID: LCS 580-400464/2-A
Matrix: Solid
Analysis Batch: 400663

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 400464

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	500	451		mg/Kg		90	75 - 125
Motor Oil Range Organics (C24-C40)	500	484		mg/Kg		97	39 - 106

Surrogate	LCS %Recovery	LCS Qualifier	Limits
o-Terphenyl	91	M	45 - 130

Lab Sample ID: LCSD 580-400464/3-A
Matrix: Solid
Analysis Batch: 400663

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 400464

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	500	444		mg/Kg		89	75 - 125	1	20
Motor Oil Range Organics (C24-C40)	500	476		mg/Kg		95	39 - 106	2	20

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
o-Terphenyl	90	M	45 - 130

Method: 2540G - SM 2540G

Lab Sample ID: 580-116756-1 DU
Matrix: Solid
Analysis Batch: 400388

Client Sample ID: A3-240BH-SON01-004.0-005.0
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	82.7		82.6		%		0.1	20
Percent Moisture	17.3		17.4		%		0.5	20

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116756-1

Client Sample ID: A3-240BH-SON01-004.0-005.0
Lab Sample ID: 580-116756-1
Date Collected: 08/05/22 10:36
Matrix: Solid
Date Received: 08/09/22 09:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	400388	JSM	EET SEA	08/12/22 11:29

Client Sample ID: A3-240BH-SON01-004.0-005.0
Lab Sample ID: 580-116756-1
Date Collected: 08/05/22 10:36
Matrix: Solid
Date Received: 08/09/22 09:40
Percent Solids: 82.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			400460	S1B	EET SEA	08/12/22 19:41
Total/NA	Analysis	8270E SIM		1	400498	TL1	EET SEA	08/14/22 06:36
Total/NA	Prep	3546			400464	S1B	EET SEA	08/12/22 20:07
Total/NA	Analysis	8015D DRO		1	400663	DH	EET SEA	08/15/22 20:14

Client Sample ID: A3-350BH-SON01-002.0-003.0
Lab Sample ID: 580-116756-2
Date Collected: 08/05/22 14:04
Matrix: Solid
Date Received: 08/09/22 09:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	400388	JSM	EET SEA	08/12/22 11:29

Client Sample ID: A3-350BH-SON01-002.0-003.0
Lab Sample ID: 580-116756-2
Date Collected: 08/05/22 14:04
Matrix: Solid
Date Received: 08/09/22 09:40
Percent Solids: 81.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			400460	S1B	EET SEA	08/12/22 19:41
Total/NA	Analysis	8270E SIM		1	400498	TL1	EET SEA	08/14/22 06:12
Total/NA	Prep	3546			400464	S1B	EET SEA	08/12/22 20:07
Total/NA	Analysis	8015D DRO		1	400663	DH	EET SEA	08/15/22 20:34

Laboratory References:
EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-116756-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-116756-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-116756-1	A3-240BH-SON01-004.0-005.0	Solid	08/05/22 10:36	08/09/22 09:40
580-116756-2	A3-350BH-SON01-002.0-003.0	Solid	08/05/22 14:04	08/09/22 09:40

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins | Environment Testing America

COC # 08082022SIT-SEA-01

Client Information

Client Contact: (b) (6)
Company: AECOM-Honolulu
Address: 1001 Bishop Street, ASB Tower, Suite 1600
City: Honolulu
State, Zip: Hawaii, 96813
Phone: (b) (6)
Email: (b) (6)@aecom.com/ (b) (6)@aecom.com
Project Name: LNAPL Characterization
Site: Red Hill Bulk Fuel Storage Facility

Sampler: (b) (6)
Phone: (b) (6)
PWSID:
Due Date Requested:
TAT Requested (days): 4
Compliance Project: Δ Yes Δ No
PO #: 141286
WO #:
Project #: 60674414
SSOW#:

Lab PM: (b) (6)
E-Mail: (b) (6)@EurofinsET.com
Carrier Tracking No(s):
State of Origin: Hawaii
COC No:
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, MaMIS, LFelow-flow, Bubbler)	Matrix (WG=Groundwater, SO=soil, PR=product GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				I		A							
A3-290 BH-SON01-004.0-005.0	8/5/22	1036	G	SO	N	N		1-4ozJar								
A3-550 BH-SON01-002.0-003.0	8/5/22	1424	G	SO	N	N		1-4ozJar								
~~2S BH-SON01-~~	~~8/5/22~~		~~G~~	~~SO~~	N	N		1-4ozJar								
~~A3-SQTB01-2208WK4~~	8/5/22			~~SO~~												
					N	N										
					N	N										
					N	N										
					N	N										

(b) (6)

8/5/22

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Z - Methanol
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return To Client X Disposal By Lab Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify) IV

Special Instructions/QC Requirements:

Empty Kit Relinquished by: (b) (6) Date: Time: Method of Shipment:

Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
(b) (6)	8/5/22 1636	AECOM	(b) (6)	08/05/2022 1630	AECOM
(b) (6)	08/08/2022 1424	AECOM		8/9/22 0940	EBN

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:

Therm. ID: 129 Cor: 4.4° Unc: 4.0°
Cooler Dsc: MR
Packing: Bub
Cust. Seal: Yes ___ No ___
Blue Ice: Wet, Dry, None
FedEx: P.O.
UPS:
Lab Cour:
Other:

580-116756 Chain of Custody

9/12/2022 (Rev. 1)

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-116756-1

Login Number: 116756
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-117282-1
Client Project/Site: RH Site Characterization JBPHH N62742-17
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/16/2022 5:15:51 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

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www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-117282-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-117282-1

REVISION 1: SEPTEMBER 16, 2022

Report revised for 8260B CALUFT GRO, which needed to be reran due to low trending internal standard**.**

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT

Two samples were received on 8/25/2022 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.8º C.

Receipt Exceptions

The number of container listed on the Chain-of-Custody (COC) following sample did not match the number of containers received. The COC lists 3 vials while only 2 vials were received.A3SVMP-WQTB01-2208WK4 (580-117282-2).

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

GASOLINE RANGE ORGANICS (GRO)

Samples A3-010SVMP-WGN01B-2208WK4 (580-117282-1) and A3SVMP-WQTB01-2208WK4 (580-117282-2) were analyzed for gasoline range organics (GRO) in accordance with 8260B CALUFT. The samples were analyzed on 08/31/2022.

Reanalysis of the following sample was performed outside of the analytical holding time due to client requested re-analysis: A3-010SVMP-WGN01B-2208WK4 (580-117282-1). Both sets of data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS)

Job ID: 580-117282-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

Samples A3-010SVMP-WGN01B-2208WK4 (580-117282-1) and A3SVMP-WQTB01-2208WK4 (580-117282-2) were analyzed for volatile organic compounds (GC-MS) in accordance with 8260D. The samples were analyzed on 08/31/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)

Sample A3-010SVMP-WGN01B-2208WK4 (580-117282-1) was analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 08/30/2022 and analyzed on 08/31/2022.

Internal standard (ISTD) Acenaphthene-d10, 1,4-Dichlorobenzene-d4, Chrysene-d12, Naphthalene-d8, Phenanthrene-d10 and Perylene-d12 response for the method blank was outside of lower acceptance limits. A low internal standard creates a high bias for the affected analytes. The associated analytes were non-detect above the reporting limit; therefore, re-analysis of samples was not performed and the data has been qualified and reported. (MB 580-402294/1-A)

Surrogate recovery for the following sample was outside control limits: A3-010SVMP-WGN01B-2208WK4 (580-117282-1). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS

Sample A3-010SVMP-WGN01B-2208WK4 (580-117282-1) was analyzed for Diesel Range Organics in accordance with 8015D DRO. The samples were prepared on 08/30/2022 and analyzed on 08/31/2022.

Surrogate recovery for the following sample was outside control limits: A3-010SVMP-WGN01B-2208WK4 (580-117282-1). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ORGANIC PREP

Method 3510C: The following sample formed emulsions during the extraction procedure: A3-010SVMP-WGN01B-2208WK4 (580-117282-1). The emulsions were broken up using additional DCM rinsing and sodium sulfate filtrations as needed.

Method 3510C: The following sample: A3-010SVMP-WGN01B-2208WK4 (580-117282-1) was decanted prior to preparation.

Definitions/Glossary

Client: AECOM
Job ID: 580-117282-1
Project/Site: RH Site Characterization JBPHH N62742-17

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
H	Sample was prepped or analyzed beyond the specified holding time
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC/MS Semi VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117282-1

Client Sample ID: A3-010SVMP-WGN01B-2208WK4

Lab Sample ID: 580-117282-1
Date Collected: 08/23/22 10:30
Matrix: Water
Date Received: 08/25/22 09:30

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	92	J	100	31	ug/L			08/31/22 12:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*88*		*69 - 133*		*08/31/22 12:53*	*1*

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS - RA

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	62	J H	100	31	ug/L			09/15/22 07:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*85*		*69 - 133*		*09/15/22 07:30*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U M	1.0	0.24	ug/L			08/31/22 12:53	1
Toluene	0.80	U	1.0	0.39	ug/L			08/31/22 12:53	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			08/31/22 12:53	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			08/31/22 12:53	1
o-Xylene	0.80	U	1.0	0.39	ug/L			08/31/22 12:53	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			08/31/22 12:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*104*		*85 - 114*		*08/31/22 12:53*	*1*
Toluene-d8 (Surr)	*95*		*89 - 112*		*08/31/22 12:53*	*1*
Dibromofluoromethane (Surr)	*93*		*80 - 119*		*08/31/22 12:53*	*1*
1,2-Dichloroethane-d4 (Surr)	*89*		*81 - 118*		*08/31/22 12:53*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.084	U Q	0.10	0.034	ug/L		08/30/22 09:17	08/31/22 08:01	1
2-Methylnaphthalene	0.084	U Q	0.21	0.041	ug/L		08/30/22 09:17	08/31/22 08:01	1
Naphthalene	0.42	U Q	0.52	0.17	ug/L		08/30/22 09:17	08/31/22 08:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*15*	*Q*	*40 - 140*	*08/30/22 09:17*	*08/31/22 08:01*	*1*
Fluoranthene-d10 (Surr)	*30*	*Q*	*40 - 140*	*08/30/22 09:17*	*08/31/22 08:01*	*1*
Terphenyl-d14	*37*	*Q*	*58 - 132*	*08/30/22 09:17*	*08/31/22 08:01*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	1500		110	67	ug/L		08/30/22 09:11	08/31/22 05:18	1
Motor Oil Range Organics (C24-C40)	500		360	190	ug/L		08/30/22 09:11	08/31/22 05:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*12*	*Q*	*56 - 125*	*08/30/22 09:11*	*08/31/22 05:18*	*1*

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117282-1

Client Sample ID: A3SVMP-WQTB01-2208WK4

Lab Sample ID: 580-117282-2
Date Collected: 08/23/22 00:01
Matrix: Water
Date Received: 08/25/22 09:30

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U M	100	31	ug/L			08/31/22 00:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*69 - 133*		*08/31/22 00:43*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U	1.0	0.24	ug/L			08/31/22 12:29	1
Toluene	0.80	U	1.0	0.39	ug/L			08/31/22 12:29	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			08/31/22 12:29	1
m-Xylene & p-Xylene	0.80	U	2.0	0.53	ug/L			08/31/22 12:29	1
o-Xylene	0.80	U	1.0	0.39	ug/L			08/31/22 12:29	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			08/31/22 12:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*85 - 114*		*08/31/22 12:29*	*1*
Toluene-d8 (Surr)	*95*		*89 - 112*		*08/31/22 12:29*	*1*
Dibromofluoromethane (Surr)	*89*		*80 - 119*		*08/31/22 12:29*	*1*
1,2-Dichloroethane-d4 (Surr)	*86*		*81 - 118*		*08/31/22 12:29*	*1*

QC Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117282-1

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 580-402429/5
Matrix: Water
Analysis Batch: 402429

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U M	100	31	ug/L			08/30/22 22:17	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*69 - 133*		*08/30/22 22:17*	*1*

Lab Sample ID: LCS 580-402429/8
Matrix: Water
Analysis Batch: 402429

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics [C6 - C10]	1000	1040		ug/L		104	78 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*107*		*69 - 133*

Lab Sample ID: LCSD 580-402429/9
Matrix: Water
Analysis Batch: 402429

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics [C6 - C10]	1000	1120		ug/L		112	78 - 122	7	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*106*		*69 - 133*

Lab Sample ID: MB 580-402520/4
Matrix: Water
Analysis Batch: 402520

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U M	100	31	ug/L			08/31/22 10:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*87*		*69 - 133*		*08/31/22 10:25*	*1*

Lab Sample ID: LCS 580-402520/7
Matrix: Water
Analysis Batch: 402520

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics [C6 - C10]	1000	824	M	ug/L		82	78 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*91*		*69 - 133*

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: LCSD 580-402520/8
Matrix: Water
Analysis Batch: 402520

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics [C6 - C10]			1000	808		ug/L		81	78 - 122	2	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*89*		*69 - 133*

Lab Sample ID: MB 580-403931/4
Matrix: Water
Analysis Batch: 403931

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U	100	31	ug/L			09/15/22 01:21	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*81*		*69 - 133*		*09/15/22 01:21*	*1*

Lab Sample ID: LCS 580-403931/5
Matrix: Water
Analysis Batch: 403931

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Gasoline Range Organics [C6 - C10]			1000	832		ug/L		83	78 - 122		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*85*		*69 - 133*

Lab Sample ID: LCSD 580-403931/6
Matrix: Water
Analysis Batch: 403931

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics [C6 - C10]			1000	830		ug/L		83	78 - 122	0	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*85*		*69 - 133*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 580-402517/4
Matrix: Water
Analysis Batch: 402517

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U	1.0	0.24	ug/L			08/31/22 10:25	1
Toluene	0.80	U	1.0	0.39	ug/L			08/31/22 10:25	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			08/31/22 10:25	1

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 580-402517/4
Matrix: Water
Analysis Batch: 402517

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
m-Xylene & p-Xylene	0.80	U	2.0	0.53	ug/L			08/31/22 10:25	1
o-Xylene	0.80	U	1.0	0.39	ug/L			08/31/22 10:25	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			08/31/22 10:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*102*		*85 - 114*		*08/31/22 10:25*	*1*
Toluene-d8 (Surr)	*97*		*89 - 112*		*08/31/22 10:25*	*1*
Dibromofluoromethane (Surr)	*88*		*80 - 119*		*08/31/22 10:25*	*1*
1,2-Dichloroethane-d4 (Surr)	*85*		*81 - 118*		*08/31/22 10:25*	*1*

Lab Sample ID: LCS 580-402517/5
Matrix: Water
Analysis Batch: 402517

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	10.0	9.86		ug/L		99	79 - 120
Toluene	10.0	9.52		ug/L		95	80 - 121
Ethylbenzene	10.0	9.51		ug/L		95	79 - 121
m-Xylene & p-Xylene	10.0	9.67		ug/L		97	80 - 121
o-Xylene	10.0	9.58		ug/L		96	78 - 122
Xylenes, Total	20.0	19.3		ug/L		96	79 - 121

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*106*		*85 - 114*
Toluene-d8 (Surr)	*95*		*89 - 112*
Dibromofluoromethane (Surr)	*96*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*90*		*81 - 118*

Lab Sample ID: LCSD 580-402517/6
Matrix: Water
Analysis Batch: 402517

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	10.0	9.70		ug/L		97	79 - 120	2	20
Toluene	10.0	9.36		ug/L		94	80 - 121	2	20
Ethylbenzene	10.0	9.59		ug/L		96	79 - 121	1	20
m-Xylene & p-Xylene	10.0	9.76		ug/L		98	80 - 121	1	20
o-Xylene	10.0	9.69		ug/L		97	78 - 122	1	20
Xylenes, Total	20.0	19.5		ug/L		97	79 - 121	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*107*		*85 - 114*
Toluene-d8 (Surr)	*94*		*89 - 112*
Dibromofluoromethane (Surr)	*96*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*89*		*81 - 118*

QC Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117282-1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-402294/1-A
Matrix: Water
Analysis Batch: 402509

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 402294

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.080	U	0.10	0.033	ug/L		08/30/22 09:17	08/31/22 11:25	1
2-Methylnaphthalene	0.080	U	0.20	0.039	ug/L		08/30/22 09:17	08/31/22 11:25	1
Naphthalene	0.40	U	0.50	0.16	ug/L		08/30/22 09:17	08/31/22 11:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*54*	*M*	*40 - 140*	*08/30/22 09:17*	*08/31/22 11:25*	*1*
Fluoranthene-d10 (Surr)	*87*		*40 - 140*	*08/30/22 09:17*	*08/31/22 11:25*	*1*
Terphenyl-d14	*102*		*58 - 132*	*08/30/22 09:17*	*08/31/22 11:25*	*1*

Lab Sample ID: LCS 580-402294/2-A
Matrix: Water
Analysis Batch: 402455

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 402294

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	4.00	2.20		ug/L		55	41 - 115
2-Methylnaphthalene	4.00	2.20		ug/L		55	39 - 114
Naphthalene	4.00	2.10		ug/L		52	43 - 114

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*55*		*40 - 140*
Fluoranthene-d10 (Surr)	*81*		*40 - 140*
Terphenyl-d14	*89*		*58 - 132*

Lab Sample ID: LCSD 580-402294/3-A
Matrix: Water
Analysis Batch: 402455

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 402294

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene	4.00	2.04		ug/L		51	41 - 115	7	20
2-Methylnaphthalene	4.00	2.05		ug/L		51	39 - 114	7	20
Naphthalene	4.00	2.04		ug/L		51	43 - 114	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*57*		*40 - 140*
Fluoranthene-d10 (Surr)	*78*		*40 - 140*
Terphenyl-d14	*87*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-402293/1-A
Matrix: Water
Analysis Batch: 402451

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 402293

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	100	U	110	65	ug/L		08/30/22 09:11	08/31/22 14:07	1
Motor Oil Range Organics (C24-C40)	300	U	350	180	ug/L		08/30/22 09:11	08/31/22 14:07	1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: MB 580-402293/1-A
Matrix: Water
Analysis Batch: 402451

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 402293

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*57*		*56 - 125*	*08/30/22 09:11*	*08/31/22 14:07*	*1*

Lab Sample ID: LCS 580-402293/2-A
Matrix: Water
Analysis Batch: 402451

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 402293

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	4000	2400		ug/L		60	36 - 132
Motor Oil Range Organics (C24-C40)	4000	2850		ug/L		71	41 - 113

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*67*	*M*	*56 - 125*

Lab Sample ID: LCSD 580-402293/3-A
Matrix: Water
Analysis Batch: 402451

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 402293

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	4000	2450		ug/L		61	36 - 132	2	20
Motor Oil Range Organics (C24-C40)	4000	2890		ug/L		72	41 - 113	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*70*	*M*	*56 - 125*

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117282-1

Client Sample ID: A3-010SVMP-WGN01B-2208WK4 — Lab Sample ID: 580-117282-1

Date Collected: 08/23/22 10:30 — **Matrix: Water**
Date Received: 08/25/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260/CALUFT DOD		1	402520	RJL	EET SEA	08/31/22 12:53
Total/NA	Analysis	8260/CALUFT DOD	RA	1	403931	BNM	EET SEA	09/15/22 07:30
Total/NA	Analysis	8260D		1	402517	RJL	EET SEA	08/31/22 12:53
Total/NA	Prep	3510C			402294	JJY	EET SEA	08/30/22 09:17
Total/NA	Analysis	8270E SIM		1	402455	E1L	EET SEA	08/31/22 08:01
Total/NA	Prep	3510C			402293	JJY	EET SEA	08/30/22 09:11
Total/NA	Analysis	8015D DRO		1	402451	JSM	EET SEA	08/31/22 05:18

Client Sample ID: A3SVMP-WQTB01-2208WK4 — Lab Sample ID: 580-117282-2

Date Collected: 08/23/22 00:01 — **Matrix: Water**
Date Received: 08/25/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260/CALUFT DOD		1	402429	BNM	EET SEA	08/31/22 00:43
Total/NA	Analysis	8260D		1	402517	RJL	EET SEA	08/31/22 12:29

Laboratory References:
EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-117282-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

Sample Summary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117282-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-117282-1	A3-010SVMP-WGN01B-2208WK4	Water	08/23/22 10:30	08/25/22 09:30
580-117282-2	A3SVMP-WQTB01-2208WK4	Water	08/23/22 00:01	08/25/22 09:30

580-117282 Chain of Custody

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

Client Information

Client Contact: [redacted] (b) (6)
Company: AECOM-Honolulu
Address: 1001 Bishop Street, ASB Tower, Suite 1600
City: Honolulu
State, Zip: Hawaii, 96813
Phone: [redacted] (b) (6)
Email: [redacted] (b) (6)@aecom.com/ [redacted] (b) (6) @aecom.com
Project Name: LNAPL Characterization
Site: Red Hill Bulk Fuel Storage Facility

Samp: [redacted] (b) (6)
Phone: [redacted] (b) (6)
PWSID:
Due Date Requested:
TAT Requested (days): 7
Compliance Project: Δ Yes Δ No
PO #: 141286
WO #:
Project #: 60674414
SSOW#:

Lab PM: [redacted] (b) (6)
E-Mail: [redacted] (b) (6) @EurofinsET.com
Carrier Tracking No(s):
State of Origin: Hawaii

COC No: 08242022 SIT ~~PWL~~ - SEA - 01
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, M=MIS, L=low-flow, B=bailer)	Matrix (WG=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3-010SVMP-WGN01B-2208WK4	8/23/22	1030	B	WG	N	N		[redacted] (b) (6)	3 4-40mL	2-250mlAmb	2-250mlAmb					
~~A3-BH-WGN01B-2208WK4~~	~~8/23/22~~		~~B~~	~~WG~~	N	N			~~4-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
~~A3-BH-WGN01B-2208WK4~~	~~8/23/22~~		~~B~~	~~WG~~	N	N			~~4-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
A3SVMP-WQTB01-2208WK4	8/23/22	—		WQ					3-40mL							
					N	N										
			[redacted] (b) (6)	8/28/2022												
					N	N										
					N	N										

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Deliverable Requested: I, II, III, IV, Other (specify) IV

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return To Client X Disposal By Lab Archive For _____ Months

Special Instructions/QC Requirements:

Empty Kit Relinquished by:
Date:
Time:
Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
[redacted] (b) (6)	08/23/2022 1800	AECOM	[redacted] (b) (6)	8/23/22 1800	AECOM
[redacted]	8/24/22 1159	AECOM	[redacted] (b) (6)	8/25/22 0930	[illegible]
[redacted]					

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: A2 4.8/4.2
FedEx
LgB
Bubble

580-117282 Chain of Custody

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

Client Information

Client Contact: (b) (6)
Company: AECOM-Honolulu
Address: 1001 Bishop Street, ASB Tower, Suite 1600
City: Honolulu
State, Zip: Hawaii, 96813
Phone: (b) (6)
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com
Project Name: LNAPL Characterization
Site: Red Hill Bulk Fuel Storage Facility

Samp: (b) (6)
Phone: (b) (6)
PWSID:
Due Date Requested:
TAT Requested (days): 7
Compliance Project: Δ Yes Δ No
PO #: 141286
WO #:
Project #: 60674414
SSOW#:

Lab PM: (b) (6)
E-Mail: (b) (6) @EurofinsET.com
Carrier Tracking No(s):
State of Origin: Hawaii

COC No: 08242022 SIT-SEA-01
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, M=MIS, LF=low-flow, B=bailer)	Matrix (WG=Groundwater, SO=soil, PR=product GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C				Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3-010SVMP-WGN01B-2208WK4	8/23/22	1030	B	WG	N	N		(b) (6)	3 4-40mL	2-250mlAmb	2-250mlAmb					
~~A3 BH-WGN01B-2208WK4~~	~~8/23/22~~		~~B~~	~~WG~~	N	N			~~4-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
~~A3 BH-WGN01B-2208WK4~~	~~8/23/22~~		~~B~~	~~WG~~	N	N			~~4-40mL~~	~~2-250mlAmb~~	~~2-250mlAmb~~					
A3SVMP-WQTB01-2208WK4	8/23/22	—		WQ					3-40mL							
					N	N										
			(b) (6)	8/28/2022												
					N	N										
					N	N										

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - Methanol
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Deliverable Requested: I, II, III, IV, Other (specify) IV

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return To Client X Disposal By Lab Archive For _____ Months

Special Instructions/QC Requirements:

Empty Kit Relinquished by:
Date:
Time:
Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6)	08/23/2022 1800	AECOM	(b) (6)	8/23/22 1800	AECOM
	8/24/22 1159	AECOM	(b) (6)	8/25/22 0930	[illegible]

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks: A2 4.8/4.2
FedEx
LgB
Bubble

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-117282-1

Login Number: 117282
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-117418-1
Client Project/Site: RH Site Characterization JBPHH N62742-17
Revision: 1

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/12/2022 8:22:25 AM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

Review your project results through my EOL

Have a Question? Ask The Expert

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-117418-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: RH Site Characterization JBPHH N62742-17
Report Number: 580-117418-1

REVISION 1: SEPTEMBER 12, 2022
Report revised to correct the client ID for sample 1.

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
Three samples were received on 8/30/2022 9:35 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 3.3º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)
Samples A3375BH-SON01-000.0-001.0 (580-117418-1), A3-110BH-SON01-004.0-005.0 (580-117418-2) and A3-090BH-SON01-003.0-004.0 (580-117418-3) were analyzed for semivolatile organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 08/31/2022 and analyzed on 09/06/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS
Samples A3375BH-SON01-000.0-001.0 (580-117418-1), A3-110BH-SON01-004.0-005.0 (580-117418-2) and A3-090BH-SON01-003.0-004.0 (580-117418-3) were analyzed for diesel range organics in accordance with 8015DRO. The samples were prepared on 09/07/2022 and analyzed on 09/09/2022.

The laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 580-403103 and analytical batch 580-403368 recovered outside control limits for the following analytes: Motor Oil Range Organics (C24-C40). The analyte was biased high in the LCS/LCSD and was not detected in the associated samples; therefore, the data have been reported.

Job ID: 580-117418-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

Continuing calibration verification (CCV) standard associated with batch 580-403440 recovered outside %Drift acceptance criteria for o-Terphenyl surrogate by 0.2%, therefore it passes via rounding. The %Recovery is within acceptance criteria for the surrogate in the CCV and associated samples; therefore, the data are qualified and reported. (CCV 580-403440/14)

Diesel Range Organics (C10-C24) failed the recovery criteria high for the MS of sample A3-110BH-SON01-004.0-005.0MS (580-117418-2) in batch 580-403440. Diesel Range Organics (C10-C24) and Motor Oil Range Organics (C24-C40) failed the recovery criteria high for the MSD of sample A3-110BH-SON01-004.0-005.0MSD (580-117418-2) in batch 580-403440. Motor Oil Range Organics (C24-C40) exceeded the RPD limit. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

The presence of the '4' qualifier indicates analytes where the concentration in the unspiked sample exceeded four times the spiking amount.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Samples A3375BH-SON01-000.0-001.0 (580-117418-1), A3-110BH-SON01-004.0-005.0 (580-117418-2) and A3-090BH-SON01-003.0-004.0 (580-117418-3) were analyzed for percent solids in accordance with Method 2540G. The samples were analyzed on 09/07/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117418-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
J1	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
M	Manual integrated compound.
Q	One or more quality control criteria failed.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117418-1

Client Sample ID: A3375BH-SON01-000.0-001.0

Lab Sample ID: 580-117418-1
Date Collected: 08/26/22 10:20
Matrix: Solid
Date Received: 08/30/22 09:35
Percent Solids: 73.5

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0020	U	0.0067	0.00084	mg/Kg	☼	08/31/22 13:16	09/06/22 16:58	1
2-Methylnaphthalene	0.0040	U	0.0067	0.0027	mg/Kg	☼	08/31/22 13:16	09/06/22 16:58	1
Naphthalene	0.0053	U M	0.0067	0.0022	mg/Kg	☼	08/31/22 13:16	09/06/22 16:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*76*		*40 - 140*	*08/31/22 13:16*	*09/06/22 16:58*	*1*
Fluoranthene-d10 (Surr)	*92*		*40 - 140*	*08/31/22 13:16*	*09/06/22 16:58*	*1*
Terphenyl-d14	*101*		*58 - 132*	*08/31/22 13:16*	*09/06/22 16:58*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	40	U	66	13	mg/Kg	☼	09/07/22 08:33	09/09/22 00:49	1
Motor Oil Range Organics (C24-C40)	40	U Q	66	26	mg/Kg	☼	09/07/22 08:33	09/09/22 00:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*80*		*45 - 130*	*09/07/22 08:33*	*09/09/22 00:49*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**73.5**		0.1	0.1	%			09/07/22 13:53	1
Percent Moisture	**26.5**		0.1	0.1	%			09/07/22 13:53	1

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117418-1

Client Sample ID: A3-110BH-SON01-004.0-005.0

Lab Sample ID: 580-117418-2

Date Collected: 08/29/22 09:58
Date Received: 08/30/22 09:35

Matrix: Solid
Percent Solids: 65.7

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	6.5		0.0074	0.00093	mg/Kg	☼	08/31/22 13:16	09/06/22 17:23	1
2-Methylnaphthalene	8.9		0.0074	0.0030	mg/Kg	☼	08/31/22 13:16	09/06/22 17:23	1
Naphthalene	3.3		0.0074	0.0024	mg/Kg	☼	08/31/22 13:16	09/06/22 17:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*67*		*40 - 140*	*08/31/22 13:16*	*09/06/22 17:23*	*1*
Fluoranthene-d10 (Surr)	*88*		*40 - 140*	*08/31/22 13:16*	*09/06/22 17:23*	*1*
Terphenyl-d14	*95*		*58 - 132*	*08/31/22 13:16*	*09/06/22 17:23*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	3100	J1	75	15	mg/Kg	☼	09/07/22 12:38	09/09/22 16:10	1
Motor Oil Range Organics (C24-C40)	45	U J1	75	30	mg/Kg	☼	09/07/22 12:38	09/09/22 16:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*76*	*Q*	*45 - 130*	*09/07/22 12:38*	*09/09/22 16:10*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	65.7		0.1	0.1	%			09/07/22 13:53	1
Percent Moisture	34.3		0.1	0.1	%			09/07/22 13:53	1

Client Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117418-1

Client Sample ID: A3-090BH-SON01-003.0-004.0

Lab Sample ID: 580-117418-3

Date Collected: 08/29/22 11:41
Date Received: 08/30/22 09:35

Matrix: Solid
Percent Solids: 70.1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	3.2		0.0069	0.00088	mg/Kg	☼	08/31/22 13:16	09/06/22 17:48	1
2-Methylnaphthalene	4.5		0.0069	0.0028	mg/Kg	☼	08/31/22 13:16	09/06/22 17:48	1
Naphthalene	1.5		0.0069	0.0023	mg/Kg	☼	08/31/22 13:16	09/06/22 17:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*68*	*M*	*40 - 140*	*08/31/22 13:16*	*09/06/22 17:48*	*1*
Fluoranthene-d10 (Surr)	*93*		*40 - 140*	*08/31/22 13:16*	*09/06/22 17:48*	*1*
Terphenyl-d14	*101*		*58 - 132*	*08/31/22 13:16*	*09/06/22 17:48*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	1900		70	14	mg/Kg	☼	09/07/22 12:38	09/09/22 17:10	1
Motor Oil Range Organics (C24-C40)	42	U	70	28	mg/Kg	☼	09/07/22 12:38	09/09/22 17:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*79*	*Q*	*45 - 130*	*09/07/22 12:38*	*09/09/22 17:10*	*1*

General Chemistry

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	70.1		0.1	0.1	%			09/07/22 13:53	1
Percent Moisture	29.9		0.1	0.1	%			09/07/22 13:53	1

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-402547/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 402980 — **Prep Batch: 402547**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.0015	U	0.0050	0.00063	mg/Kg		08/31/22 13:16	09/06/22 14:54	1
2-Methylnaphthalene	0.0030	U	0.0050	0.0021	mg/Kg		08/31/22 13:16	09/06/22 14:54	1
Naphthalene	0.0040	U	0.0050	0.0016	mg/Kg		08/31/22 13:16	09/06/22 14:54	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*91*		*40 - 140*	*08/31/22 13:16*	*09/06/22 14:54*	*1*
Fluoranthene-d10 (Surr)	*102*		*40 - 140*	*08/31/22 13:16*	*09/06/22 14:54*	*1*
Terphenyl-d14	*112*		*58 - 132*	*08/31/22 13:16*	*09/06/22 14:54*	*1*

Lab Sample ID: LCS 580-402547/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 402980 — **Prep Batch: 402547**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1-Methylnaphthalene	1.00	0.976		mg/Kg		98	43 - 111
2-Methylnaphthalene	1.00	1.01		mg/Kg		101	39 - 114
Naphthalene	1.00	0.887		mg/Kg		89	38 - 111

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*106*		*40 - 140*
Fluoranthene-d10 (Surr)	*93*		*40 - 140*
Terphenyl-d14	*102*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-403103/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403368 — **Prep Batch: 403103**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		09/07/22 08:33	09/08/22 23:48	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		09/07/22 08:33	09/08/22 23:48	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*82*		*45 - 130*	*09/07/22 08:33*	*09/08/22 23:48*	*1*

Lab Sample ID: LCS 580-403103/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403368 — **Prep Batch: 403103**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Diesel Range Organics (C10-C24)	500	483		mg/Kg		97	75 - 125
Motor Oil Range Organics (C24-C40)	500	556	Q	mg/Kg		111	39 - 106

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*106*	*M*	*45 - 130*

QC Sample Results

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117418-1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: LCSD 580-403103/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403368 — **Prep Batch: 403103**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			500	476		mg/Kg		95	75 - 125	1	20
Motor Oil Range Organics (C24-C40)			500	545	Q	mg/Kg		109	39 - 106	2	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*106*		*45 - 130*

Lab Sample ID: 580-117418-1 MS — **Client Sample ID: A3375BH-SON01-000.0-001.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403368 — **Prep Batch: 403103**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)	40	U	666	632		mg/Kg	☼	95	75 - 125		
Motor Oil Range Organics (C24-C40)	40	U Q	666	682		mg/Kg	☼	102	39 - 106		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*94*		*45 - 130*

Lab Sample ID: 580-117418-1 MSD — **Client Sample ID: A3375BH-SON01-000.0-001.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403368 — **Prep Batch: 403103**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	40	U	658	592		mg/Kg	☼	90	75 - 125	7	20
Motor Oil Range Organics (C24-C40)	40	U Q	658	609		mg/Kg	☼	92	39 - 106	11	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*89*		*45 - 130*

Lab Sample ID: MB 580-403152/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403440 — **Prep Batch: 403152**

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	30	U	50	9.9	mg/Kg		09/07/22 12:38	09/09/22 15:10	1
Motor Oil Range Organics (C24-C40)	30	U	50	20	mg/Kg		09/07/22 12:38	09/09/22 15:10	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*76*		*45 - 130*	*09/07/22 12:38*	*09/09/22 15:10*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC) (Continued)

Lab Sample ID: LCS 580-403152/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403440 — **Prep Batch: 403152**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)			500	446		mg/Kg		89	75 - 125		
Motor Oil Range Organics (C24-C40)			500	470		mg/Kg		94	39 - 106		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*90*		*45 - 130*

Lab Sample ID: LCSD 580-403152/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403440 — **Prep Batch: 403152**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			500	450		mg/Kg		90	75 - 125	1	20
Motor Oil Range Organics (C24-C40)			500	474		mg/Kg		95	39 - 106	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*87*	*M*	*45 - 130*

Lab Sample ID: 580-117418-2 MS — **Client Sample ID: A3-110BH-SON01-004.0-005.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403440 — **Prep Batch: 403152**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)	3100	J1	743	4230	4	mg/Kg	☼	154	75 - 125		
Motor Oil Range Organics (C24-C40)	45	U J1	743	691		mg/Kg	☼	93	39 - 106		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
o-Terphenyl	*87*		*45 - 130*

Lab Sample ID: 580-117418-2 MSD — **Client Sample ID: A3-110BH-SON01-004.0-005.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 403440 — **Prep Batch: 403152**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)	3100	J1	737	4200	4	mg/Kg	☼	152	75 - 125	1	20
Motor Oil Range Organics (C24-C40)	45	U J1	737	994	J1	mg/Kg	☼	135	39 - 106	36	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
o-Terphenyl	*96*		*45 - 130*

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117418-1

Client Sample ID: A3375BH-SON01-000.0-001.0
Lab Sample ID: 580-117418-1
Date Collected: 08/26/22 10:20
Matrix: Solid
Date Received: 08/30/22 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	403168	RJL	EET SEA	09/07/22 13:53

Client Sample ID: A3375BH-SON01-000.0-001.0
Lab Sample ID: 580-117418-1
Date Collected: 08/26/22 10:20
Matrix: Solid
Date Received: 08/30/22 09:35
Percent Solids: 73.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			402547	TOA	EET SEA	08/31/22 13:16
Total/NA	Analysis	8270E SIM		1	402980	JSM	EET SEA	09/06/22 16:58
Total/NA	Prep	3546			403103	S1B	EET SEA	09/07/22 08:33
Total/NA	Analysis	8015D DRO		1	403368	DH	EET SEA	09/09/22 00:49

Client Sample ID: A3-110BH-SON01-004.0-005.0
Lab Sample ID: 580-117418-2
Date Collected: 08/29/22 09:58
Matrix: Solid
Date Received: 08/30/22 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	403168	RJL	EET SEA	09/07/22 13:53

Client Sample ID: A3-110BH-SON01-004.0-005.0
Lab Sample ID: 580-117418-2
Date Collected: 08/29/22 09:58
Matrix: Solid
Date Received: 08/30/22 09:35
Percent Solids: 65.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			402547	TOA	EET SEA	08/31/22 13:16
Total/NA	Analysis	8270E SIM		1	402980	JSM	EET SEA	09/06/22 17:23
Total/NA	Prep	3546			403152	TOA	EET SEA	09/07/22 12:38
Total/NA	Analysis	8015D DRO		1	403440	DH	EET SEA	09/09/22 16:10

Client Sample ID: A3-090BH-SON01-003.0-004.0
Lab Sample ID: 580-117418-3
Date Collected: 08/29/22 11:41
Matrix: Solid
Date Received: 08/30/22 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	2540G		1	403168	RJL	EET SEA	09/07/22 13:53

Client Sample ID: A3-090BH-SON01-003.0-004.0
Lab Sample ID: 580-117418-3
Date Collected: 08/29/22 11:41
Matrix: Solid
Date Received: 08/30/22 09:35
Percent Solids: 70.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3546			402547	TOA	EET SEA	08/31/22 13:16
Total/NA	Analysis	8270E SIM		1	402980	JSM	EET SEA	09/06/22 17:48
Total/NA	Prep	3546			403152	TOA	EET SEA	09/07/22 12:38
Total/NA	Analysis	8015D DRO		1	403440	DH	EET SEA	09/09/22 17:10

Lab Chronicle

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117418-1

Laboratory References:

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Job ID: 580-117418-1
Project/Site: RH Site Characterization JBPHH N62742-17

Laboratory: Eurofins Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Solid	Percent Moisture
2540G		Solid	Percent Solids

Sample Summary

Client: AECOM
Project/Site: RH Site Characterization JBPHH N62742-17

Job ID: 580-117418-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-117418-1	A3375BH-SON01-000.0-001.0	Solid	08/26/22 10:20	08/30/22 09:35
580-117418-2	A3-110BH-SON01-004.0-005.0	Solid	08/29/22 09:58	08/30/22 09:35
580-117418-3	A3-090BH-SON01-003.0-004.0	Solid	08/29/22 11:41	08/30/22 09:35

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

Client Information

Client Contact: (b) (6)
Company: AECOM-Honolulu
Address: 1001 Bishop Street, ASB Tower, Suite 1600
City: Honolulu
State, Zip: Hawaii, 96813
Phone: (b) (6)
Email: (b) (6) @aecom.com/ (b) (6) @aecom.com
Project Name: LNAPL Characterization
Site: Red Hill Bulk Fuel Storage Facility

Sampler: (b) (6)
Phone: (b) (6)
PWSID:
Due Date Requested:
TAT Requested (days): 7
Compliance Project: Δ Yes Δ No
PO #: 141286
WO #:
Project #: 60674414
SSOW#:

Lab PM: (b) (6)
E-Mail: (b) (6) @EurofinsET.com
Carrier Tracking No(s):
State of Origin: Hawaii

COC No: 0829202225IT-SEA-01
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, MS/MSD, L=flow-flow, B=bailer)	Matrix (W=Groundwater, S=soil, P=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	#REF!	N, IMN, 2MN, TPH-d/o 8270D, SIM/3550 #REF!	#REF!	#REF!	#REF!	Total Number of containers	Special Instructions/Note:
	8/26		Preservation Code:				F	A					
A3 375 BH-SON01-000.0 - 001.0	8/26/22	1020	G	SO	N	N		1-4ozJar					SAMPLE DATE 8/26/2022
A3 -110 BH-SON01-004.0 - 005.0	8/29/22	0958	G	SO	N	N		1-4ozJar					Sample Date 8/29/22
A3 -090 BH-SON01-003.0-004.0	8/29/22	1141	G	SO	N	N		1-4ozJar					Sample Date 8/29/22
~~A3-SQTB01-2208WK4~~	~~8/22/22~~			~~SQ~~									
					N	N							
					N	N							
					N	N							
					N	N							

580-117418 Chain of Custody

Therm. ID: A2 Cor: 3.3 ° Unc: 2.7 °
Cooler Dsc: MR
Packing: Bub
Cust. Seal: Yes ___ No ✓
Blue Ice Wet, Dry, None
FedEx: P.O
UPS:
Lab Courier:
Other:

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - Di Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - Methanol

Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Deliverable Requested: I, II, III, IV, Other (specify) IV

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return To Client X Disposal By Lab Archive For ____ Months

Special Instructions/QC Requirements:

Empty Kit Relinquished by: Date: Time: (b) (6) Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6)	08/29/2022 1325	AECOM	(b) (6)	8-29-22 1325	AECOM
(b) (6)	1345 8-29-22	AECOM	(b) (6)	8/30/22 0935	EETN
	Date/Time:	Company		Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-117418-1

Login Number: 117418

List Source: Eurofins Seattle

List Number: 1

Creator: [redacted] (b) (6)

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-117885-1
Client Project/Site: LNAPL Site Characterization

For:
AECOM
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: [redacted]

[redacted]

Authorized for release by:
9/23/2022 11:02:28 PM

[redacted], Project Manager II
[redacted]
[redacted]@et.eurofinsus.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 580-117885-1

Laboratory: Eurofins Seattle

Narrative

CASE NARRATIVE
Client: AECOM
Project: LNAPL Site Characterization
Report Number: 580-117885-1

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

Following DoD QSM guidelines, manual integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure, Acceptable Manual Integration Practices, SOP No.: Q-S-002. The reason(s) for manual integration have been documented on the affected chromatogram(s), which is/are provided in the raw data package. The raw data also includes the original chromatogram(s) prior to any manual integration being performed. Manual integrations are detailed in the manual integration summary forms following this narrative.

It should be noted that samples with elevated Limits of Quantitation (LOQs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the LOQs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT

Five samples were received on 9/14/2022 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 2 coolers at receipt time were 1.4º C and 2.0º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

GASOLINE RANGE ORGANICS (GRO)

Samples A3375TW-WGN01LF-2209WK3 (580-117885-1), A3325TW-WGN01LF-2209WK3 (580-117885-2), A3210TW-WGN01LF-2209WK3 (580-117885-3), A3050TW-WGN01LF-2209WK3 (580-117885-4) and Trip Blank-WQTBLF-2209WK3 (580-117885-5) were analyzed for gasoline range organics (GRO) in accordance with 8260B CALUFT. The samples were analyzed on 09/22/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GC-MS)

Samples A3375TW-WGN01LF-2209WK3 (580-117885-1), A3325TW-WGN01LF-2209WK3 (580-117885-2), A3210TW-WGN01LF-2209WK3 (580-117885-3), A3050TW-WGN01LF-2209WK3 (580-117885-4) and Trip Blank-WQTBLF-2209WK3 (580-117885-5) were analyzed for volatile organic compounds (GC-MS) in accordance with 8260D. The samples were analyzed on 09/22/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS - SELECTED ION MODE (SIM)

Samples A3375TW-WGN01LF-2209WK3 (580-117885-1), A3325TW-WGN01LF-2209WK3 (580-117885-2), A3210TW-WGN01LF-2209WK3 (580-117885-3) and A3050TW-WGN01LF-2209WK3 (580-117885-4) were analyzed for semivolatile

Job ID: 580-117885-1 (Continued)

Laboratory: Eurofins Seattle (Continued)

organic compounds - Selected Ion Mode (SIM) in accordance with 8270E SIM. The samples were prepared on 09/16/2022 and analyzed on 09/20/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DIESEL RANGE ORGANICS

Samples A3375TW-WGN01LF-2209WK3 (580-117885-1), A3325TW-WGN01LF-2209WK3 (580-117885-2), A3210TW-WGN01LF-2209WK3 (580-117885-3) and A3050TW-WGN01LF-2209WK3 (580-117885-4) were analyzed for Diesel Range Organics in accordance with 8015D DRO. The samples were prepared on 09/19/2022 and analyzed on 09/19/2022 and 09/20/2022.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC/MS Semi VOA

Qualifier	Qualifier Description
M	Manual integrated compound.
U	Undetected at the Limit of Detection.

GC Semi VOA

Qualifier	Qualifier Description
J	Estimated: The analyte was positively identified; the quantitation is an estimation
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Client Sample ID: A3375TW-WGN01LF-2209WK3

Lab Sample ID: 580-117885-1

Date Collected: 09/12/22 10:00
Matrix: Water
Date Received: 09/14/22 09:30

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U M	100	31	ug/L			09/22/22 17:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*78*	*M*	*69 - 133*		*09/22/22 17:24*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U M	1.0	0.24	ug/L			09/22/22 17:24	1
Toluene	0.80	U	1.0	0.39	ug/L			09/22/22 17:24	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			09/22/22 17:24	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			09/22/22 17:24	1
o-Xylene	0.80	U M	1.0	0.39	ug/L			09/22/22 17:24	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			09/22/22 17:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*92*	*M*	*85 - 114*		*09/22/22 17:24*	*1*
Toluene-d8 (Surr)	*102*		*89 - 112*		*09/22/22 17:24*	*1*
Dibromofluoromethane (Surr)	*97*		*80 - 119*		*09/22/22 17:24*	*1*
1,2-Dichloroethane-d4 (Surr)	*86*		*81 - 118*		*09/22/22 17:24*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.087	U M	0.11	0.036	ug/L		09/16/22 09:10	09/20/22 16:26	1
2-Methylnaphthalene	0.087	U M	0.22	0.042	ug/L		09/16/22 09:10	09/20/22 16:26	1
Naphthalene	0.43	U M	0.54	0.18	ug/L		09/16/22 09:10	09/20/22 16:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*57*		*40 - 140*	*09/16/22 09:10*	*09/20/22 16:26*	*1*
Fluoranthene-d10 (Surr)	*83*		*40 - 140*	*09/16/22 09:10*	*09/20/22 16:26*	*1*
Terphenyl-d14	*95*		*58 - 132*	*09/16/22 09:10*	*09/20/22 16:26*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**74**	**J**	120	69	ug/L		09/19/22 10:30	09/19/22 22:49	1
Motor Oil Range Organics (C24-C40)	320	U	370	190	ug/L		09/19/22 10:30	09/19/22 22:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*75*		*56 - 125*	*09/19/22 10:30*	*09/19/22 22:49*	*1*

Client Sample Results

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Client Sample ID: A3325TW-WGN01LF-2209WK3

Lab Sample ID: 580-117885-2
Date Collected: 09/12/22 10:30
Matrix: Water
Date Received: 09/14/22 09:30

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U	100	31	ug/L			09/22/22 17:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*78*		*69 - 133*		*09/22/22 17:49*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U	1.0	0.24	ug/L			09/22/22 17:49	1
Toluene	0.80	U	1.0	0.39	ug/L			09/22/22 17:49	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			09/22/22 17:49	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			09/22/22 17:49	1
o-Xylene	0.80	U	1.0	0.39	ug/L			09/22/22 17:49	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			09/22/22 17:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*92*		*85 - 114*		*09/22/22 17:49*	*1*
Toluene-d8 (Surr)	*103*		*89 - 112*		*09/22/22 17:49*	*1*
Dibromofluoromethane (Surr)	*99*		*80 - 119*		*09/22/22 17:49*	*1*
1,2-Dichloroethane-d4 (Surr)	*86*		*81 - 118*		*09/22/22 17:49*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.083	U M	0.10	0.034	ug/L		09/16/22 09:10	09/20/22 16:46	1
2-Methylnaphthalene	0.083	U	0.21	0.041	ug/L		09/16/22 09:10	09/20/22 16:46	1
Naphthalene	0.42	U M	0.52	0.17	ug/L		09/16/22 09:10	09/20/22 16:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*60*		*40 - 140*	*09/16/22 09:10*	*09/20/22 16:46*	*1*
Fluoranthene-d10 (Surr)	*85*		*40 - 140*	*09/16/22 09:10*	*09/20/22 16:46*	*1*
Terphenyl-d14	*98*		*58 - 132*	*09/16/22 09:10*	*09/20/22 16:46*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**330**		110	66	ug/L		09/19/22 10:30	09/19/22 23:09	1
Motor Oil Range Organics (C24-C40)	**220**	**J**	350	180	ug/L		09/19/22 10:30	09/19/22 23:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*78*		*56 - 125*	*09/19/22 10:30*	*09/19/22 23:09*	*1*

Client Sample Results

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Client Sample ID: A3210TW-WGN01LF-2209WK3

Lab Sample ID: 580-117885-3

Date Collected: 09/12/22 11:10
Date Received: 09/14/22 09:30

Matrix: Water

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U	100	31	ug/L			09/22/22 18:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*79*		*69 - 133*		*09/22/22 18:13*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U	1.0	0.24	ug/L			09/22/22 18:13	1
Toluene	0.80	U	1.0	0.39	ug/L			09/22/22 18:13	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			09/22/22 18:13	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			09/22/22 18:13	1
o-Xylene	0.80	U	1.0	0.39	ug/L			09/22/22 18:13	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			09/22/22 18:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*93*		*85 - 114*		*09/22/22 18:13*	*1*
Toluene-d8 (Surr)	*101*		*89 - 112*		*09/22/22 18:13*	*1*
Dibromofluoromethane (Surr)	*95*		*80 - 119*		*09/22/22 18:13*	*1*
1,2-Dichloroethane-d4 (Surr)	*84*		*81 - 118*		*09/22/22 18:13*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.088	U	0.11	0.036	ug/L		09/16/22 09:10	09/20/22 17:05	1
2-Methylnaphthalene	0.088	U M	0.22	0.043	ug/L		09/16/22 09:10	09/20/22 17:05	1
Naphthalene	0.44	U M	0.55	0.18	ug/L		09/16/22 09:10	09/20/22 17:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*57*		*40 - 140*	*09/16/22 09:10*	*09/20/22 17:05*	*1*
Fluoranthene-d10 (Surr)	*82*		*40 - 140*	*09/16/22 09:10*	*09/20/22 17:05*	*1*
Terphenyl-d14	*95*		*58 - 132*	*09/16/22 09:10*	*09/20/22 17:05*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	110	U	120	69	ug/L		09/19/22 10:30	09/19/22 23:29	1
Motor Oil Range Organics (C24-C40)	320	U	370	190	ug/L		09/19/22 10:30	09/19/22 23:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*71*		*56 - 125*	*09/19/22 10:30*	*09/19/22 23:29*	*1*

Client Sample Results

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Client Sample ID: A3050TW-WGN01LF-2209WK3

Lab Sample ID: 580-117885-4

Date Collected: 09/12/22 11:50
Matrix: Water
Date Received: 09/14/22 09:30

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U	100	31	ug/L			09/22/22 18:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*82*		*69 - 133*		*09/22/22 18:38*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U	1.0	0.24	ug/L			09/22/22 18:38	1
Toluene	0.80	U	1.0	0.39	ug/L			09/22/22 18:38	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			09/22/22 18:38	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			09/22/22 18:38	1
o-Xylene	0.80	U	1.0	0.39	ug/L			09/22/22 18:38	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			09/22/22 18:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*85 - 114*		*09/22/22 18:38*	*1*
Toluene-d8 (Surr)	*101*		*89 - 112*		*09/22/22 18:38*	*1*
Dibromofluoromethane (Surr)	*95*		*80 - 119*		*09/22/22 18:38*	*1*
1,2-Dichloroethane-d4 (Surr)	*87*		*81 - 118*		*09/22/22 18:38*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.086	U M	0.11	0.036	ug/L		09/16/22 09:10	09/20/22 17:25	1
2-Methylnaphthalene	0.086	U M	0.22	0.042	ug/L		09/16/22 09:10	09/20/22 17:25	1
Naphthalene	0.43	U M	0.54	0.18	ug/L		09/16/22 09:10	09/20/22 17:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*66*		*40 - 140*	*09/16/22 09:10*	*09/20/22 17:25*	*1*
Fluoranthene-d10 (Surr)	*100*		*40 - 140*	*09/16/22 09:10*	*09/20/22 17:25*	*1*
Terphenyl-d14	*109*		*58 - 132*	*09/16/22 09:10*	*09/20/22 17:25*	*1*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	**1200**		120	69	ug/L		09/19/22 10:30	09/20/22 00:09	1
Motor Oil Range Organics (C24-C40)	**210**	**J**	370	190	ug/L		09/19/22 10:30	09/20/22 00:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*74*		*56 - 125*	*09/19/22 10:30*	*09/20/22 00:09*	*1*

Client Sample Results

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Client Sample ID: Trip Blank-WQTBLF-2209WK3

Lab Sample ID: 580-117885-5
Date Collected: 09/12/22 09:00
Matrix: Water
Date Received: 09/14/22 09:30

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U	100	31	ug/L			09/22/22 17:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*79*		*69 - 133*		*09/22/22 17:00*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U	1.0	0.24	ug/L			09/22/22 17:00	1
Toluene	0.80	U	1.0	0.39	ug/L			09/22/22 17:00	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			09/22/22 17:00	1
m-Xylene & p-Xylene	0.80	U M	2.0	0.53	ug/L			09/22/22 17:00	1
o-Xylene	0.80	U	1.0	0.39	ug/L			09/22/22 17:00	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			09/22/22 17:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*93*		*85 - 114*		*09/22/22 17:00*	*1*
Toluene-d8 (Surr)	*103*		*89 - 112*		*09/22/22 17:00*	*1*
Dibromofluoromethane (Surr)	*93*		*80 - 119*		*09/22/22 17:00*	*1*
1,2-Dichloroethane-d4 (Surr)	*83*		*81 - 118*		*09/22/22 17:00*	*1*

Method: 8260/CALUFT DOD - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 580-404701/5
Matrix: Water
Analysis Batch: 404701

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics [C6 - C10]	80	U M	100	31	ug/L			09/22/22 14:57	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*84*		*69 - 133*		*09/22/22 14:57*	*1*

Lab Sample ID: LCS 580-404701/8
Matrix: Water
Analysis Batch: 404701

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Gasoline Range Organics [C6 - C10]	1000	895	M	ug/L		90	78 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*84*		*69 - 133*

Lab Sample ID: LCSD 580-404701/9
Matrix: Water
Analysis Batch: 404701

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Gasoline Range Organics [C6 - C10]	1000	851	M	ug/L		85	78 - 122	5	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*77*		*69 - 133*

Method: 8260D - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 580-404698/5
Matrix: Water
Analysis Batch: 404698

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	0.50	U M	1.0	0.24	ug/L			09/22/22 14:57	1
Toluene	0.80	U	1.0	0.39	ug/L			09/22/22 14:57	1
Ethylbenzene	0.80	U	1.0	0.50	ug/L			09/22/22 14:57	1
m-Xylene & p-Xylene	0.80	U	2.0	0.53	ug/L			09/22/22 14:57	1
o-Xylene	0.80	U	1.0	0.39	ug/L			09/22/22 14:57	1
Xylenes, Total	0.80	U	2.0	0.53	ug/L			09/22/22 14:57	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*85 - 114*		*09/22/22 14:57*	*1*
Toluene-d8 (Surr)	*97*		*89 - 112*		*09/22/22 14:57*	*1*
Dibromofluoromethane (Surr)	*94*		*80 - 119*		*09/22/22 14:57*	*1*
1,2-Dichloroethane-d4 (Surr)	*85*		*81 - 118*		*09/22/22 14:57*	*1*

Method: 8260D - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 580-404698/6
Matrix: Water
Analysis Batch: 404698

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Benzene	10.0	9.59		ug/L		96	79 - 120
Toluene	10.0	10.1		ug/L		101	80 - 121
Ethylbenzene	10.0	9.58		ug/L		96	79 - 121
m-Xylene & p-Xylene	10.0	9.63		ug/L		96	80 - 121
o-Xylene	10.0	9.41		ug/L		94	78 - 122
Xylenes, Total	20.0	19.0		ug/L		95	79 - 121

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*97*		*85 - 114*
Toluene-d8 (Surr)	*101*		*89 - 112*
Dibromofluoromethane (Surr)	*97*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*84*		*81 - 118*

Lab Sample ID: LCSD 580-404698/7
Matrix: Water
Analysis Batch: 404698

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Benzene	10.0	9.50		ug/L		95	79 - 120	1	20
Toluene	10.0	9.73		ug/L		97	80 - 121	3	20
Ethylbenzene	10.0	9.49		ug/L		95	79 - 121	1	20
m-Xylene & p-Xylene	10.0	9.58		ug/L		96	80 - 121	0	20
o-Xylene	10.0	9.28		ug/L		93	78 - 122	1	20
Xylenes, Total	20.0	18.9		ug/L		94	79 - 121	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*97*		*85 - 114*
Toluene-d8 (Surr)	*99*		*89 - 112*
Dibromofluoromethane (Surr)	*99*		*80 - 119*
1,2-Dichloroethane-d4 (Surr)	*86*		*81 - 118*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 580-404068/1-A
Matrix: Water
Analysis Batch: 404363

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 404068

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	0.080	U M	0.10	0.033	ug/L		09/16/22 09:10	09/20/22 10:55	1
2-Methylnaphthalene	0.080	U M	0.20	0.039	ug/L		09/16/22 09:10	09/20/22 10:55	1
Naphthalene	0.40	U M	0.50	0.16	ug/L		09/16/22 09:10	09/20/22 10:55	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-methylnaphthalene-d10	*67*		*40 - 140*	*09/16/22 09:10*	*09/20/22 10:55*	*1*
Fluoranthene-d10 (Surr)	*92*		*40 - 140*	*09/16/22 09:10*	*09/20/22 10:55*	*1*
Terphenyl-d14	*105*		*58 - 132*	*09/16/22 09:10*	*09/20/22 10:55*	*1*

Method: 8270E SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCS 580-404068/2-A
Matrix: Water
Analysis Batch: 404363

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 404068

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
1-Methylnaphthalene			4.00	3.03		ug/L		76	41 - 115		
2-Methylnaphthalene			4.00	2.97		ug/L		74	39 - 114		
Naphthalene			4.00	2.71		ug/L		68	43 - 114		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-methylnaphthalene-d10	*75*		*40 - 140*
Fluoranthene-d10 (Surr)	*80*		*40 - 140*
Terphenyl-d14	*88*		*58 - 132*

Lab Sample ID: LCSD 580-404068/3-A
Matrix: Water
Analysis Batch: 404363

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 404068

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1-Methylnaphthalene			4.00	3.36		ug/L		84	41 - 115	10	20
2-Methylnaphthalene			4.00	3.29		ug/L		82	39 - 114	10	20
Naphthalene			4.00	3.10		ug/L		77	43 - 114	13	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2-methylnaphthalene-d10	*80*		*40 - 140*
Fluoranthene-d10 (Surr)	*91*		*40 - 140*
Terphenyl-d14	*102*		*58 - 132*

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 580-404222/1-A
Matrix: Water
Analysis Batch: 404286

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 404222

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics (C10-C24)	100	U	110	65	ug/L		09/19/22 10:30	09/19/22 20:28	1
Motor Oil Range Organics (C24-C40)	300	U	350	180	ug/L		09/19/22 10:30	09/19/22 20:28	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*68*		*56 - 125*	*09/19/22 10:30*	*09/19/22 20:28*	*1*

Lab Sample ID: LCS 580-404222/2-A
Matrix: Water
Analysis Batch: 404286

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 404222

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Diesel Range Organics (C10-C24)			4000	3660		ug/L		92	36 - 132		
Motor Oil Range Organics (C24-C40)			4000	4410		ug/L		110	41 - 113		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*101*		*56 - 125*

QC Sample Results

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Method: 8015D DRO - Diesel Range Organics (DRO) (GC)

Lab Sample ID: LCSD 580-404222/3-A
Matrix: Water
Analysis Batch: 404286

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 404222

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Diesel Range Organics (C10-C24)			4000	3520		ug/L		88	36 - 132	4	20
Motor Oil Range Organics (C24-C40)			4000	4190		ug/L		105	41 - 113	5	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*91*		*56 - 125*

Lab Chronicle

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Client Sample ID: A3375TW-WGN01LF-2209WK3 — Lab Sample ID: 580-117885-1

Date Collected: 09/12/22 10:00 — **Matrix: Water**
Date Received: 09/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260/CALUFT DOD		1	404701	BNM	EET SEA	09/22/22 17:24
Total/NA	Analysis	8260D		1	404698	BNM	EET SEA	09/22/22 17:24
Total/NA	Prep	3510C			404068	KLW	EET SEA	09/16/22 09:10
Total/NA	Analysis	8270E SIM		1	404363	E1L	EET SEA	09/20/22 16:26
Total/NA	Prep	3510C			404222	KLW	EET SEA	09/19/22 10:30
Total/NA	Analysis	8015D DRO		1	404286	DH	EET SEA	09/19/22 22:49

Client Sample ID: A3325TW-WGN01LF-2209WK3 — Lab Sample ID: 580-117885-2

Date Collected: 09/12/22 10:30 — **Matrix: Water**
Date Received: 09/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260/CALUFT DOD		1	404701	BNM	EET SEA	09/22/22 17:49
Total/NA	Analysis	8260D		1	404698	BNM	EET SEA	09/22/22 17:49
Total/NA	Prep	3510C			404068	KLW	EET SEA	09/16/22 09:10
Total/NA	Analysis	8270E SIM		1	404363	E1L	EET SEA	09/20/22 16:46
Total/NA	Prep	3510C			404222	KLW	EET SEA	09/19/22 10:30
Total/NA	Analysis	8015D DRO		1	404286	DH	EET SEA	09/19/22 23:09

Client Sample ID: A3210TW-WGN01LF-2209WK3 — Lab Sample ID: 580-117885-3

Date Collected: 09/12/22 11:10 — **Matrix: Water**
Date Received: 09/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260/CALUFT DOD		1	404701	BNM	EET SEA	09/22/22 18:13
Total/NA	Analysis	8260D		1	404698	BNM	EET SEA	09/22/22 18:13
Total/NA	Prep	3510C			404068	KLW	EET SEA	09/16/22 09:10
Total/NA	Analysis	8270E SIM		1	404363	E1L	EET SEA	09/20/22 17:05
Total/NA	Prep	3510C			404222	KLW	EET SEA	09/19/22 10:30
Total/NA	Analysis	8015D DRO		1	404286	DH	EET SEA	09/19/22 23:29

Client Sample ID: A3050TW-WGN01LF-2209WK3 — Lab Sample ID: 580-117885-4

Date Collected: 09/12/22 11:50 — **Matrix: Water**
Date Received: 09/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260/CALUFT DOD		1	404701	BNM	EET SEA	09/22/22 18:38
Total/NA	Analysis	8260D		1	404698	BNM	EET SEA	09/22/22 18:38
Total/NA	Prep	3510C			404068	KLW	EET SEA	09/16/22 09:10
Total/NA	Analysis	8270E SIM		1	404363	E1L	EET SEA	09/20/22 17:25
Total/NA	Prep	3510C			404222	KLW	EET SEA	09/19/22 10:30
Total/NA	Analysis	8015D DRO		1	404286	DH	EET SEA	09/20/22 00:09

Lab Chronicle

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Client Sample ID: Trip Blank-WQTBLF-2209WK3

Lab Sample ID: 580-117885-5

Date Collected: 09/12/22 09:00

Matrix: Water

Date Received: 09/14/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260/CALUFT DOD		1	404701	BNM	EET SEA	09/22/22 17:00
Total/NA	Analysis	8260D		1	404698	BNM	EET SEA	09/22/22 17:00

Laboratory References:

EET SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Laboratory: Eurofins Seattle

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
ANAB	Dept. of Defense ELAP	L2236	01-19-25

Sample Summary

Client: AECOM
Project/Site: LNAPL Site Characterization

Job ID: 580-117885-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-117885-1	A3375TW-WGN01LF-2209WK3	Water	09/12/22 10:00	09/14/22 09:30
580-117885-2	A3325TW-WGN01LF-2209WK3	Water	09/12/22 10:30	09/14/22 09:30
580-117885-3	A3210TW-WGN01LF-2209WK3	Water	09/12/22 11:10	09/14/22 09:30
580-117885-4	A3050TW-WGN01LF-2209WK3	Water	09/12/22 11:50	09/14/22 09:30
580-117885-5	Trip Blank-WQTBLF-2209WK3	Water	09/12/22 09:00	09/14/22 09:30

580-117885 Chain of Custody

Eurofins-Seattle
5755 8th St E
Tacoma, WA 98424
Phone : 253-248-4972

Chain of Custody Record

eurofins Environment Testing America

Client Information

Client Contact: (b) (6)
Company: AECOM-Honolulu
Address: 1001 Bishop Street, ASB Tower, Suite 1600
City: Honolulu
State, Zip: Hawaii, 96813
Phone: (b) (6)
Email: (b) (6)@aecom.com/ (b) (6) @aecom.com
Project Name: LNAPL Characterization
Site: Red Hill Bulk Fuel Storage Facility

Sampler: (b) (6)
Phone: (b) (6)
PWSID:
Due Date Requested:
TAT Requested (days): 7
Compliance Project: Δ Yes Δ No
PO #: 141286
WO #:
Project #: 60674414
SSOW#:

Lab PM: (b) (6)
E-Mail: (b) (6) @EurofinsET.com
Carrier Tracking No(s):
State of Origin: Hawaii

COC No: 0913 2022SET-SEA-01
Page:
Job #:

Analysis Requested

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab, M=MS, LF=low-flow, B=bailer)	Matrix (WQ=Groundwater, SO=soil, PR=product, GS=Soil vapor)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	BTEX, TPH-g, 8260D/5035B	N,1MN,2MN TPH-d/o, 8270D SIM/3550C 8015C/3550C	BTEX, TPH-g, SW-846 8260D	Nap,1MN,2MN, SW-846 8270E/3510C	TPH-d/o, 8015C	(b) (6) 9/13/22			Total Number of containers	Special Instructions/Note:
			Preservation Code:				F		A							
A3375TW-WGN01LF-2209WK3	9/12/22	1000	LF	WG	N	N			4-40mL	2-250mlAmb	2-250mlAmb					
A3325TW-WGN01LF-2209WK3	9/12/22	1030	LF	WG	N	N			4-40mL	2-250mlAmb	2-250mlAmb					
A3210TW-WGN01LF-2209WK3	9/12/22	1110	LF	WG	N	N			4-40mL	2-250mlAmb	2-250mlAmb					
A3050TW-WGN01LF-2209WK3	9/12/22	1150	LF	WG	N	N			4-40mL	2-250mlAmb	2-250mlAmb					
					N	N										
Trip Blank-WQTBLF-2209WK3	~~9/13/22~~ 9/12/22 (b) (6)	0900	LF	WQ	N	N			3-40mL							
					N	N										
					N	N										
					N	N										

9/12/22 (b) (6)

Preservation Codes:

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Z - Methanol
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Deliverable Requested: I, II, III, IV, Other (specify) IV

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return To Client X Disposal By Lab Archive For ____ Months

Special Instructions/QC Requirements:

Empty Kit Relinquished by: Date: Time: Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
(b) (6)	9/12/22 @ 1500	AECOM	(b) (6)	9/12/22 1500	AECOM
(b) (6)	9/13/22 1435	AECOM	(b) (6)	9/14/22 0930	[illegible]
	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

Therm. ID: T28 Cor: 2.0 ° Unc: 1.4 °
Cooler Dsc: 1/2
Packing: Bubble
Cust. Seal: Yes ✓ No
Blue Ice: Wet, Dry, None
FedEx: No
UPS:
Lab Cour:
Other:

Therm. ID: A3 Cor: 1.4 ° Unc: 1.3 °
Cooler Dsc: 2/2
Packing: Bubble
Cust. Seal: Yes ✓ No
Blue Ice: Wet, Dry, None
FedEx:
UPS:
Lab Cour:
Other:

Login Sample Receipt Checklist

Client: AECOM

Job Number: 580-117885-1

Login Number: 117885
List Number: 1
Creator: [redacted]

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

ANALYTICAL REPORT

Lab Number:	L2250292
Client:	GSI Environmental Inc. 2211 Norfolk Suite 1000 Houston, TX 77098
ATTN:	[redacted] (b) (6)
Phone:	[redacted] (b) (6)
Project Name:	Not Specified
Project Number:	CTO-22F0106
Report Date:	10/04/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2250292-01	A3015TW-PRN01-WK2	WATER	Not Specified	09/12/22 13:15	09/15/22
L2250292-02	A3-010DSVMP-PRN01-WK2	WATER	Not Specified	09/12/22 12:55	09/15/22

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

PIANO Volatile Organics

The WG1691160-5 Method Blank, associated with L2250292-01, has concentrations below the reporting limits and "J" qualified. Associated field sample results are "B" qualified if the concentrations are less than 10x the concentrations in the blank.

Saturated Hydrocarbons

L2250292-01 and -02: The sample was extracted and then analyzed using a gas chromatograph equipped with a flame ionization detector (GC/FID). The temperature program and associated experimental conditions were optimized to obtain maximum resolution in an eighty minute chromatographic run representative of hydrocarbons in the n-Octane (C8) to n-Tetracontane (C40) range. Qualitative evaluation of the sample was conducted by reviewing the sample chromatogram in conjunction with a chromatogram of a normal alkane series generated with the same chromatographic conditions. Chromatograms of hydrocarbon reference materials obtained from our library of 82 reference standards were also utilized to provide the best possible sample match. Quantitative determination of the sample's hydrocarbon concentration was performed in accordance with EPA Method 8015M. The sample's total hydrocarbon concentration and all associated quality control data are included in the report.

The following qualitative information is based on a tentative interpretation of chromatographic pattern recognition and boiling point ranges:

Total Petroleum Hydrocarbon Identification

L2250292-01 and -02 contain hydrocarbons eluting in the range of n-Nonane (C9) to after the elution of n-Octadecane (C18).

Based on the data generated, L2250292-01 and -02 containsmaterial eluting in the low to mid weight ranges of the chromatogram which is similar to a JP-5 Jet Fuel / Kerosene type product.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

(b) (6)

Authorized Signature: [redacted]

Title: Technical Director/Representative

Date: 10/04/22

ORGANICS

VOLATILES

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8260B
Analytical Date: 09/23/22 10:22
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3-Methyl-1-butene	ND		ug/l	2.00	0.297	1
Isopentane	ND		ug/l	2.00	0.366	1
1-Pentene	ND		ug/l	2.00	0.365	1
2-Methyl-1-Butene	ND		ug/l	2.00	0.311	1
Pentane	ND		ug/l	2.00	0.624	1
trans-2-Pentene	ND		ug/l	2.00	0.270	1
Isoprene	ND		ug/l	2.00	0.357	1
cis-2-Pentene	ND		ug/l	2.00	0.322	1
Tertiary Butanol	ND		ug/l	25.0	3.24	1
2,2-Dimethylbutane	ND		ug/l	2.00	0.617	1
4-Methyl-1-pentene	ND		ug/l	2.00	0.311	1
Cyclopentane	ND		ug/l	2.00	0.519	1
2,3-Dimethylbutane	ND		ug/l	2.00	0.826	1
2-Methylpentane	ND		ug/l	2.00	0.542	1
Methyl tert butyl ether	ND		ug/l	2.00	0.412	1
3-Methylpentane	ND		ug/l	2.00	0.317	1
1-Hexene	ND		ug/l	2.00	0.281	1
n-Hexane	ND		ug/l	2.00	0.329	1
Isopropyl Ether	ND		ug/l	2.00	0.242	1
trans-2-Hexene	ND		ug/l	2.00	0.261	1
2-Methyl-2-pentene	ND		ug/l	2.00	0.306	1
cis-2-Hexene	ND		ug/l	2.00	0.271	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.00	0.303	1
2,2-Dimethylpentane	ND		ug/l	2.00	0.269	1
Methylcyclopentane	ND		ug/l	2.00	0.268	1
2,4-Dimethylpentane	ND		ug/l	2.00	0.247	1
2,2,3-Trimethylbutane	ND		ug/l	2.00	0.270	1
1,2-Dichloroethane	ND		ug/l	2.00	0.295	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3,3-Dimethylpentane	ND		ug/l	2.00	0.372	1
Cyclohexane	ND		ug/l	2.00	0.247	1
2-Methylhexane	ND		ug/l	2.00	0.315	1
Benzene	ND		ug/l	2.00	0.305	1
2,3-Dimethylpentane	ND		ug/l	2.00	0.265	1
Thiophene	ND		ug/l	2.00	0.284	1
1,1-Dimethylcyclopentane	ND		ug/l	2.00	0.240	1
3-Methylhexane	ND		ug/l	2.00	0.320	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.00	0.246	1
3-Ethylpentane	ND		ug/l	2.00	0.289	1
1-Heptene/1,2-DMCP (trans)	ND		ug/l	4.00	0.585	1
Isooctane	ND		ug/l	2.00	0.218	1
trans-3-Heptene	ND		ug/l	2.00	0.311	1
Heptane	ND		ug/l	2.00	0.348	1
trans-2-Heptene	ND		ug/l	2.00	0.256	1
cis-2-Heptene	ND		ug/l	2.00	0.387	1
2,2-Dimethylhexane	ND		ug/l	2.00	0.290	1
Methylcyclohexane	ND		ug/l	2.00	0.270	1
2,5-Dimethylhexane	ND		ug/l	2.00	0.348	1
2,4-Dimethylhexane	ND		ug/l	2.00	0.243	1
Ethylcyclopentane	ND		ug/l	2.00	0.265	1
2,2,3-Trimethylpentane	ND		ug/l	2.00	0.347	1
2,3,4-Trimethylpentane	ND		ug/l	2.00	0.261	1
2,3,3-Trimethylpentane	ND		ug/l	2.00	0.397	1
Xylene (Total)[1]	14.0		ug/l	2.00	0.209	1
2,3-Dimethylhexane	ND		ug/l	2.00	0.485	1
2-Methylheptane	ND		ug/l	2.00	0.338	1
4-Methylheptane	ND		ug/l	2.00	0.344	1
3-Methylheptane	ND		ug/l	2.00	0.385	1
3-Ethylhexane	ND		ug/l	2.00	0.358	1
Toluene	ND		ug/l	2.00	0.271	1
2-Methylthiophene	ND		ug/l	2.00	0.170	1
1,4-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.260	1
3-Methylthiophene	ND		ug/l	2.00	0.234	1
1-Octene	ND		ug/l	5.00	0.307	1
Octane	ND		ug/l	2.00	0.235	1
1,2-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.294	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1,2-Dibromoethane	ND		ug/l	2.00	0.320	1
cis-2-Octene	ND		ug/l	2.00	0.229	1
Isopropylcyclopentane	ND		ug/l	2.00	0.293	1
1,2-Dimethylcyclohexane (cis)	ND		ug/l	2.00	0.581	1
2,5-Dimethylheptane	ND		ug/l	2.00	0.335	1
3,5-Dimethylheptane	ND		ug/l	2.00	0.282	1
3,3-Dimethylheptane	ND		ug/l	2.00	0.242	1
1,1,4-Trimethylcyclohexane	ND		ug/l	2.00	0.199	1
2,3-Dimethylheptane	ND		ug/l	2.00	0.228	1
3,4-Dimethylheptane	ND		ug/l	2.00	0.340	1
4-Methyloctane	ND		ug/l	2.00	0.334	1
2-Methyloctane	ND		ug/l	2.00	0.512	1
Ethylbenzene	ND		ug/l	2.00	0.216	1
2-Ethylthiophene	ND		ug/l	2.00	0.176	1
3-Methyloctane	ND		ug/l	2.00	0.224	1
3,3-Diethylpentane	ND		ug/l	2.00	0.233	1
p/m-Xylene	ND		ug/l	4.00	0.381	1
1-Nonene	ND		ug/l	5.00	0.270	1
trans-3-Nonene	ND		ug/l	2.00	0.237	1
cis-3-Nonene	ND		ug/l	2.00	0.374	1
Nonane (C9)	ND		ug/l	2.00	0.311	1
Styrene	ND		ug/l	2.00	0.202	1
o-Xylene	14.0		ug/l	2.00	0.209	1
2-Nonene	ND		ug/l	5.00	0.254	1
Isopropylcyclohexane	ND		ug/l	2.00	0.212	1
Isopropylbenzene	ND		ug/l	2.00	0.187	1
3,3-Dimethyloctane	ND		ug/l	2.00	0.202	1
n-Propylbenzene	ND		ug/l	2.00	0.177	1
2-Methylnonane	ND		ug/l	2.00	0.283	1
3-Methylnonane	ND		ug/l	2.00	0.279	1
1-Methyl-3-Ethylbenzene	ND		ug/l	2.00	0.316	1
1-Methyl-4-Ethylbenzene	5.46		ug/l	2.00	0.282	1
1,3,5-Trimethylbenzene	24.0		ug/l	2.00	0.230	1
1-Decene	ND		ug/l	2.00	0.260	1
Isobutylcyclohexane	ND		ug/l	2.00	0.163	1
1-Methyl-2-Ethylbenzene	25.9		ug/l	2.00	0.170	1
Decane (C10)	ND		ug/l	2.00	0.271	1

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01 Date Collected: 09/12/22 13:15

Client ID: A3015TW-PRN01-WK2 Date Received: 09/15/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
tert-Butylbenzene	0.417	J	ug/l	2.00	0.211	1
1,2,4-Trimethylbenzene	ND		ug/l	2.00	0.207	1
Isobutylbenzene	ND		ug/l	2.00	0.270	1
sec-Butylbenzene	0.290	J	ug/l	2.00	0.259	1
1-Methyl-3-Isopropylbenzene	7.65		ug/l	2.00	0.258	1
1-Methyl-4-Isopropylbenzene	4.11		ug/l	2.00	0.212	1
1,2,3-Trimethylbenzene	87.3		ug/l	2.00	0.223	1
1-Methyl-2-Isopropylbenzene	2.52		ug/l	2.00	0.217	1
Indane	6.33		ug/l	2.00	0.123	1
1,3-Diethylbenzene	6.24		ug/l	2.00	0.249	1
1-Methyl-3-N-Propylbenzene	7.01		ug/l	2.00	0.202	1
Indene	0.689	J	ug/l	2.00	0.116	1
1-Methyl-4-N-Propylbenzene	2.91		ug/l	2.00	0.250	1
n-Butylbenzene	ND		ug/l	2.00	0.197	1
1,2-Dimethyl-4-Ethylbenzene	18.8		ug/l	2.00	0.245	1
1,2-Diethylbenzene	6.93		ug/l	2.00	0.296	1
1-Methyl-2-N-Propylbenzene	18.2		ug/l	2.00	0.249	1
1,4-Dimethyl-2-Ethylbenzene	1.44	J	ug/l	2.00	0.187	1
Undecane	0.999	J	ug/l	2.00	0.222	1
1,3-Dimethyl-4-Ethylbenzene	2.52		ug/l	2.00	0.194	1
1,3-Dimethyl-5-Ethylbenzene	19.4		ug/l	2.00	0.236	1
1,3-Dimethyl-2-Ethylbenzene	10.4		ug/l	2.00	0.149	1
1,2-Dimethyl-3-Ethylbenzene	22.9		ug/l	2.00	0.127	1
1,2,4,5-Tetramethylbenzene	15.9		ug/l	2.00	0.155	1
1,2,3,5-Tetramethylbenzene	41.8		ug/l	2.00	0.152	1
N-Pentylbenzene	ND		ug/l	2.00	0.249	1
1,2,3,4-Tetramethylbenzene	58.9		ug/l	2.00	0.214	1
1,3-Dimethyl-5-tert-Butylbenzene	ND		ug/l	2.00	0.285	1
Dodecane (C12)	2.61	J	ug/l	5.00	0.657	1
1,3,5-Triethylbenzene	ND		ug/l	2.00	0.380	1
Naphthalene	ND		ug/l	2.00	0.835	1
Benzothiophene	ND		ug/l	2.00	1.06	1
1,2,4-Triethylbenzene	ND		ug/l	2.00	0.340	1
Hexylbenzene	ND		ug/l	2.00	0.385	1
MMT	ND		ug/l	5.00	1.29	1
Tridecane	5.06		ug/l	5.00	1.39	1
2-Methylnaphthalene	ND		ug/l	5.00	1.32	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1-Methylnaphthalene	4.30	J	ug/l	5.00	1.47	1
Tetradecane (C14)	7.18		ug/l	5.00	0.612	1
Pentadecane	3.78	J	ug/l	5.00	1.12	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	108		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	99		70-130

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
3-Methyl-1-butene	ND		ug/l	2.00	0.297
Isopentane	ND		ug/l	2.00	0.366
1-Pentene	ND		ug/l	2.00	0.365
2-Methyl-1-Butene	ND		ug/l	2.00	0.311
Pentane	ND		ug/l	2.00	0.624
trans-2-Pentene	ND		ug/l	2.00	0.270
Isoprene	ND		ug/l	2.00	0.357
cis-2-Pentene	ND		ug/l	2.00	0.322
Tertiary Butanol	15.3	J	ug/l	25.0	3.24
2,2-Dimethylbutane	ND		ug/l	2.00	0.617
4-Methyl-1-pentene	ND		ug/l	2.00	0.311
Cyclopentane	ND		ug/l	2.00	0.519
2,3-Dimethylbutane	ND		ug/l	2.00	0.826
2-Methylpentane	ND		ug/l	2.00	0.542
Methyl tert butyl ether	ND		ug/l	2.00	0.412
3-Methylpentane	ND		ug/l	2.00	0.317
1-Hexene	ND		ug/l	2.00	0.281
n-Hexane	ND		ug/l	2.00	0.329
Isopropyl Ether	ND		ug/l	2.00	0.242
trans-2-Hexene	ND		ug/l	2.00	0.261
2-Methyl-2-pentene	ND		ug/l	2.00	0.306
cis-2-Hexene	ND		ug/l	2.00	0.271
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.00	0.303
2,2-Dimethylpentane	ND		ug/l	2.00	0.269
Methylcyclopentane	ND		ug/l	2.00	0.268
2,4-Dimethylpentane	ND		ug/l	2.00	0.247
2,2,3-Trimethylbutane	ND		ug/l	2.00	0.270
1,2-Dichloroethane	ND		ug/l	2.00	0.295
3,3-Dimethylpentane	ND		ug/l	2.00	0.372

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
Cyclohexane	ND		ug/l	2.00	0.247
2-Methylhexane	ND		ug/l	2.00	0.315
Benzene	ND		ug/l	2.00	0.305
2,3-Dimethylpentane	ND		ug/l	2.00	0.265
Thiophene	ND		ug/l	2.00	0.284
1,1-Dimethylcyclopentane	ND		ug/l	2.00	0.240
3-Methylhexane	ND		ug/l	2.00	0.320
Tertiary-Amyl Methyl Ether	ND		ug/l	2.00	0.246
3-Ethylpentane	ND		ug/l	2.00	0.289
1-Heptene/1,2-DMCP (trans)	ND		ug/l	4.00	0.585
Isooctane	ND		ug/l	2.00	0.218
trans-3-Heptene	ND		ug/l	2.00	0.311
Heptane	ND		ug/l	2.00	0.348
trans-2-Heptene	ND		ug/l	2.00	0.256
cis-2-Heptene	ND		ug/l	2.00	0.387
2,2-Dimethylhexane	ND		ug/l	2.00	0.290
Methylcyclohexane	ND		ug/l	2.00	0.270
2,5-Dimethylhexane	ND		ug/l	2.00	0.348
2,4-Dimethylhexane	ND		ug/l	2.00	0.243
Ethylcyclopentane	ND		ug/l	2.00	0.265
2,2,3-Trimethylpentane	ND		ug/l	2.00	0.347
2,3,4-Trimethylpentane	ND		ug/l	2.00	0.261
2,3,3-Trimethylpentane	ND		ug/l	2.00	0.397
Xylene (Total)[1]	ND		ug/l	2.00	0.209
2,3-Dimethylhexane	ND		ug/l	2.00	0.485
2-Methylheptane	ND		ug/l	2.00	0.338
4-Methylheptane	ND		ug/l	2.00	0.344
3-Methylheptane	ND		ug/l	2.00	0.385
3-Ethylhexane	ND		ug/l	2.00	0.358

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
Toluene	ND		ug/l	2.00	0.271
2-Methylthiophene	ND		ug/l	2.00	0.170
1,4-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.260
3-Methylthiophene	ND		ug/l	2.00	0.234
1-Octene	ND		ug/l	5.00	0.307
Octane	ND		ug/l	2.00	0.235
1,2-Dimethylcyclohexane (trans)	ND		ug/l	2.00	0.294
1,2-Dibromoethane	ND		ug/l	2.00	0.320
cis-2-Octene	ND		ug/l	2.00	0.229
Isopropylcyclopentane	ND		ug/l	2.00	0.293
1,2-Dimethylcyclohexane (cis)	ND		ug/l	2.00	0.581
2,5-Dimethylheptane	ND		ug/l	2.00	0.335
3,5-Dimethylheptane	ND		ug/l	2.00	0.282
3,3-Dimethylheptane	ND		ug/l	2.00	0.242
1,1,4-Trimethylcyclohexane	ND		ug/l	2.00	0.199
2,3-Dimethylheptane	ND		ug/l	2.00	0.228
3,4-Dimethylheptane	ND		ug/l	2.00	0.340
4-Methyloctane	ND		ug/l	2.00	0.334
2-Methyloctane	ND		ug/l	2.00	0.512
Ethylbenzene	ND		ug/l	2.00	0.216
2-Ethylthiophene	ND		ug/l	2.00	0.176
3-Methyloctane	ND		ug/l	2.00	0.224
3,3-Diethylpentane	ND		ug/l	2.00	0.233
p/m-Xylene	ND		ug/l	4.00	0.381
1-Nonene	ND		ug/l	5.00	0.270
trans-3-Nonene	ND		ug/l	2.00	0.237
cis-3-Nonene	ND		ug/l	2.00	0.374
Nonane (C9)	ND		ug/l	2.00	0.311
Styrene	ND		ug/l	2.00	0.202

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
o-Xylene	ND		ug/l	2.00	0.209
2-Nonene	ND		ug/l	5.00	0.254
Isopropylcyclohexane	ND		ug/l	2.00	0.212
Isopropylbenzene	ND		ug/l	2.00	0.187
3,3-Dimethyloctane	ND		ug/l	2.00	0.202
n-Propylbenzene	ND		ug/l	2.00	0.177
2-Methylnonane	ND		ug/l	2.00	0.283
3-Methylnonane	ND		ug/l	2.00	0.279
1-Methyl-3-Ethylbenzene	ND		ug/l	2.00	0.316
1-Methyl-4-Ethylbenzene	ND		ug/l	2.00	0.282
1,3,5-Trimethylbenzene	ND		ug/l	2.00	0.230
1-Decene	ND		ug/l	2.00	0.260
Isobutylcyclohexane	ND		ug/l	2.00	0.163
1-Methyl-2-Ethylbenzene	ND		ug/l	2.00	0.170
Decane (C10)	ND		ug/l	2.00	0.271
tert-Butylbenzene	ND		ug/l	2.00	0.211
1,2,4-Trimethylbenzene	ND		ug/l	2.00	0.207
Isobutylbenzene	ND		ug/l	2.00	0.270
sec-Butylbenzene	ND		ug/l	2.00	0.259
1-Methyl-3-Isopropylbenzene	ND		ug/l	2.00	0.258
1-Methyl-4-Isopropylbenzene	ND		ug/l	2.00	0.212
1,2,3-Trimethylbenzene	ND		ug/l	2.00	0.223
1-Methyl-2-Isopropylbenzene	ND		ug/l	2.00	0.217
Indane	ND		ug/l	2.00	0.123
1,3-Diethylbenzene	ND		ug/l	2.00	0.249
1-Methyl-3-N-Propylbenzene	ND		ug/l	2.00	0.202
Indene	ND		ug/l	2.00	0.116
1-Methyl-4-N-Propylbenzene	ND		ug/l	2.00	0.250
n-Butylbenzene	ND		ug/l	2.00	0.197

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					
1,2-Dimethyl-4-Ethylbenzene	ND		ug/l	2.00	0.245
1,2-Diethylbenzene	ND		ug/l	2.00	0.296
1-Methyl-2-N-Propylbenzene	ND		ug/l	2.00	0.249
1,4-Dimethyl-2-Ethylbenzene	ND		ug/l	2.00	0.187
Undecane	ND		ug/l	2.00	0.222
1,3-Dimethyl-4-Ethylbenzene	ND		ug/l	2.00	0.194
1,3-Dimethyl-5-Ethylbenzene	ND		ug/l	2.00	0.236
1,3-Dimethyl-2-Ethylbenzene	ND		ug/l	2.00	0.149
1,2-Dimethyl-3-Ethylbenzene	ND		ug/l	2.00	0.127
1,2,4,5-Tetramethylbenzene	ND		ug/l	2.00	0.155
1,2,3,5-Tetramethylbenzene	ND		ug/l	2.00	0.152
N-Pentylbenzene	ND		ug/l	2.00	0.249
1,2,3,4-Tetramethylbenzene	ND		ug/l	2.00	0.214
1,3-Dimethyl-5-tert-Butylbenzene	ND		ug/l	2.00	0.285
Dodecane (C12)	ND		ug/l	5.00	0.657
1,3,5-Triethylbenzene	ND		ug/l	2.00	0.380
Naphthalene	ND		ug/l	2.00	0.835
Benzothiophene	ND		ug/l	2.00	1.06
1,2,4-Triethylbenzene	ND		ug/l	2.00	0.340
Hexylbenzene	ND		ug/l	2.00	0.385
MMT	ND		ug/l	5.00	1.29
Tridecane	ND		ug/l	5.00	1.39
2-Methylnaphthalene	ND		ug/l	5.00	1.32
1-Methylnaphthalene	ND		ug/l	5.00	1.47
Tetradecane (C14)	ND		ug/l	5.00	0.612
Pentadecane	ND		ug/l	5.00	1.12

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/22/22 19:18
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01 Batch: WG1691160-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	107		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	97		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01 Batch: WG1691160-3 WG1691160-4								
1-Pentene	104		109		50-130	5		30
Pentane	85		90		50-130	6		30
Tertiary Butanol	91		88		50-130	3		30
Cyclopentane	90		96		50-130	6		30
2-Methylpentane	92		95		50-130	3		30
Methyl tert butyl ether	80		82		50-130	2		30
3-Methylpentane	96		99		50-130	3		30
1-Hexene	100		103		50-130	3		30
n-Hexane	90		94		50-130	4		30
Isopropyl Ether	85		87		50-130	2		30
Ethyl-Tert-Butyl-Ether	75		76		50-130	1		30
Methylcyclopentane	100		104		50-130	4		30
2,4-Dimethylpentane	92		97		50-130	5		30
Cyclohexane	101		105		50-130	4		30
2-Methylhexane	94		96		50-130	2		30
Benzene	90		92		50-130	2		30
2,3-Dimethylpentane	96		98		50-130	2		30
3-Methylhexane	86		86		50-130	0		30
Tertiary-Amyl Methyl Ether	79		80		50-130	1		30
Isooctane	100		102		50-130	2		30
Heptane	102		102		50-130	0		30
Methylcyclohexane	94		94		50-130	0		30
2-Methylheptane	100		102		50-130	2		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01 Batch: WG1691160-3 WG1691160-4								
3-Methylheptane	99		100		50-130	1		30
Toluene	90		92		50-130	2		30
Octane	102		102		50-130	0		30
Ethylbenzene	90		93		50-130	3		30
p/m-Xylene	96		98		50-130	2		30
Nonane (C9)	95		96		50-130	1		30
o-Xylene	96		98		50-130	2		30
Isopropylbenzene	98		100		50-130	2		30
n-Propylbenzene	100		103		50-130	3		30
1-Methyl-3-Ethylbenzene	98		100		50-130	2		30
1-Methyl-4-Ethylbenzene	102		104		50-130	2		30
1,3,5-Trimethylbenzene	100		104		50-130	4		30
1-Decene	78		80		50-130	3		30
1-Methyl-2-Ethylbenzene	100		103		50-130	3		30
Decane (C10)	106		110		50-130	4		30
1,2,4-Trimethylbenzene	96		97		50-130	1		30
sec-Butylbenzene	106		108		50-130	2		30
1-Methyl-4-N-Propylbenzene	98		100		50-130	2		30
n-Butylbenzene	100		103		50-130	3		30
1,2-Diethylbenzene	99		100		50-130	1		30
Undecane	102		106		50-130	4		30
N-Pentylbenzene	99		102		50-130	3		30
Dodecane (C12)	124		126		50-130	2		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: Not Specified

Project Number: CTO-22F0106

Lab Number: L2250292

Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01 Batch: WG1691160-3 WG1691160-4								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Dibromofluoromethane	102		102		70-130
Toluene-d8	102		101		70-130
4-Bromofluorobenzene	102		102		70-130

PETROLEUM HYDROCARBONS

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 09/20/22 00:11
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	ND		mg/l	0.014	0.004	1
n-Decane (C10)	0.010	J	mg/l	0.014	0.002	1
n-Undecane (C11)	0.050		mg/l	0.014	0.001	1
n-Dodecane (C12)	0.093		mg/l	0.014	0.002	1
n-Tridecane (C13)	0.156		mg/l	0.069	0.012	1
2,6,10-Trimethyldodecane (1380)	0.020		mg/l	0.014	0.001	1
n-Tetradecane (C14)	0.075		mg/l	0.014	0.001	1
2,6,10-Trimethyltridecane (1470)	0.013	J	mg/l	0.014	0.002	1
n-Pentadecane (C15)	0.021		mg/l	0.014	0.002	1
n-Hexadecane (C16)	0.007	J	mg/l	0.014	0.002	1
Norpristane (1650)	ND		mg/l	0.014	0.002	1
n-Heptadecane (C17)	0.002	J	mg/l	0.014	0.002	1
Pristane	ND		mg/l	0.014	0.002	1
n-Octadecane (C18)	0.002	J	mg/l	0.014	0.001	1
Phytane	ND		mg/l	0.014	0.001	1
n-Nonadecane (C19)	ND		mg/l	0.014	0.002	1
n-Eicosane (C20)	ND		mg/l	0.014	0.001	1
n-Heneicosane (C21)	ND		mg/l	0.014	0.001	1
n-Docosane (C22)	ND		mg/l	0.014	0.001	1
n-Tricosane (C23)	0.004	J	mg/l	0.014	0.001	1
n-Tetracosane (C24)	ND		mg/l	0.014	0.001	1
n-Pentacosane (C25)	ND		mg/l	0.069	0.008	1
n-Hexacosane (C26)	ND		mg/l	0.014	0.002	1
n-Heptacosane (C27)	ND		mg/l	0.014	0.001	1
n-Octacosane (C28)	0.070	C	mg/l	0.014	0.003	1
n-Nonacosane (C29)	0.003	J	mg/l	0.014	0.002	1
n-Triacontane (C30)	0.003	J	mg/l	0.014	0.002	1
n-Hentriacontane (C31)	0.003	J	mg/l	0.014	0.002	1

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-01
Client ID: A3015TW-PRN01-WK2
Sample Location: Not Specified
Date Collected: 09/12/22 13:15
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	0.003	J	mg/l	0.014	0.002	1
n-Tritriacontane (C33)	0.003	J	mg/l	0.014	0.002	1
n-Tetratriacontane (C34)	0.003	J	mg/l	0.014	0.002	1
n-Pentatriacontane (C35)	0.003	J	mg/l	0.014	0.002	1
n-Hexatriacontane (C36)	0.002	J	mg/l	0.014	0.002	1
n-Heptatriacontane (C37)	ND		mg/l	0.014	0.003	1
n-Octatriacontane (C38)	ND		mg/l	0.014	0.003	1
n-Nonatriacontane (C39)	ND		mg/l	0.014	0.002	1
n-Tetracontane (C40)	ND		mg/l	0.014	0.002	1
C9-C44 Total Petroleu	4.20		mg/l	0.458	0.077	1
C10-C28 DRO	4.60		mg/l	0.292	0.050	1
C28-C40 ORO	ND		mg/l	0.153	0.023	1
Total Saturated Hydrocarbons	0.546	J	mg/l	0.014	0.001	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	89		50-130
d50-Tetracosane	91		50-130

Project Name: Not Specified
Project Number: CTO-22F0106
Lab Number: L2250292
Report Date: 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-02
Client ID: A3-010DSVMP-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 12:55
Date Received: 09/15/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8015D(M)
Analytical Date: 09/20/22 01:41
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	0.006	J	mg/l	0.008	0.003	1
n-Decane (C10)	0.104		mg/l	0.008	0.001	1
n-Undecane (C11)	0.674		mg/l	0.008	0.001	1
n-Dodecane (C12)	1.28		mg/l	0.008	0.001	1
n-Tridecane (C13)	1.45		mg/l	0.042	0.007	1
2,6,10-Trimethyldodecane (1380)	0.407		mg/l	0.008	0.001	1
n-Tetradecane (C14)	1.14		mg/l	0.008	0.001	1
2,6,10-Trimethyltridecane (1470)	0.377		mg/l	0.008	0.001	1
n-Pentadecane (C15)	0.537		mg/l	0.008	0.001	1
n-Hexadecane (C16)	0.139		mg/l	0.008	0.001	1
Norpristane (1650)	0.043		mg/l	0.008	0.001	1
n-Heptadecane (C17)	0.050		mg/l	0.008	0.001	1
Pristane	0.048		mg/l	0.008	0.001	1
n-Octadecane (C18)	0.025		mg/l	0.008	0.001	1
Phytane	0.028		mg/l	0.008	0.001	1
n-Nonadecane (C19)	ND		mg/l	0.008	0.001	1
n-Eicosane (C20)	0.009		mg/l	0.008	0.0005	1
n-Heneicosane (C21)	0.005	J	mg/l	0.008	0.001	1
n-Docosane (C22)	0.005	J	mg/l	0.008	0.0004	1
n-Tricosane (C23)	0.004	J	mg/l	0.008	0.001	1
n-Tetracosane (C24)	0.004	J	mg/l	0.008	0.001	1
n-Pentacosane (C25)	ND		mg/l	0.042	0.005	1
n-Hexacosane (C26)	0.003	J	mg/l	0.008	0.001	1
n-Heptacosane (C27)	ND		mg/l	0.008	0.001	1
n-Octacosane (C28)	0.044	C	mg/l	0.008	0.002	1
n-Nonacosane (C29)	0.031		mg/l	0.008	0.001	1
n-Triacontane (C30)	0.006	J	mg/l	0.008	0.001	1
n-Hentriacontane (C31)	ND		mg/l	0.008	0.001	1

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

SAMPLE RESULTS

Lab ID: L2250292-02 Date Collected: 09/12/22 12:55

Client ID: A3-010DSVMP-PRN01-WK2 Date Received: 09/15/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	0.005	J	mg/l	0.008	0.001	1
n-Tritriacontane (C33)	0.002	J	mg/l	0.008	0.001	1
n-Tetratriacontane (C34)	0.003	J	mg/l	0.008	0.001	1
n-Pentatriacontane (C35)	ND		mg/l	0.008	0.001	1
n-Hexatriacontane (C36)	0.002	J	mg/l	0.008	0.001	1
n-Heptatriacontane (C37)	ND		mg/l	0.008	0.002	1
n-Octatriacontane (C38)	0.002	J	mg/l	0.008	0.002	1
n-Nonatriacontane (C39)	ND		mg/l	0.008	0.001	1
n-Tetracontane (C40)	ND		mg/l	0.008	0.001	1
C9-C44 Total Petroleu	46.4		mg/l	0.275	0.046	1
C10-C28 DRO	45.5		mg/l	0.175	0.030	1
C28-C40 ORO	12.3		mg/l	0.092	0.014	1
Total Saturated Hydrocarbons	6.43	J	mg/l	0.008	0.0004	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	88		50-130
d50-Tetracosane	88		50-130

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 09/19/22 18:10
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1688303-1					
n-Nonane (C9)	ND		mg/l	0.001	0.0003
n-Decane (C10)	ND		mg/l	0.001	0.0001
n-Undecane (C11)	ND		mg/l	0.001	0.0001
n-Dodecane (C12)	ND		mg/l	0.001	0.0001
n-Tridecane (C13)	ND		mg/l	0.005	0.001
2,6,10-Trimethyldodecane (1380)	ND		mg/l	0.001	0.0001
n-Tetradecane (C14)	ND		mg/l	0.001	0.0001
2,6,10-Trimethyltridecane (1470)	ND		mg/l	0.001	0.0001
n-Pentadecane (C15)	ND		mg/l	0.001	0.0001
n-Hexadecane (C16)	ND		mg/l	0.001	0.0001
Norpristane (1650)	ND		mg/l	0.001	0.0001
n-Heptadecane (C17)	ND		mg/l	0.001	0.0001
Pristane	ND		mg/l	0.001	0.0002
n-Octadecane (C18)	ND		mg/l	0.001	0.0001
Phytane	ND		mg/l	0.001	0.0001
n-Nonadecane (C19)	ND		mg/l	0.001	0.0002
n-Eicosane (C20)	ND		mg/l	0.001	0.0001
n-Heneicosane (C21)	ND		mg/l	0.001	0.0001
n-Docosane (C22)	ND		mg/l	0.001	0.00004
n-Tricosane (C23)	ND		mg/l	0.001	0.0001
n-Tetracosane (C24)	ND		mg/l	0.001	0.0001
n-Pentacosane (C25)	ND		mg/l	0.005	0.001
n-Hexacosane (C26)	ND		mg/l	0.001	0.0001
n-Heptacosane (C27)	ND		mg/l	0.001	0.0001
n-Octacosane (C28)	0.001	JC	mg/l	0.001	0.0002
n-Nonacosane (C29)	ND		mg/l	0.001	0.0001
n-Triacontane (C30)	ND		mg/l	0.001	0.0001
n-Hentriacontane (C31)	ND		mg/l	0.001	0.0001
n-Dotriacontane (C32)	ND		mg/l	0.001	0.0001

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 09/19/22 18:10
Analyst: WR

Extraction Method: EPA 3510C
Extraction Date: 09/16/22 10:30

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1688303-1					
n-Tritriacontane (C33)	ND		mg/l	0.001	0.0001
n-Tetratriacontane (C34)	ND		mg/l	0.001	0.0002
n-Pentatriacontane (C35)	ND		mg/l	0.001	0.0002
n-Hexatriacontane (C36)	ND		mg/l	0.001	0.0001
n-Heptatriacontane (C37)	ND		mg/l	0.001	0.0002
n-Octatriacontane (C38)	ND		mg/l	0.001	0.0002
n-Nonatriacontane (C39)	ND		mg/l	0.001	0.0002
n-Tetracontane (C40)	ND		mg/l	0.001	0.0002
C9-C44 Total Petroleu	ND		mg/l	0.033	0.006
C10-C28 DRO	0.008	J	mg/l	0.021	0.004
C28-C40 ORO	ND		mg/l	0.011	0.002
Total Saturated Hydrocarbons	0.001	J	mg/l	0.001	0.00004

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	90		50-130
d50-Tetracosane	92		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01-02 Batch: WG1688303-2 WG1688303-3								
Nonane (C9)	76		72		50-130	5		30
n-Decane (C10)	85		81		50-130	5		30
n-Dodecane (C12)	90		88		50-130	2		30
n-Tetradecane (C14)	89		90		50-130	1		30
n-Hexadecane (C16)	93		94		50-130	1		30
n-Octadecane (C18)	94		96		50-130	2		30
n-Nonadecane (C19)	100		100		50-130	0		30
n-Eicosane (C20)	94		96		50-130	2		30
n-Docosane (C22)	95		95		50-130	0		30
n-Tetracosane (C24)	101		101		50-130	0		30
n-Hexacosane (C26)	96		97		50-130	1		30
n-Octacosane (C28)	100		101		50-130	1		30
n-Triacontane (C30)	95		96		50-130	1		30
n-Hexatriacontane (C36)	81		82		50-130	1		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	89		89		50-130
d50-Tetracosane	93		93		50-130

Project Name: Not Specified
Project Number: CTO-22F0106

Lab Number: L2250292
Report Date: 10/04/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2250292-01A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		A2-SHC(7)
L2250292-01X	Vial HCl preserved split	A	NA		3.2	Y	Absent		A2-PIANO8260(14)
L2250292-01Y	Vial HCl preserved split	A	NA		3.2	Y	Absent		-
L2250292-02A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		A2-SHC(7)

*Values in parentheses indicate holding time in days

Project Name: Not Specified **Lab Number:** L2250292

Project Number: CTO-22F0106 **Report Date:** 10/04/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	Not Specified	**Lab Number:**	L2250292
Project Number:	CTO-22F0106	**Report Date:**	10/04/22

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

COC# 09132022SIT-Alpha-02

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 9/15/22

ALPHA Job #: L2250292

Project Information

Project Name: Site Characterization/Adit 3

Project Location: RHBFSF-Adit 3

Project #: CTO-22F0106

Project Manager: [redacted] (b) (6)

ALPHA Quote #:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #: 02.30.01.

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

Client Information

Client: GSI-Rhodes for CTO22F0106 (AECOM)

Address: 1001 Bishop Street, Ste 1600

Honolulu, Hawaii

Phone: [redacted] (b) (6)

Fax:

Email: [redacted] (b) (6) @aecom.com

☐ These samples have been Previously analyzed by Alpha

Turn-Around Time

☐ Standard ☐ Rush (ONLY IF PRE-APPROVED)

Due Date: Time:

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS

Saturated Hydrocarbon ANalysis: PIANO

[redacted] (b) (6) 9/12/22

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Saturated Hydrocarbon ANalysis												Sample Specific Comments
50292-01	A3015TW-PRN01-WK2	9/12/22	1315	~~Product~~ WW 9/15	[redacted] (b) (6)	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is wat/prod
	~~A3-010TW-PRN01-WK2~~	~~9/12/22~~	~~1335~~	~~Product~~		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	~~Sample is product~~
	~~A3-040TW-PRN01-WK2~~	~~9/12/22~~	~~1410~~	~~Product~~		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	~~Sample is product~~
-02	A3-010DSVMP-PRN01-WK2	9/12/222	1255	~~Product~~ WATER		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sample is wat/prod
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

9/12/22 [redacted] (b) (6)

[redacted] (b) (6) 9/15/22 10:02

Container Type	-	-	-	-	-	-	-	-	-	-	-	-
Preservative	-	-	-	-	-	-	-	-	-	-	-	-

Relinquished By:	Date/Time	Received By:	Date/Time
[redacted] (b) (6)	9/12/22 1600	[redacted] (b) (6)	9/12/22 1600
	9/13/22 1330		FEDEX
FEDEX	9/15/22 1000		9/15/22 1000

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

ORIGIN ID:HNLA [redacted] (b) (6)
[redacted] (b) (6)
AECOM
1001 BISHOP ST STE 1600

HONOLULU, HI 96813
UNITED STATES US

SHIP DATE: 13SEP22
ACTWGT: 38.75 LB
CAD: 6994244/SSFE2322
DIMS: 24x14x14 IN

BILL THIRD PARTY

TO ATTN: [redacted] (b) (6)
ALPHA ANALYTICAL
320 FORBES BLVD.

MANSFIELD MA 02048
(508) 822-9300
INV:
PO:
REF: 60674414.02.30.01
DEPT:

FedEx Express

TRK# 0201 2779 4907 3052

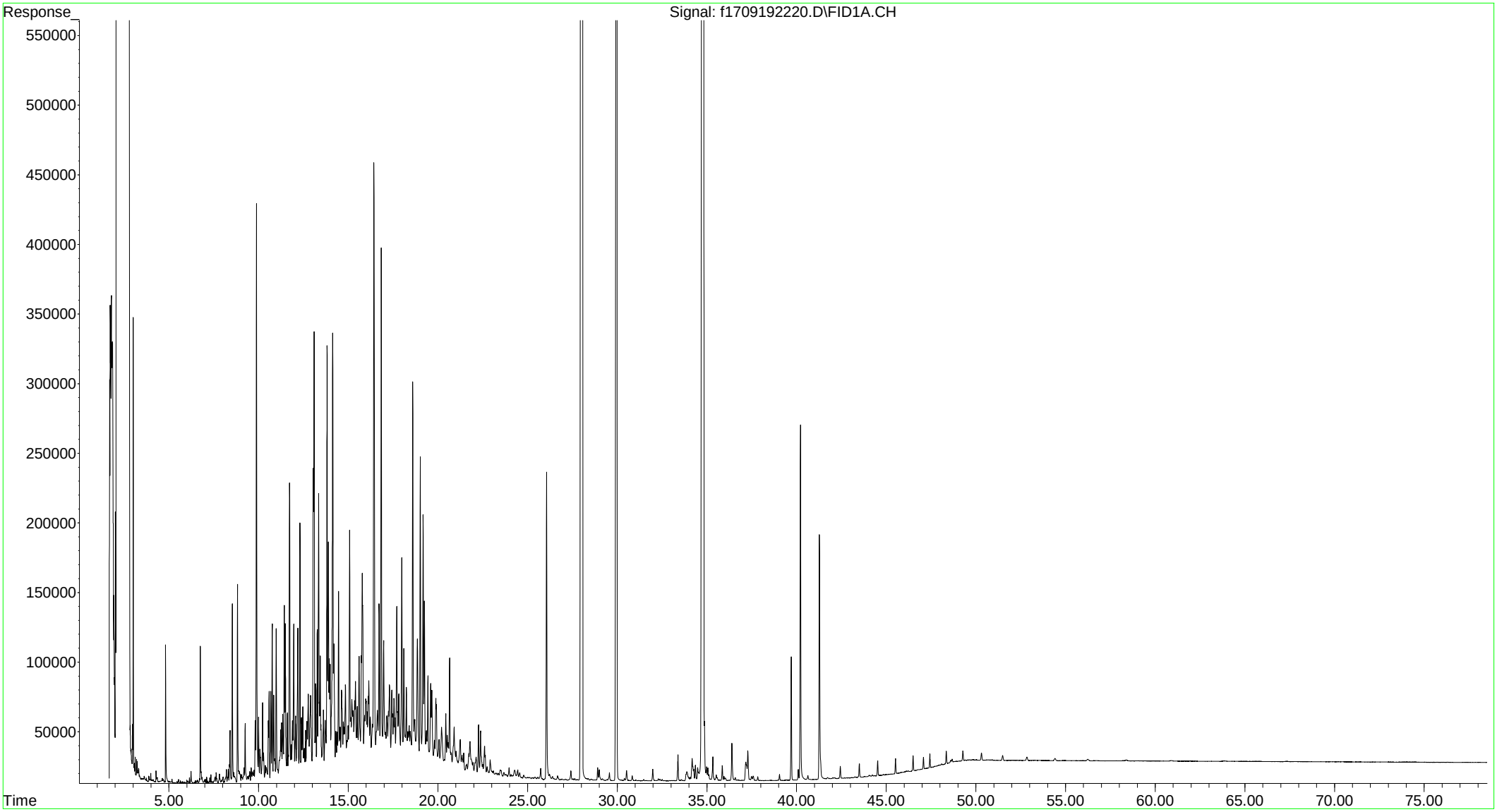
THU - 15 SEP 10:30A
PRIORITY OVERNIGHT
AHS
02048
MA-US BOS

XE PYMA

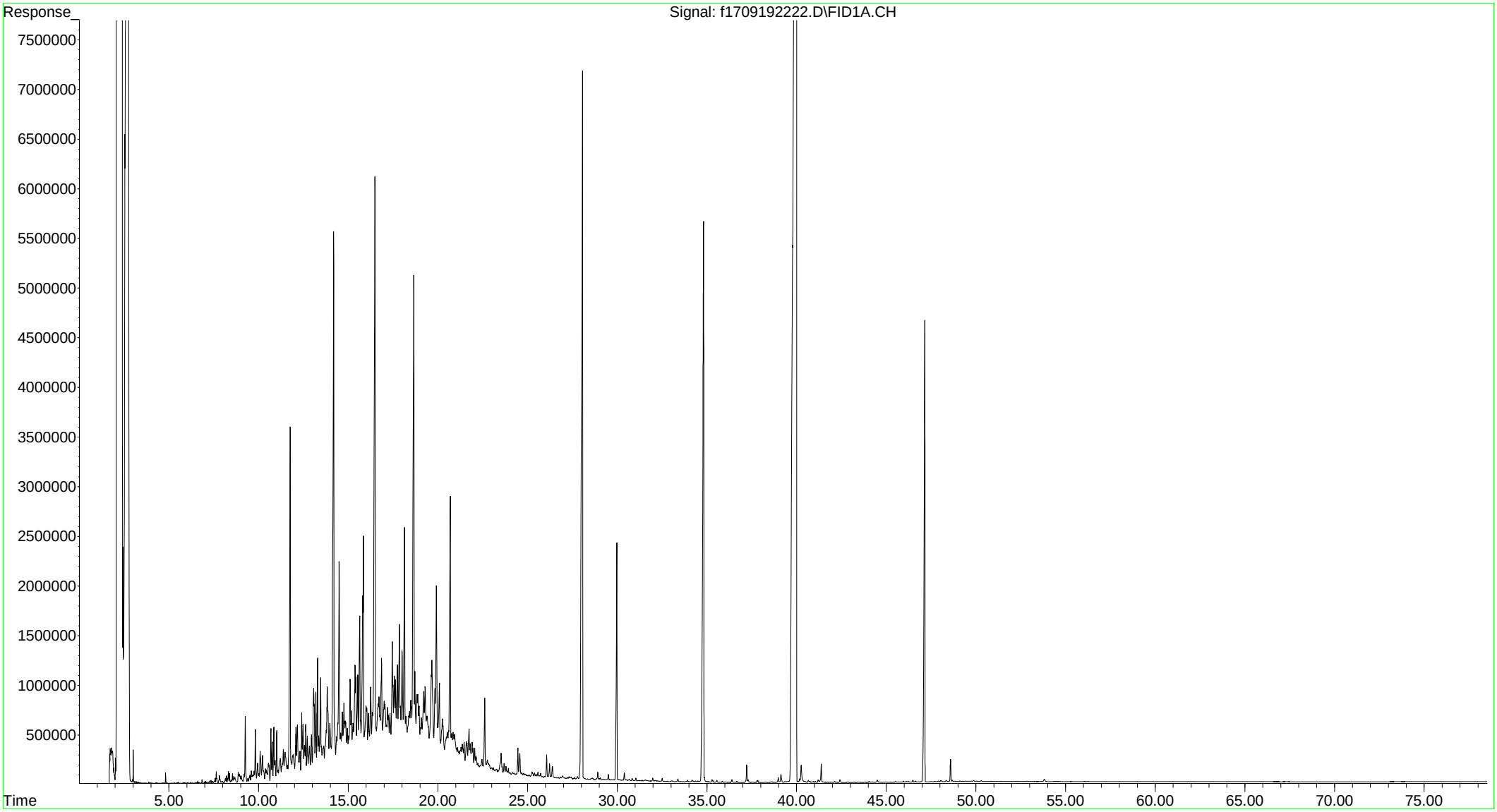
Part # 150297-435 RRDB EXP 06/23

GC-FID Chromatogram

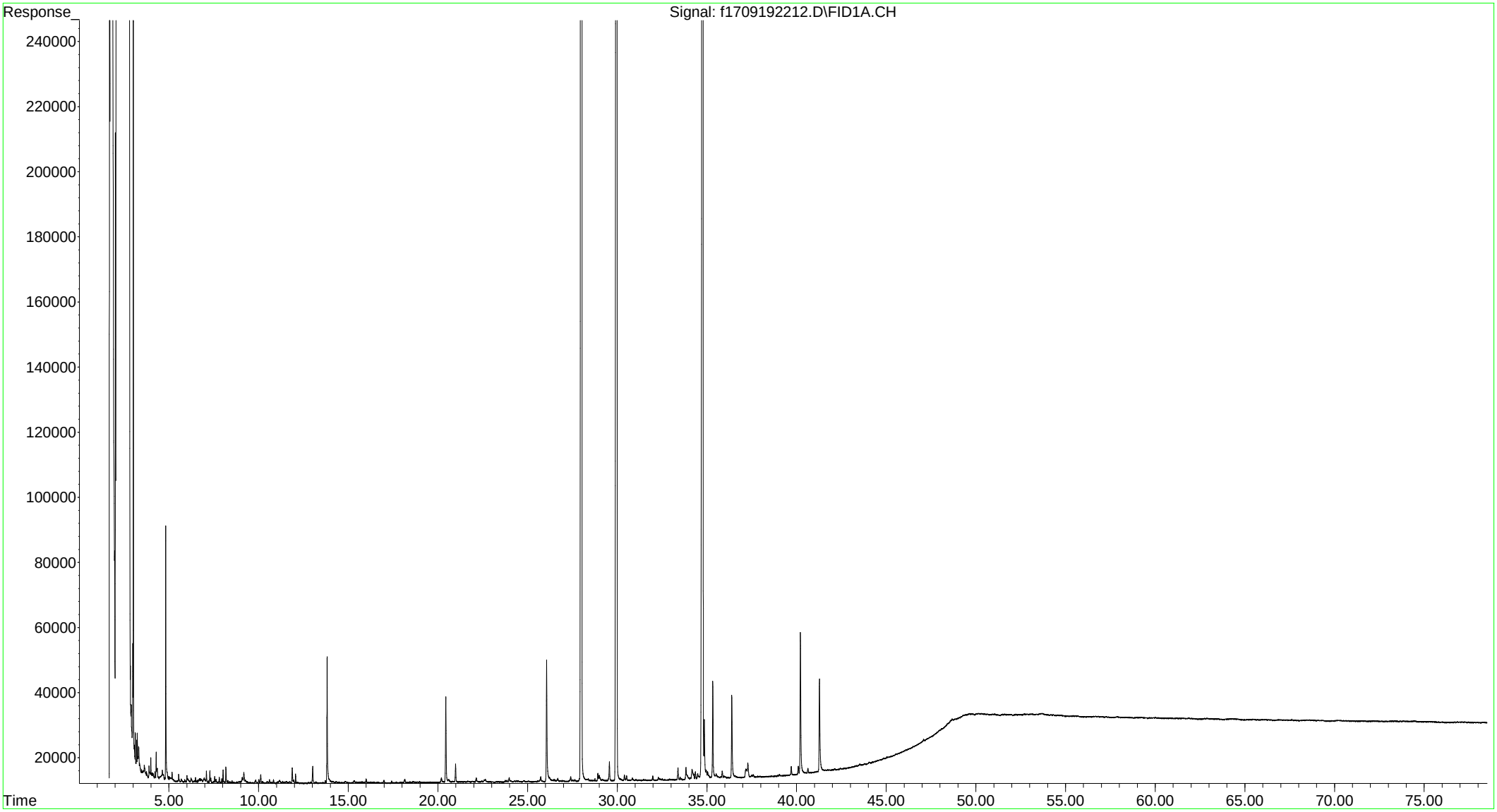
```
File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192220.D
Operator   : FID17:WR
Acquired   : 20 Sep 2022  12:11 am using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: l2250292-01,42,,
Misc Info  : WG1689232,WG1688303,ICAL18753
Vial Number: 10
```



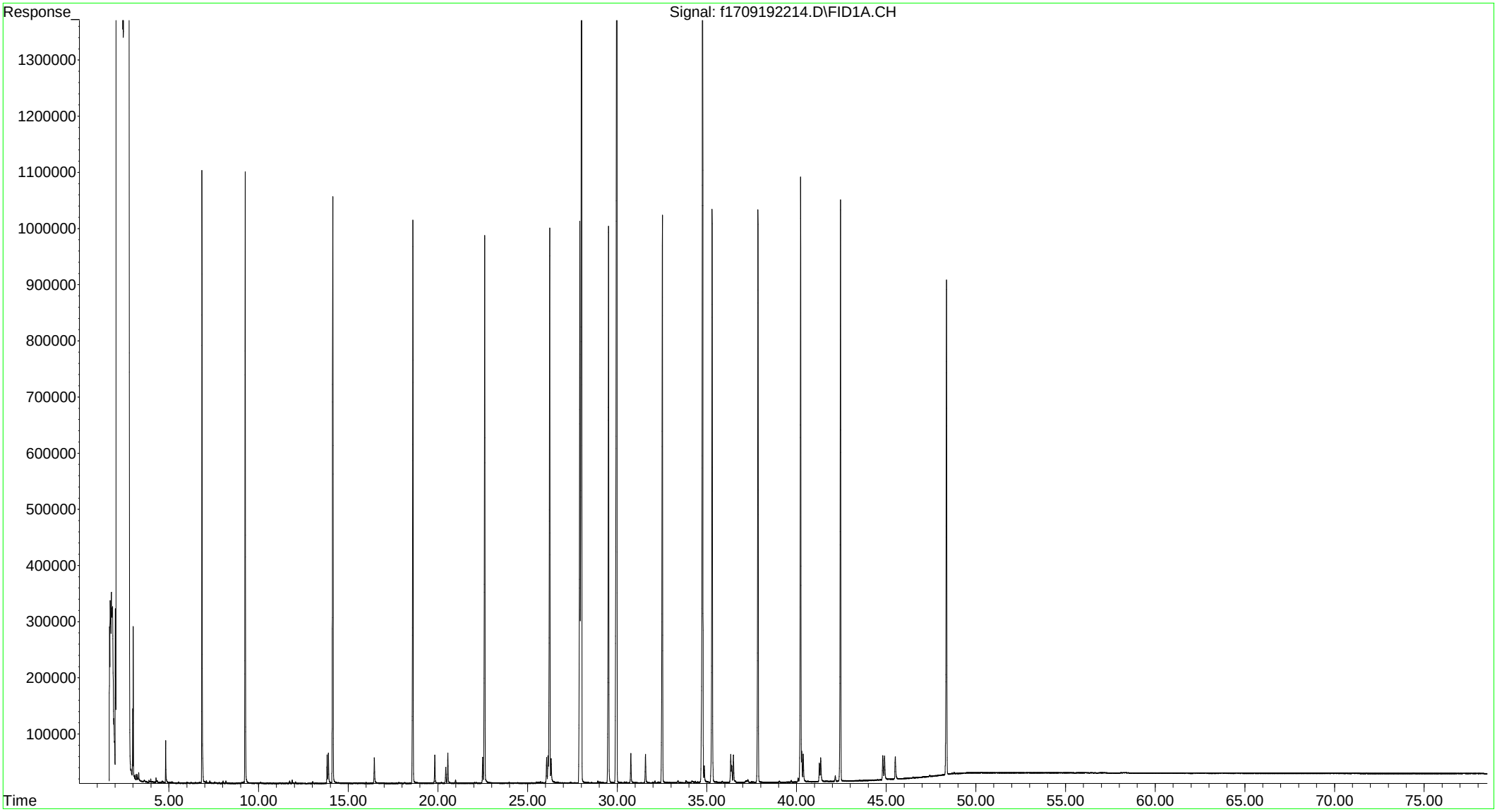
```
File        :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192222.D
Operator    : FID17:WR
Acquired    : 20 Sep 2022   1:41 am using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: l2250292-02,42,,
Misc Info   : WG1689232,WG1688303,ICAL18753
Vial Number: 11
```



```
File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192212.D
Operator   : FID17:WR
Acquired   : 19 Sep 2022   6:10 pm using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: WG1688303-1,42,,
Misc Info  : WG1689232,WG1688303,ICAL18753
Vial Number: 6
```

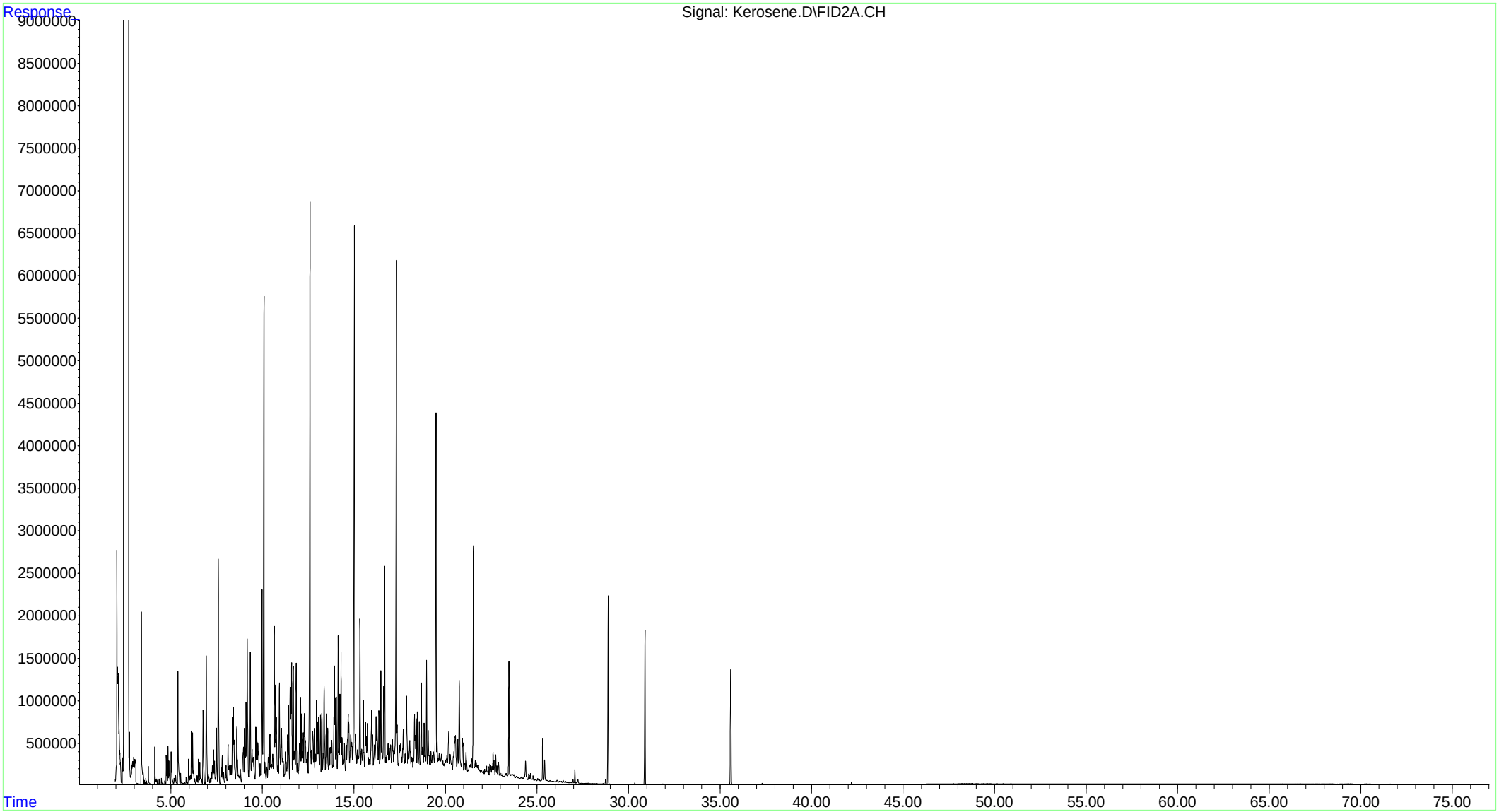


```
File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192214.D
Operator   : FID17:WR
Acquired   : 19 Sep 2022   7:40 pm using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: wg1688303-2,32,,
Misc Info  : WG1689232,WG1688303,ICAL18753
Vial Number: 7
```

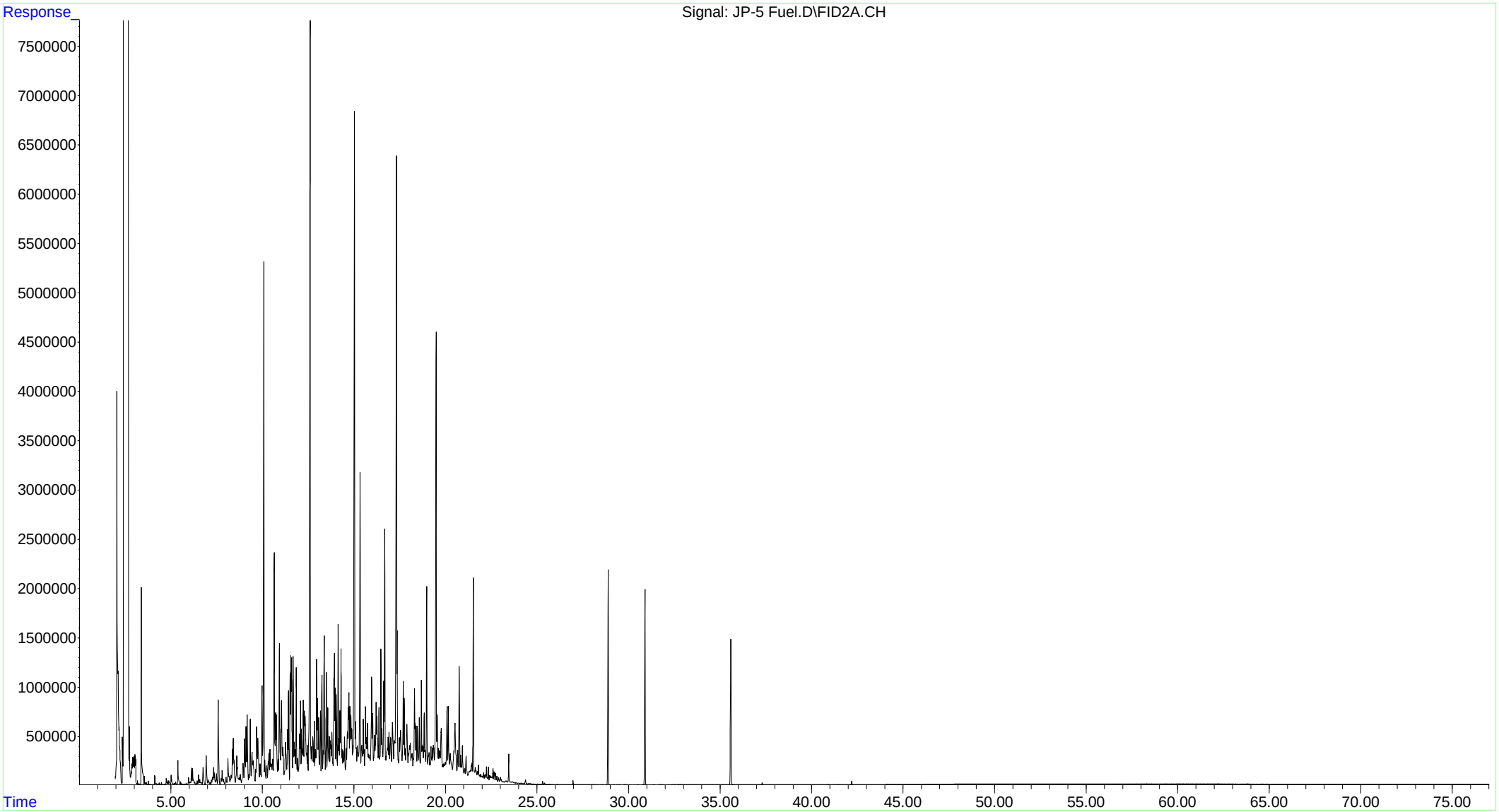


Petroleum Reference Standards

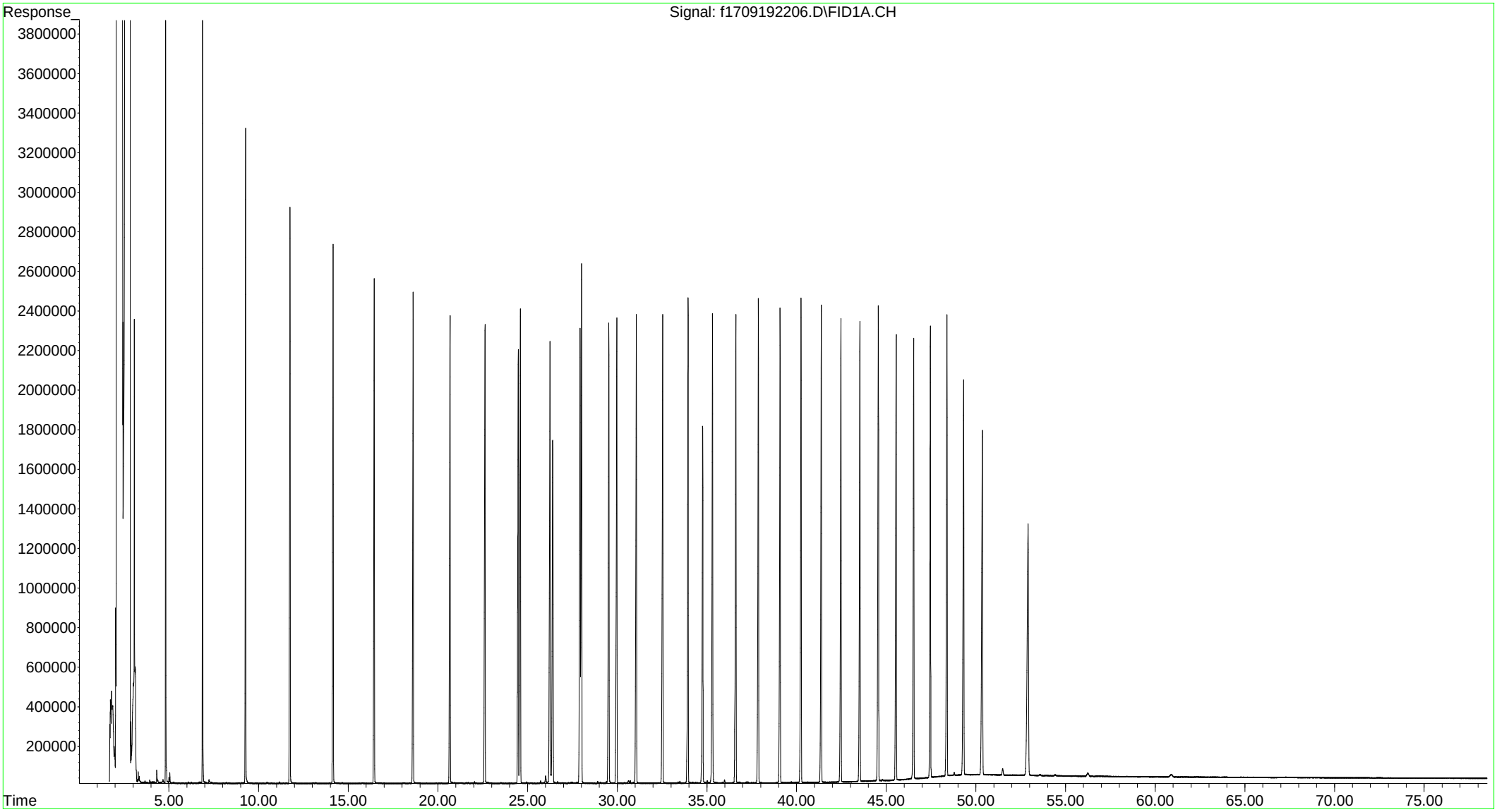
```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\Kerosen
...         e.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 21 Nov 2011   9:22 pm using AcqMethod FRNC2AF.M
Sample    : KEROSENE
Misc Info : 1X F042710G
```



```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\JP-5 Fu
...         el.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 19 Nov 2011   4:22 pm using AcqMethod FRNC2AF.M
Sample    : JP-5 FUEL
Misc Info : F042710P
```



```
File       :O:\Forensics\Data\FID17\2022\SEP\SEP19\f1709192206.D
Operator   : FID17:WR
Acquired   : 19 Sep 2022   1:39 pm using AcqMethod FID17A.M
Instrument :   FID17
Sample Name: WG1689232-1
Misc Info  : WG1689232,FRBE91,ICAL18753
Vial Number: 3
```



ANALYTICAL REPORT

Lab Number:	L2250426
Client:	GSI Environmental Inc. 2211 Norfolk Suite 1000 Houston, TX 77098
ATTN:	[redacted] (b) (6)
Phone:	[redacted] (b) (6)
Project Name:	SITE CHARACTERIZATION/ADIT 3
Project Number:	CTO-22F0106
Report Date:	10/07/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106

Lab Number: L2250426
Report Date: 10/07/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2250426-01	A3-010TW-PRN01-WK2	OIL	Not Specified	09/12/22 13:35	09/20/22
L2250426-02	A3-040TW-PRN01-WK2	OIL	Not Specified	09/12/22 14:10	09/20/22

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

PIANO Volatile Organics

L2250426-01D and -02D: The samples have elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the samples.

L2250426-01D2 and -02D2: The samples were re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range.

The WG1692182-5 Method Blank, associated with L2250426-01D2, -01D, -02D2, and -02D, has concentrations below the reporting limits and "J" qualified. Associated field sample results are "B" qualified if the concentrations are less than 10x the concentrations in the blank.

Saturated Hydrocarbons

L2250426-01 and -02: The sample was extracted and then analyzed using a gas chromatograph equipped with a flame ionization detector (GC/FID). The temperature program and associated experimental conditions were optimized to obtain maximum resolution in an eighty minute chromatographic run representative of hydrocarbons in the n-Octane (C8) to n-Tetracontane (C40) range. Qualitative evaluation of the sample was conducted by reviewing the sample chromatogram in conjunction with a chromatogram of a normal alkane series generated with the same chromatographic conditions. Chromatograms of hydrocarbon reference materials obtained from our library of 82 reference standards were also utilized to provide the best possible sample match. Quantitative determination of the sample's hydrocarbon concentration was performed in accordance with EPA Method 8015M. The sample's total hydrocarbon concentration and all associated quality control data are included in the report.

The following qualitative information is based on a tentative interpretation of chromatographic pattern

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Case Narrative (continued)

recognition and boiling point ranges:

Total Petroleum Hydrocarbon Identification

L2250426-01 and -02 contain hydrocarbons eluting in the range of n-Octane (C8) to after the elution of n-Heptadecane (C17).

Based on the data generated, L2250426-01 and -02 contain material eluting in the low to mid weight ranges of the chromatogram which is similar to a JP-5 Jet Fuel / Kerosene type product.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: (b) (6) [redacted]

Title: Technical Director/Representative Date: 10/07/22

ORGANICS

VOLATILES

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D2 Date Collected: 09/12/22 13:35
Client ID: A3-010TW-PRN01-WK2 Date Received: 09/20/22
Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 21:42
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
Decane (C10)	14200		mg/kg	1950	265.	200
Undecane	38600		mg/kg	1950	217.	200
Dodecane (C12)	40600		mg/kg	4880	642.	200
Tridecane	30200		mg/kg	4880	1360	200
Tetradecane (C14)	19600		mg/kg	4880	598.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	92		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	100		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 18:09
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3-Methyl-1-butene	ND		mg/kg	97.6	14.5	10
Isopentane	ND		mg/kg	97.6	17.9	10
1-Pentene	ND		mg/kg	97.6	17.8	10
2-Methyl-1-Butene	ND		mg/kg	97.6	15.2	10
Pentane	ND		mg/kg	97.6	30.5	10
trans-2-Pentene	ND		mg/kg	97.6	13.2	10
Isoprene	ND		mg/kg	97.6	17.4	10
cis-2-Pentene	ND		mg/kg	97.6	15.7	10
Tertiary Butanol	ND		mg/kg	1220	158.	10
2,2-Dimethylbutane	ND		mg/kg	97.6	30.1	10
4-Methyl-1-pentene	ND		mg/kg	97.6	15.2	10
Cyclopentane	ND		mg/kg	97.6	25.3	10
2,3-Dimethylbutane	ND		mg/kg	97.6	40.3	10
2-Methylpentane	ND		mg/kg	97.6	26.5	10
Methyl tert butyl ether	ND		mg/kg	97.6	20.1	10
3-Methylpentane	ND		mg/kg	97.6	15.5	10
1-Hexene	ND		mg/kg	97.6	13.7	10
n-Hexane	ND		mg/kg	97.6	16.1	10
Isopropyl Ether	ND		mg/kg	97.6	11.8	10
trans-2-Hexene	ND		mg/kg	97.6	12.7	10
2-Methyl-2-pentene	ND		mg/kg	97.6	14.9	10
cis-2-Hexene	ND		mg/kg	97.6	13.2	10
Ethyl-Tert-Butyl-Ether	ND		mg/kg	97.6	14.8	10
2,2-Dimethylpentane	ND		mg/kg	97.6	13.1	10
Methylcyclopentane	ND		mg/kg	97.6	13.1	10
2,4-Dimethylpentane	ND		mg/kg	97.6	12.1	10
2,2,3-Trimethylbutane	ND		mg/kg	97.6	13.2	10
1,2-Dichloroethane	ND		mg/kg	97.6	14.4	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3,3-Dimethylpentane	ND		mg/kg	97.6	18.2	10
Cyclohexane	ND		mg/kg	97.6	12.1	10
2-Methylhexane	ND		mg/kg	97.6	15.4	10
Benzene	ND		mg/kg	97.6	14.9	10
2,3-Dimethylpentane	ND		mg/kg	97.6	12.9	10
Thiophene	ND		mg/kg	97.6	13.9	10
1,1-Dimethylcyclopentane	ND		mg/kg	97.6	11.7	10
3-Methylhexane	ND		mg/kg	97.6	15.6	10
Tertiary-Amyl Methyl Ether	ND		mg/kg	97.6	12.0	10
3-Ethylpentane	ND		mg/kg	97.6	14.1	10
1-Heptene/1,2-DMCP (trans)	ND		mg/kg	195	28.6	10
Isooctane	ND		mg/kg	97.6	10.6	10
trans-3-Heptene	ND		mg/kg	97.6	15.2	10
Heptane	25.2	J	mg/kg	97.6	17.0	10
trans-2-Heptene	ND		mg/kg	97.6	12.5	10
cis-2-Heptene	ND		mg/kg	97.6	18.9	10
2,2-Dimethylhexane	ND		mg/kg	97.6	14.2	10
Methylcyclohexane	81.1	J	mg/kg	97.6	13.2	10
2,5-Dimethylhexane	ND		mg/kg	97.6	17.0	10
2,4-Dimethylhexane	ND		mg/kg	97.6	11.9	10
Ethylcyclopentane	ND		mg/kg	97.6	12.9	10
2,2,3-Trimethylpentane	ND		mg/kg	97.6	16.9	10
2,3,4-Trimethylpentane	ND		mg/kg	97.6	12.7	10
Xylene (Total)[1]	594		mg/kg	97.6	10.2	10
2,3,3-Trimethylpentane	ND		mg/kg	97.6	19.4	10
2,3-Dimethylhexane	ND		mg/kg	97.6	23.7	10
2-Methylheptane	86.1	J	mg/kg	97.6	16.5	10
4-Methylheptane	ND		mg/kg	97.6	16.8	10
3-Methylheptane	93.4	J	mg/kg	97.6	13.9	10
3-Ethylhexane	ND		mg/kg	97.6	17.5	10
Toluene	16.2	J	mg/kg	97.6	13.2	10
2-Methylthiophene	ND		mg/kg	97.6	8.30	10
1,4-Dimethylcyclohexane (trans)	75.0	J	mg/kg	97.6	12.7	10
3-Methylthiophene	ND		mg/kg	97.6	11.4	10
1-Octene	ND		mg/kg	244	15.0	10
Octane	324		mg/kg	97.6	11.5	10
1,2-Dimethylcyclohexane (trans)	144		mg/kg	97.6	14.4	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1,2-Dibromoethane	ND		mg/kg	97.6	15.6	10
cis-2-Octene	ND		mg/kg	97.6	11.2	10
Isopropylcyclopentane	ND		mg/kg	97.6	14.3	10
1,2-Dimethylcyclohexane (cis)	73.7	J	mg/kg	97.6	28.4	10
2,5-Dimethylheptane	160		mg/kg	97.6	16.4	10
3,5-Dimethylheptane	42.3	J	mg/kg	97.6	13.8	10
3,3-Dimethylheptane	19.9	J	mg/kg	97.6	11.8	10
1,1,4-Trimethylcyclohexane	ND		mg/kg	97.6	9.72	10
2,3-Dimethylheptane	304		mg/kg	97.6	11.1	10
3,4-Dimethylheptane	149		mg/kg	97.6	16.6	10
4-Methyloctane	323		mg/kg	97.6	16.3	10
2-Methyloctane	338		mg/kg	97.6	25.0	10
Ethylbenzene	141		mg/kg	97.6	10.5	10
2-Ethylthiophene	ND		mg/kg	97.6	8.59	10
3-Methyloctane	554		mg/kg	97.6	10.9	10
3,3-Diethylpentane	ND		mg/kg	97.6	11.4	10
p/m-Xylene	448		mg/kg	195	18.6	10
1-Nonene	ND		mg/kg	244	13.2	10
trans-3-Nonene	ND		mg/kg	97.6	11.6	10
cis-3-Nonene	ND		mg/kg	97.6	18.3	10
Nonane (C9)	2810		mg/kg	97.6	15.2	10
Styrene	ND		mg/kg	97.6	9.86	10
o-Xylene	146		mg/kg	97.6	10.2	10
2-Nonene	ND		mg/kg	244	12.4	10
Isopropylcyclohexane	ND		mg/kg	97.6	10.4	10
Isopropylbenzene	152		mg/kg	97.6	9.13	10
3,3-Dimethyloctane	188		mg/kg	97.6	9.86	10
n-Propylbenzene	438		mg/kg	97.6	8.64	10
2-Methylnonane	1830		mg/kg	97.6	13.8	10
3-Methylnonane	1940		mg/kg	97.6	13.6	10
1-Methyl-3-Ethylbenzene	721		mg/kg	97.6	15.4	10
1-Methyl-4-Ethylbenzene	525		mg/kg	97.6	13.8	10
1,3,5-Trimethylbenzene	970		mg/kg	97.6	11.2	10
1-Decene	ND		mg/kg	97.6	12.7	10
Isobutylcyclohexane	ND		mg/kg	97.6	7.96	10
1-Methyl-2-Ethylbenzene	706		mg/kg	97.6	8.30	10
Decane (C10)	13400	E	mg/kg	97.6	13.2	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D Date Collected: 09/12/22 13:35

Client ID: A3-010TW-PRN01-WK2 Date Received: 09/20/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
tert-Butylbenzene	27.7	J	mg/kg	97.6	10.3	10
1,2,4-Trimethylbenzene	2940		mg/kg	97.6	10.1	10
Isobutylbenzene	203		mg/kg	97.6	13.2	10
sec-Butylbenzene	492		mg/kg	97.6	12.6	10
1-Methyl-3-Isopropylbenzene	571		mg/kg	97.6	12.6	10
1-Methyl-4-Isopropylbenzene	518		mg/kg	97.6	10.4	10
1,2,3-Trimethylbenzene	1810		mg/kg	97.6	10.9	10
1-Methyl-2-Isopropylbenzene	139		mg/kg	97.6	10.6	10
Indane	269		mg/kg	97.6	6.00	10
1,3-Diethylbenzene	646		mg/kg	97.6	12.2	10
1-Methyl-3-N-Propylbenzene	1520		mg/kg	97.6	9.86	10
Indene	73.8	J	mg/kg	97.6	5.66	10
1-Methyl-4-N-Propylbenzene	897		mg/kg	97.6	12.2	10
n-Butylbenzene	824		mg/kg	97.6	9.62	10
1,2-Dimethyl-4-Ethylbenzene	1410		mg/kg	97.6	12.0	10
1,2-Diethylbenzene	415		mg/kg	97.6	14.4	10
1-Methyl-2-N-Propylbenzene	1450		mg/kg	97.6	12.2	10
1,4-Dimethyl-2-Ethylbenzene	1340		mg/kg	97.6	9.13	10
Undecane	24700	E	mg/kg	97.6	10.8	10
1,3-Dimethyl-4-Ethylbenzene	1560		mg/kg	97.6	9.47	10
1,3-Dimethyl-5-Ethylbenzene	2040		mg/kg	97.6	11.5	10
1,3-Dimethyl-2-Ethylbenzene	455		mg/kg	97.6	7.28	10
1,2-Dimethyl-3-Ethylbenzene	976		mg/kg	97.6	6.20	10
1,2,4,5-Tetramethylbenzene	1110		mg/kg	97.6	7.57	10
1,2,3,5-Tetramethylbenzene	1980		mg/kg	97.6	7.42	10
N-Pentylbenzene	491		mg/kg	97.6	12.2	10
1,2,3,4-Tetramethylbenzene	1660		mg/kg	97.6	10.4	10
1,3-Dimethyl-5-tert-Butylbenzene	ND		mg/kg	97.6	13.9	10
Dodecane (C12)	22700	E	mg/kg	244	32.1	10
1,3,5-Triethylbenzene	ND		mg/kg	97.6	18.6	10
Naphthalene	1860		mg/kg	97.6	40.8	10
Benzothiophene	ND		mg/kg	97.6	51.6	10
1,2,4-Triethylbenzene	ND		mg/kg	97.6	16.6	10
Hexylbenzene	593		mg/kg	97.6	18.8	10
MMT	ND		mg/kg	244	62.8	10
Tridecane	18000	E	mg/kg	244	68.0	10
2-Methylnaphthalene	3640		mg/kg	244	64.6	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1-Methylnaphthalene	2490		mg/kg	244	71.7	10
Tetradecane (C14)	11200	E	mg/kg	244	29.9	10
Pentadecane	2980		mg/kg	244	54.4	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	95		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	102		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D2 Date Collected: 09/12/22 14:10
Client ID: A3-040TW-PRN01-WK2 Date Received: 09/20/22
Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 22:53
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
Decane (C10)	21200		mg/kg	1920	260.	200
Undecane	48400		mg/kg	1920	213.	200
Dodecane (C12)	46400		mg/kg	4800	631.	200
Tridecane	34700		mg/kg	4800	1340	200
Tetradecane (C14)	22100		mg/kg	4800	588.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	94		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	102		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8260B
Analytical Date: 09/26/22 19:20
Analyst: RY
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3-Methyl-1-butene	ND		mg/kg	96.1	14.3	10
Isopentane	ND		mg/kg	96.1	17.6	10
1-Pentene	ND		mg/kg	96.1	17.5	10
2-Methyl-1-Butene	ND		mg/kg	96.1	14.9	10
Pentane	ND		mg/kg	96.1	30.0	10
trans-2-Pentene	ND		mg/kg	96.1	13.0	10
Isoprene	ND		mg/kg	96.1	17.1	10
cis-2-Pentene	ND		mg/kg	96.1	15.5	10
Tertiary Butanol	ND		mg/kg	1200	156.	10
2,2-Dimethylbutane	ND		mg/kg	96.1	29.6	10
4-Methyl-1-pentene	ND		mg/kg	96.1	14.9	10
Cyclopentane	ND		mg/kg	96.1	24.9	10
2,3-Dimethylbutane	ND		mg/kg	96.1	39.7	10
2-Methylpentane	ND		mg/kg	96.1	26.0	10
Methyl tert butyl ether	ND		mg/kg	96.1	19.8	10
3-Methylpentane	ND		mg/kg	96.1	15.2	10
1-Hexene	ND		mg/kg	96.1	13.5	10
n-Hexane	ND		mg/kg	96.1	15.8	10
Isopropyl Ether	ND		mg/kg	96.1	11.6	10
trans-2-Hexene	ND		mg/kg	96.1	12.5	10
2-Methyl-2-pentene	ND		mg/kg	96.1	14.7	10
cis-2-Hexene	ND		mg/kg	96.1	13.0	10
Ethyl-Tert-Butyl-Ether	ND		mg/kg	96.1	14.6	10
2,2-Dimethylpentane	ND		mg/kg	96.1	12.9	10
Methylcyclopentane	ND		mg/kg	96.1	12.9	10
2,4-Dimethylpentane	ND		mg/kg	96.1	11.9	10
2,2,3-Trimethylbutane	ND		mg/kg	96.1	13.0	10
1,2-Dichloroethane	ND		mg/kg	96.1	14.2	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
3,3-Dimethylpentane	ND		mg/kg	96.1	17.9	10
Cyclohexane	ND		mg/kg	96.1	11.9	10
2-Methylhexane	ND		mg/kg	96.1	15.1	10
Benzene	16.1	J	mg/kg	96.1	14.6	10
2,3-Dimethylpentane	ND		mg/kg	96.1	12.7	10
Thiophene	ND		mg/kg	96.1	13.6	10
1,1-Dimethylcyclopentane	ND		mg/kg	96.1	11.5	10
3-Methylhexane	ND		mg/kg	96.1	15.4	10
Tertiary-Amyl Methyl Ether	ND		mg/kg	96.1	11.8	10
3-Ethylpentane	ND		mg/kg	96.1	13.9	10
1-Heptene/1,2-DMCP (trans)	ND		mg/kg	192	28.1	10
Isooctane	ND		mg/kg	96.1	10.5	10
trans-3-Heptene	ND		mg/kg	96.1	14.9	10
Heptane	55.8	J	mg/kg	96.1	16.7	10
trans-2-Heptene	ND		mg/kg	96.1	12.3	10
cis-2-Heptene	ND		mg/kg	96.1	18.6	10
2,2-Dimethylhexane	ND		mg/kg	96.1	13.9	10
Methylcyclohexane	127		mg/kg	96.1	13.0	10
2,5-Dimethylhexane	ND		mg/kg	96.1	16.7	10
2,4-Dimethylhexane	12.5	J	mg/kg	96.1	11.7	10
Ethylcyclopentane	13.2	J	mg/kg	96.1	12.7	10
2,2,3-Trimethylpentane	ND		mg/kg	96.1	16.7	10
2,3,4-Trimethylpentane	ND		mg/kg	96.1	12.5	10
Xylene (Total)[1]	544		mg/kg	96.1	10.0	10
2,3,3-Trimethylpentane	ND		mg/kg	96.1	19.1	10
2,3-Dimethylhexane	ND		mg/kg	96.1	23.3	10
2-Methylheptane	144		mg/kg	96.1	16.2	10
4-Methylheptane	ND		mg/kg	96.1	16.5	10
3-Methylheptane	133		mg/kg	96.1	13.7	10
3-Ethylhexane	ND		mg/kg	96.1	17.2	10
Toluene	ND		mg/kg	96.1	13.0	10
2-Methylthiophene	ND		mg/kg	96.1	8.16	10
1,4-Dimethylcyclohexane (trans)	59.2	J	mg/kg	96.1	12.5	10
3-Methylthiophene	ND		mg/kg	96.1	11.2	10
1-Octene	ND		mg/kg	240	14.7	10
Octane	631		mg/kg	96.1	11.3	10
1,2-Dimethylcyclohexane (trans)	188		mg/kg	96.1	14.1	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1,2-Dibromoethane	ND		mg/kg	96.1	15.4	10
cis-2-Octene	ND		mg/kg	96.1	11.0	10
Isopropylcyclopentane	19.8	J	mg/kg	96.1	14.1	10
1,2-Dimethylcyclohexane (cis)	103		mg/kg	96.1	27.9	10
2,5-Dimethylheptane	179		mg/kg	96.1	16.1	10
3,5-Dimethylheptane	53.6	J	mg/kg	96.1	13.5	10
3,3-Dimethylheptane	20.9	J	mg/kg	96.1	11.6	10
1,1,4-Trimethylcyclohexane	ND		mg/kg	96.1	9.56	10
2,3-Dimethylheptane	342		mg/kg	96.1	11.0	10
3,4-Dimethylheptane	159		mg/kg	96.1	16.3	10
4-Methyloctane	378		mg/kg	96.1	16.0	10
2-Methyloctane	519		mg/kg	96.1	24.6	10
Ethylbenzene	64.1	J	mg/kg	96.1	10.4	10
2-Ethylthiophene	ND		mg/kg	96.1	8.45	10
3-Methyloctane	688		mg/kg	96.1	10.8	10
3,3-Diethylpentane	ND		mg/kg	96.1	11.2	10
p/m-Xylene	192		mg/kg	192	18.3	10
1-Nonene	ND		mg/kg	240	13.0	10
trans-3-Nonene	ND		mg/kg	96.1	11.4	10
cis-3-Nonene	ND		mg/kg	96.1	18.0	10
Nonane (C9)	4280		mg/kg	96.1	14.9	10
Styrene	ND		mg/kg	96.1	9.70	10
o-Xylene	352		mg/kg	96.1	10.0	10
2-Nonene	ND		mg/kg	240	12.2	10
Isopropylcyclohexane	ND		mg/kg	96.1	10.2	10
Isopropylbenzene	197		mg/kg	96.1	8.98	10
3,3-Dimethyloctane	152		mg/kg	96.1	9.70	10
n-Propylbenzene	454		mg/kg	96.1	8.50	10
2-Methylnonane	1980		mg/kg	96.1	13.6	10
3-Methylnonane	2040		mg/kg	96.1	13.4	10
1-Methyl-3-Ethylbenzene	641		mg/kg	96.1	15.2	10
1-Methyl-4-Ethylbenzene	706		mg/kg	96.1	13.5	10
1,3,5-Trimethylbenzene	1260		mg/kg	96.1	11.0	10
1-Decene	ND		mg/kg	96.1	12.5	10
Isobutylcyclohexane	ND		mg/kg	96.1	7.83	10
1-Methyl-2-Ethylbenzene	1080		mg/kg	96.1	8.16	10
Decane (C10)	16200	E	mg/kg	96.1	13.0	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D Date Collected: 09/12/22 14:10

Client ID: A3-040TW-PRN01-WK2 Date Received: 09/20/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
tert-Butylbenzene	31.7	J	mg/kg	96.1	10.1	10
1,2,4-Trimethylbenzene	3790		mg/kg	96.1	9.94	10
Isobutylbenzene	227		mg/kg	96.1	13.0	10
sec-Butylbenzene	556		mg/kg	96.1	12.4	10
1-Methyl-3-Isopropylbenzene	748		mg/kg	96.1	12.4	10
1-Methyl-4-Isopropylbenzene	605		mg/kg	96.1	10.2	10
1,2,3-Trimethylbenzene	2440		mg/kg	96.1	10.7	10
1-Methyl-2-Isopropylbenzene	151		mg/kg	96.1	10.4	10
Indane	208		mg/kg	96.1	5.91	10
1,3-Diethylbenzene	652		mg/kg	96.1	12.0	10
1-Methyl-3-N-Propylbenzene	1880		mg/kg	96.1	9.70	10
Indene	79.2	J	mg/kg	96.1	5.57	10
1-Methyl-4-N-Propylbenzene	1020		mg/kg	96.1	12.0	10
n-Butylbenzene	949		mg/kg	96.1	9.46	10
1,2-Dimethyl-4-Ethylbenzene	1600		mg/kg	96.1	11.8	10
1,2-Diethylbenzene	426		mg/kg	96.1	14.2	10
1-Methyl-2-N-Propylbenzene	1780		mg/kg	96.1	12.0	10
1,4-Dimethyl-2-Ethylbenzene	1550		mg/kg	96.1	8.98	10
Undecane	27200	E	mg/kg	96.1	10.7	10
1,3-Dimethyl-4-Ethylbenzene	1870		mg/kg	96.1	9.32	10
1,3-Dimethyl-5-Ethylbenzene	2070		mg/kg	96.1	11.3	10
1,3-Dimethyl-2-Ethylbenzene	464		mg/kg	96.1	7.16	10
1,2-Dimethyl-3-Ethylbenzene	1110		mg/kg	96.1	6.10	10
1,2,4,5-Tetramethylbenzene	1260		mg/kg	96.1	7.44	10
1,2,3,5-Tetramethylbenzene	2320		mg/kg	96.1	7.30	10
N-Pentylbenzene	599		mg/kg	96.1	12.0	10
1,2,3,4-Tetramethylbenzene	1810		mg/kg	96.1	10.3	10
1,3-Dimethyl-5-tert-Butylbenzene	ND		mg/kg	96.1	13.7	10
Dodecane (C12)	26400	E	mg/kg	240	31.6	10
1,3,5-Triethylbenzene	ND		mg/kg	96.1	18.2	10
Naphthalene	2370		mg/kg	96.1	40.1	10
Benzothiophene	ND		mg/kg	96.1	50.8	10
1,2,4-Triethylbenzene	ND		mg/kg	96.1	16.3	10
Hexylbenzene	654		mg/kg	96.1	18.5	10
MMT	ND		mg/kg	240	61.8	10
Tridecane	24700	E	mg/kg	240	66.9	10
2-Methylnaphthalene	4730		mg/kg	240	63.5	10

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PIANO Volatile Organics by GC/MS - Mansfield Lab						
1-Methylnaphthalene	3230		mg/kg	240	70.5	10
Tetradecane (C14)	16100	E	mg/kg	240	29.4	10
Pentadecane	2220		mg/kg	240	53.6	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	100		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	100		70-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
3-Methyl-1-butene	ND		mg/kg	10.0	1.48
Isopentane	ND		mg/kg	10.0	1.83
1-Pentene	ND		mg/kg	10.0	1.82
2-Methyl-1-Butene	ND		mg/kg	10.0	1.56
Pentane	ND		mg/kg	10.0	3.12
trans-2-Pentene	ND		mg/kg	10.0	1.35
Isoprene	ND		mg/kg	10.0	1.78
cis-2-Pentene	ND		mg/kg	10.0	1.61
Tertiary Butanol	ND		mg/kg	125	16.2
2,2-Dimethylbutane	ND		mg/kg	10.0	3.08
4-Methyl-1-pentene	ND		mg/kg	10.0	1.56
Cyclopentane	ND		mg/kg	10.0	2.60
2,3-Dimethylbutane	ND		mg/kg	10.0	4.13
2-Methylpentane	ND		mg/kg	10.0	2.71
Methyl tert butyl ether	ND		mg/kg	10.0	2.06
3-Methylpentane	ND		mg/kg	10.0	1.58
1-Hexene	ND		mg/kg	10.0	1.40
n-Hexane	ND		mg/kg	10.0	1.64
Isopropyl Ether	ND		mg/kg	10.0	1.21
trans-2-Hexene	ND		mg/kg	10.0	1.30
2-Methyl-2-pentene	ND		mg/kg	10.0	1.53
cis-2-Hexene	ND		mg/kg	10.0	1.36
Ethyl-Tert-Butyl-Ether	ND		mg/kg	10.0	1.52
2,2-Dimethylpentane	ND		mg/kg	10.0	1.34
Methylcyclopentane	ND		mg/kg	10.0	1.34
2,4-Dimethylpentane	ND		mg/kg	10.0	1.24
2,2,3-Trimethylbutane	ND		mg/kg	10.0	1.35
1,2-Dichloroethane	ND		mg/kg	10.0	1.48
3,3-Dimethylpentane	ND		mg/kg	10.0	1.86

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
Cyclohexane	ND		mg/kg	10.0	1.24
2-Methylhexane	ND		mg/kg	10.0	1.58
Benzene	1.76	J	mg/kg	10.0	1.52
2,3-Dimethylpentane	ND		mg/kg	10.0	1.32
Thiophene	ND		mg/kg	10.0	1.42
1,1-Dimethylcyclopentane	ND		mg/kg	10.0	1.20
3-Methylhexane	ND		mg/kg	10.0	1.60
Tertiary-Amyl Methyl Ether	ND		mg/kg	10.0	1.23
3-Ethylpentane	ND		mg/kg	10.0	1.44
1-Heptene/1,2-DMCP (trans)	ND		mg/kg	20.0	2.92
Isooctane	ND		mg/kg	10.0	1.09
trans-3-Heptene	ND		mg/kg	10.0	1.56
Heptane	ND		mg/kg	10.0	1.74
trans-2-Heptene	ND		mg/kg	10.0	1.28
cis-2-Heptene	ND		mg/kg	10.0	1.94
2,2-Dimethylhexane	ND		mg/kg	10.0	1.45
Methylcyclohexane	ND		mg/kg	10.0	1.35
2,5-Dimethylhexane	ND		mg/kg	10.0	1.74
2,4-Dimethylhexane	ND		mg/kg	10.0	1.22
Ethylcyclopentane	ND		mg/kg	10.0	1.32
2,2,3-Trimethylpentane	ND		mg/kg	10.0	1.74
2,3,4-Trimethylpentane	ND		mg/kg	10.0	1.30
Xylene (Total)[1]	ND		mg/kg	10.0	1.04
2,3,3-Trimethylpentane	ND		mg/kg	10.0	1.98
2,3-Dimethylhexane	ND		mg/kg	10.0	2.42
2-Methylheptane	ND		mg/kg	10.0	1.69
4-Methylheptane	ND		mg/kg	10.0	1.72
3-Methylheptane	ND		mg/kg	10.0	1.42
3-Ethylhexane	ND		mg/kg	10.0	1.79

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
Toluene	ND		mg/kg	10.0	1.36
2-Methylthiophene	ND		mg/kg	10.0	0.850
1,4-Dimethylcyclohexane (trans)	ND		mg/kg	10.0	1.30
3-Methylthiophene	ND		mg/kg	10.0	1.17
1-Octene	ND		mg/kg	25.0	1.54
Octane	ND		mg/kg	10.0	1.18
1,2-Dimethylcyclohexane (trans)	ND		mg/kg	10.0	1.47
1,2-Dibromoethane	ND		mg/kg	10.0	1.60
cis-2-Octene	ND		mg/kg	10.0	1.14
Isopropylcyclopentane	ND		mg/kg	10.0	1.46
1,2-Dimethylcyclohexane (cis)	ND		mg/kg	10.0	2.90
2,5-Dimethylheptane	ND		mg/kg	10.0	1.68
3,5-Dimethylheptane	ND		mg/kg	10.0	1.41
3,3-Dimethylheptane	ND		mg/kg	10.0	1.21
1,1,4-Trimethylcyclohexane	ND		mg/kg	10.0	0.995
2,3-Dimethylheptane	ND		mg/kg	10.0	1.14
3,4-Dimethylheptane	ND		mg/kg	10.0	1.70
4-Methyloctane	ND		mg/kg	10.0	1.67
2-Methyloctane	ND		mg/kg	10.0	2.56
Ethylbenzene	ND		mg/kg	10.0	1.08
2-Ethylthiophene	ND		mg/kg	10.0	0.880
3-Methyloctane	ND		mg/kg	10.0	1.12
3,3-Diethylpentane	ND		mg/kg	10.0	1.16
p/m-Xylene	ND		mg/kg	20.0	1.90
1-Nonene	ND		mg/kg	25.0	1.35
trans-3-Nonene	ND		mg/kg	10.0	1.18
cis-3-Nonene	ND		mg/kg	10.0	1.87
Nonane (C9)	ND		mg/kg	10.0	1.56
Styrene	ND		mg/kg	10.0	1.01

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
o-Xylene	ND		mg/kg	10.0	1.04
2-Nonene	ND		mg/kg	25.0	1.27
Isopropylcyclohexane	ND		mg/kg	10.0	1.06
Isopropylbenzene	ND		mg/kg	10.0	0.935
3,3-Dimethyloctane	ND		mg/kg	10.0	1.01
n-Propylbenzene	ND		mg/kg	10.0	0.885
2-Methylnonane	ND		mg/kg	10.0	1.42
3-Methylnonane	ND		mg/kg	10.0	1.40
1-Methyl-3-Ethylbenzene	ND		mg/kg	10.0	1.58
1-Methyl-4-Ethylbenzene	ND		mg/kg	10.0	1.41
1,3,5-Trimethylbenzene	ND		mg/kg	10.0	1.15
1-Decene	ND		mg/kg	10.0	1.30
Isobutylcyclohexane	ND		mg/kg	10.0	0.815
1-Methyl-2-Ethylbenzene	ND		mg/kg	10.0	0.850
Decane (C10)	1.39	J	mg/kg	10.0	1.36
tert-Butylbenzene	ND		mg/kg	10.0	1.06
1,2,4-Trimethylbenzene	ND		mg/kg	10.0	1.04
Isobutylbenzene	ND		mg/kg	10.0	1.35
sec-Butylbenzene	ND		mg/kg	10.0	1.30
1-Methyl-3-Isopropylbenzene	ND		mg/kg	10.0	1.29
1-Methyl-4-Isopropylbenzene	ND		mg/kg	10.0	1.06
1,2,3-Trimethylbenzene	ND		mg/kg	10.0	1.12
1-Methyl-2-Isopropylbenzene	ND		mg/kg	10.0	1.08
Indane	ND		mg/kg	10.0	0.615
1,3-Diethylbenzene	ND		mg/kg	10.0	1.24
1-Methyl-3-N-Propylbenzene	ND		mg/kg	10.0	1.01
Indene	ND		mg/kg	10.0	0.580
1-Methyl-4-N-Propylbenzene	ND		mg/kg	10.0	1.25
n-Butylbenzene	ND		mg/kg	10.0	0.985

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					
1,2-Dimethyl-4-Ethylbenzene	ND		mg/kg	10.0	1.22
1,2-Diethylbenzene	ND		mg/kg	10.0	1.48
1-Methyl-2-N-Propylbenzene	ND		mg/kg	10.0	1.24
1,4-Dimethyl-2-Ethylbenzene	ND		mg/kg	10.0	0.935
Undecane	ND		mg/kg	10.0	1.11
1,3-Dimethyl-4-Ethylbenzene	ND		mg/kg	10.0	0.970
1,3-Dimethyl-5-Ethylbenzene	ND		mg/kg	10.0	1.18
1,3-Dimethyl-2-Ethylbenzene	ND		mg/kg	10.0	0.745
1,2-Dimethyl-3-Ethylbenzene	ND		mg/kg	10.0	0.635
1,2,4,5-Tetramethylbenzene	ND		mg/kg	10.0	0.775
1,2,3,5-Tetramethylbenzene	ND		mg/kg	10.0	0.760
N-Pentylbenzene	ND		mg/kg	10.0	1.24
1,2,3,4-Tetramethylbenzene	ND		mg/kg	10.0	1.07
1,3-Dimethyl-5-tert-Butylbenzene	ND		mg/kg	10.0	1.42
Dodecane (C12)	ND		mg/kg	25.0	3.28
1,3,5-Triethylbenzene	ND		mg/kg	10.0	1.90
Naphthalene	ND		mg/kg	10.0	4.18
Benzothiophene	ND		mg/kg	10.0	5.28
1,2,4-Triethylbenzene	ND		mg/kg	10.0	1.70
Hexylbenzene	ND		mg/kg	10.0	1.92
MMT	ND		mg/kg	25.0	6.43
Tridecane	ND		mg/kg	25.0	6.96
2-Methylnaphthalene	ND		mg/kg	25.0	6.61
1-Methylnaphthalene	ND		mg/kg	25.0	7.34
Tetradecane (C14)	ND		mg/kg	25.0	3.06
Pentadecane	ND		mg/kg	25.0	5.58

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260B
Analytical Date: 09/26/22 15:48
Analyst: RY

Parameter	Result	Qualifier	Units	RL	MDL
PIANO Volatile Organics by GC/MS - Mansfield Lab for sample(s): 01-02 Batch: WG1692182-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Dibromofluoromethane	98		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	101		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106
Lab Number: L2250426
Report Date: 10/07/22

PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01-02 Batch: WG1692182-3 WG1692182-4

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
1-Pentene	107		107		50-130	0		30
Pentane	86		87		50-130	1		30
Tertiary Butanol	89		92		50-130	3		30
Cyclopentane	92		93		50-130	1		30
2-Methylpentane	91		93		50-130	2		30
Methyl tert butyl ether	81		78		50-130	4		30
3-Methylpentane	95		95		50-130	0		30
1-Hexene	101		100		50-130	1		30
n-Hexane	90		91		50-130	1		30
Isopropyl Ether	86		86		50-130	0		30
Ethyl-Tert-Butyl-Ether	75		76		50-130	1		30
Methylcyclopentane	102		103		50-130	1		30
2,4-Dimethylpentane	93		94		50-130	1		30
Cyclohexane	102		104		50-130	2		30
2-Methylhexane	94		94		50-130	0		30
Benzene	91		91		50-130	0		30
2,3-Dimethylpentane	93		97		50-130	4		30
3-Methylhexane	83		84		50-130	1		30
Tertiary-Amyl Methyl Ether	79		80		50-130	1		30
Isooctane	101		99		50-130	2		30
Heptane	102		102		50-130	0		30
Methylcyclohexane	96		94		50-130	2		30
2-Methylheptane	102		103		50-130	1		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106
Lab Number: L2250426
Report Date: 10/07/22

PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01-02 Batch: WG1692182-3 WG1692182-4

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
3-Methylheptane	100		100		50-130	0		30
Toluene	90		91		50-130	1		30
Octane	103		104		50-130	1		30
Ethylbenzene	93		94		50-130	1		30
p/m-Xylene	97		98		50-130	1		30
Nonane (C9)	97		96		50-130	1		30
o-Xylene	96		98		50-130	2		30
Isopropylbenzene	98		99		50-130	1		30
n-Propylbenzene	101		102		50-130	1		30
1-Methyl-3-Ethylbenzene	100		101		50-130	1		30
1-Methyl-4-Ethylbenzene	101		104		50-130	3		30
1,3,5-Trimethylbenzene	102		104		50-130	2		30
1-Decene	78		78		50-130	0		30
1-Methyl-2-Ethylbenzene	101		104		50-130	3		30
Decane (C10)	105		106		50-130	1		30
1,2,4-Trimethylbenzene	96		98		50-130	2		30
sec-Butylbenzene	106		109		50-130	3		30
1-Methyl-4-N-Propylbenzene	99		100		50-130	1		30
n-Butylbenzene	100		102		50-130	2		30
1,2-Diethylbenzene	99		100		50-130	1		30
Undecane	102		102		50-130	0		30
N-Pentylbenzene	100		101		50-130	1		30
Dodecane (C12)	121		122		50-130	1		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3

Project Number: CTO-22F0106

Lab Number: L2250426

Report Date: 10/07/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PIANO Volatile Organics by GC/MS - Mansfield Lab Associated sample(s): 01-02 Batch: WG1692182-3 WG1692182-4								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Dibromofluoromethane	98		98		70-130
Toluene-d8	99		98		70-130
4-Bromofluorobenzene	103		103		70-130

PETROLEUM HYDROCARBONS

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/01/22 23:22
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	2930		mg/kg	193	57.3	1
n-Decane (C10)	15100		mg/kg	193	61.6	1
n-Undecane (C11)	39400	E	mg/kg	193	57.7	1
n-Dodecane (C12)	42500	E	mg/kg	193	42.1	1
n-Tridecane (C13)	34100		mg/kg	193	53.0	1
2,6,10-Trimethyldodecane (1380)	5210		mg/kg	193	29.1	1
n-Tetradecane (C14)	20000		mg/kg	193	29.1	1
2,6,10-Trimethyltridecane (1470)	4630		mg/kg	193	23.0	1
n-Pentadecane (C15)	7070		mg/kg	193	23.0	1
n-Hexadecane (C16)	1410		mg/kg	193	29.1	1
Norpristane (1650)	231		mg/kg	193	63.8	1
n-Heptadecane (C17)	290		mg/kg	193	63.8	1
Pristane	220		mg/kg	193	41.3	1
n-Octadecane (C18)	91.8	J	mg/kg	193	38.8	1
Phytane	72.6	J	mg/kg	193	24.3	1
n-Nonadecane (C19)	ND		mg/kg	193	49.7	1
n-Eicosane (C20)	ND		mg/kg	193	27.3	1
n-Heneicosane (C21)	ND		mg/kg	193	23.1	1
n-Docosane (C22)	ND		mg/kg	193	20.2	1
n-Tricosane (C23)	ND		mg/kg	193	24.6	1
n-Tetracosane (C24)	ND		mg/kg	193	32.3	1
n-Pentacosane (C25)	ND		mg/kg	193	102.	1
n-Hexacosane (C26)	ND		mg/kg	193	28.4	1
n-Heptacosane (C27)	ND		mg/kg	193	23.3	1
n-Octacosane (C28)	ND		mg/kg	193	41.4	1
n-Nonacosane (C29)	ND		mg/kg	193	129.	1
n-Triacontane (C30)	ND		mg/kg	193	22.2	1
n-Hentriacontane (C31)	ND		mg/kg	193	27.4	1

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 Date Collected: 09/12/22 13:35

Client ID: A3-010TW-PRN01-WK2 Date Received: 09/20/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	ND		mg/kg	193	24.3	1
n-Tritriacontane (C33)	ND		mg/kg	193	27.2	1
n-Tetratriacontane (C34)	ND		mg/kg	193	30.7	1
n-Pentatriacontane (C35)	ND		mg/kg	193	33.7	1
n-Hexatriacontane (C36)	ND		mg/kg	193	38.4	1
n-Heptatriacontane (C37)	ND		mg/kg	193	42.9	1
n-Octatriacontane (C38)	ND		mg/kg	193	45.0	1
n-Nonatriacontane (C39)	ND		mg/kg	193	62.7	1
n-Tetracontane (C40)	ND		mg/kg	193	62.7	1
C9-C44 Total Petroleu	1010000		mg/kg	6380	1400	1
C10-C28 DRO	958000		mg/kg	4060	836.	1
C28-C40 ORO	16400		mg/kg	2120	483.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	102		50-130
d50-Tetracosane	109		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-01 D
Client ID: A3-010TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 13:35
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/05/22 06:12
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Undecane (C11)	40900		mg/kg	966	288.	5
n-Dodecane (C12)	40700		mg/kg	966	210.	5
Total Saturated Hydrocarbons	173000	J	mg/kg	193	20.2	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	103		50-130
d50-Tetracosane	107		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/02/22 00:49
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	4530		mg/kg	197	58.4	1
n-Decane (C10)	20100		mg/kg	197	62.8	1
n-Undecane (C11)	45800	E	mg/kg	197	58.8	1
n-Dodecane (C12)	45500	E	mg/kg	197	42.9	1
n-Tridecane (C13)	35600		mg/kg	197	54.0	1
2,6,10-Trimethyldodecane (1380)	4640		mg/kg	197	29.6	1
n-Tetradecane (C14)	20100		mg/kg	197	29.6	1
2,6,10-Trimethyltridecane (1470)	4270		mg/kg	197	23.5	1
n-Pentadecane (C15)	7500		mg/kg	197	23.5	1
n-Hexadecane (C16)	1480		mg/kg	197	29.6	1
Norpristane (1650)	176	J	mg/kg	197	65.0	1
n-Heptadecane (C17)	314		mg/kg	197	65.0	1
Pristane	161	J	mg/kg	197	42.0	1
n-Octadecane (C18)	98.6	J	mg/kg	197	39.5	1
Phytane	34.0	J	mg/kg	197	24.7	1
n-Nonadecane (C19)	ND		mg/kg	197	50.6	1
n-Eicosane (C20)	ND		mg/kg	197	27.8	1
n-Heneicosane (C21)	ND		mg/kg	197	23.6	1
n-Docosane (C22)	ND		mg/kg	197	20.5	1
n-Tricosane (C23)	ND		mg/kg	197	25.0	1
n-Tetracosane (C24)	ND		mg/kg	197	32.9	1
n-Pentacosane (C25)	ND		mg/kg	197	104.	1
n-Hexacosane (C26)	ND		mg/kg	197	28.9	1
n-Heptacosane (C27)	ND		mg/kg	197	23.7	1
n-Octacosane (C28)	ND		mg/kg	197	42.2	1
n-Nonacosane (C29)	ND		mg/kg	197	131.	1
n-Triacontane (C30)	ND		mg/kg	197	22.6	1
n-Hentriacontane (C31)	ND		mg/kg	197	27.9	1

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 Date Collected: 09/12/22 14:10

Client ID: A3-040TW-PRN01-WK2 Date Received: 09/20/22

Sample Location: Not Specified Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	ND		mg/kg	197	24.8	1
n-Tritriacontane (C33)	ND		mg/kg	197	27.7	1
n-Tetratriacontane (C34)	ND		mg/kg	197	31.3	1
n-Pentatriacontane (C35)	ND		mg/kg	197	34.4	1
n-Hexatriacontane (C36)	ND		mg/kg	197	39.2	1
n-Heptatriacontane (C37)	ND		mg/kg	197	43.7	1
n-Octatriacontane (C38)	ND		mg/kg	197	45.9	1
n-Nonatriacontane (C39)	ND		mg/kg	197	63.9	1
n-Tetracontane (C40)	ND		mg/kg	197	63.9	1
C9-C44 Total Petroleu	973000		mg/kg	6500	1430	1
C10-C28 DRO	926000		mg/kg	4130	852.	1
C28-C40 ORO	9330		mg/kg	2160	492.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	99		50-130
d50-Tetracosane	106		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

SAMPLE RESULTS

Lab ID: L2250426-02 D
Client ID: A3-040TW-PRN01-WK2
Sample Location: Not Specified

Date Collected: 09/12/22 14:10
Date Received: 09/20/22
Field Prep: Not Specified

Sample Depth:
Matrix: Oil
Analytical Method: 1,8015D(M)
Analytical Date: 10/05/22 07:39
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Undecane (C11)	47800		mg/kg	984	294.	5
n-Dodecane (C12)	43800		mg/kg	984	214.	5
Total Saturated Hydrocarbons	191000	J	mg/kg	197	20.5	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	101		50-130
d50-Tetracosane	106		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 10/01/22 05:57
Analyst: WR

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1693518-1					
n-Nonane (C9)	ND		mg/kg	200	59.3
n-Decane (C10)	ND		mg/kg	200	63.8
n-Undecane (C11)	ND		mg/kg	200	59.7
n-Dodecane (C12)	ND		mg/kg	200	43.6
n-Tridecane (C13)	ND		mg/kg	200	54.9
2,6,10-Trimethyldodecane (1380)	ND		mg/kg	200	30.1
n-Tetradecane (C14)	ND		mg/kg	200	30.1
2,6,10-Trimethyltridecane (1470)	ND		mg/kg	200	23.9
n-Pentadecane (C15)	ND		mg/kg	200	23.9
n-Hexadecane (C16)	ND		mg/kg	200	30.1
Norpristane (1650)	ND		mg/kg	200	66.0
n-Heptadecane (C17)	ND		mg/kg	200	66.0
Pristane	ND		mg/kg	200	42.7
n-Octadecane (C18)	ND		mg/kg	200	40.1
Phytane	ND		mg/kg	200	25.1
n-Nonadecane (C19)	ND		mg/kg	200	51.4
n-Eicosane (C20)	ND		mg/kg	200	28.3
n-Heneicosane (C21)	ND		mg/kg	200	23.9
n-Docosane (C22)	ND		mg/kg	200	20.9
n-Tricosane (C23)	ND		mg/kg	200	25.4
n-Tetracosane (C24)	ND		mg/kg	200	33.5
n-Pentacosane (C25)	ND		mg/kg	200	106.
n-Hexacosane (C26)	ND		mg/kg	200	29.4
n-Heptacosane (C27)	ND		mg/kg	200	24.1
n-Octacosane (C28)	ND		mg/kg	200	42.9
n-Nonacosane (C29)	ND		mg/kg	200	133.
n-Triacontane (C30)	ND		mg/kg	200	22.9
n-Hentriacontane (C31)	ND		mg/kg	200	28.3
n-Dotriacontane (C32)	ND		mg/kg	200	25.2

Project Name: SITE CHARACTERIZATION/ADIT 3 **Lab Number:** L2250426

Project Number: CTO-22F0106 **Report Date:** 10/07/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 10/01/22 05:57
Analyst: WR

Extraction Method: EPA 3580A
Extraction Date: 09/29/22 10:38

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01-02 Batch: WG1693518-1					
n-Tritriacontane (C33)	ND		mg/kg	200	28.1
n-Tetratriacontane (C34)	ND		mg/kg	200	31.8
n-Pentatriacontane (C35)	ND		mg/kg	200	34.9
n-Hexatriacontane (C36)	ND		mg/kg	200	39.8
n-Heptatriacontane (C37)	ND		mg/kg	200	44.4
n-Octatriacontane (C38)	ND		mg/kg	200	46.6
n-Nonatriacontane (C39)	ND		mg/kg	200	64.9
n-Tetracontane (C40)	ND		mg/kg	200	64.9
C9-C44 Total Petroleu	ND		mg/kg	6600	1450
C10-C28 DRO	1010	J	mg/kg	4200	866.
C28-C40 ORO	ND		mg/kg	2200	500.
Total Saturated Hydrocarbons	ND		mg/kg	200	20.9

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	100		50-130
d50-Tetracosane	104		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106
Lab Number: L2250426
Report Date: 10/07/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01-02 Batch: WG1693518-2 WG1693518-3								
Nonane (C9)	92		93		50-130	1		30
n-Decane (C10)	94		95		50-130	1		30
n-Dodecane (C12)	98		99		50-130	1		30
n-Tetradecane (C14)	97		99		50-130	2		30
n-Hexadecane (C16)	102		107		50-130	5		30
n-Octadecane (C18)	104		106		50-130	2		30
n-Nonadecane (C19)	93		96		50-130	3		30
n-Eicosane (C20)	96		99		50-130	3		30
n-Docosane (C22)	101		104		50-130	3		30
n-Tetracosane (C24)	105		108		50-130	3		30
n-Hexacosane (C26)	103		106		50-130	3		30
n-Octacosane (C28)	97		100		50-130	3		30
n-Triacontane (C30)	104		106		50-130	2		30
n-Hexatriacontane (C36)	95		97		50-130	2		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	102		103		50-130
d50-Tetracosane	105		106		50-130

Project Name: SITE CHARACTERIZATION/ADIT 3
Project Number: CTO-22F0106

Lab Number: L2250426
Report Date: 10/07/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
NA	Present/Intact

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2250426-01A	Vial Large Septa unpreserved (4oz)	NA	NA			Y	Present/Intact		A2-PIANO8260(365),A2-SHC(365)
L2250426-02A	Vial Large Septa unpreserved (4oz)	NA	NA			Y	Present/Intact		A2-PIANO8260(365),A2-SHC(365)

*Values in parentheses indicate holding time in days

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
Project Number:	CTO-22F0106	**Report Date:**	10/07/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	SITE CHARACTERIZATION/ADIT 3	**Lab Number:**	L2250426
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Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial_No:10072210:39

COC# 09132022SIT-Alpha-01

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193

Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 9/20/22

ALPHA Job #: L2250426

Project Information

Project Name: Site Characterization/Adit 3

Project Location: RHBFSF-Adit 3

Project #: CTO-22F0106

Project Manager: [redacted] (b) (6)

ALPHA Quote #:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #: 02.30.01.

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

Client Information

Client: GSI-Rhodes for CTO22F0106 (AECOM)

Address: 1001 Bishop Street, Ste 1600

Honolulu, Hawaii

Phone: [redacted] (b) (6)

Fax:

Email: [redacted] (b) (6) @aecom.com

☐ These samples have been Previously analyzed by Alpha

Turn-Around Time

☐ Standard ☐ Rush (ONLY IF PRE-APPROVED)

Due Date: Time:

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS

Saturated Hydrocarbon ANalysis: PIANO

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Saturated Hydrocarbon ANalysis	Sample Specific Comments
	A3015TW-PRN01-WK2	9/12/22	1315	Product	[redacted] (b) (6)	☒	Sample is wat/prod
50426.01	A3-010TW-PRN01-WK2	9/12/22	1335	Product		☒	Sample is product
-02	A3-040TW-PRN01-WK2	9/12/22	1410	Product		☒	Sample is product
	A3-010DSVMP-PRN01-WK2	9/12/222	1255	Product		☒	Sample is wat/prod [redacted] (b) (6)

9/12/22 [redacted] (b) (6)

Container Type

Preservative

Relinquished By:	Date/Time	Received By:	Date/Time
[redacted] (b) (6)	9/12/22 @ 1600	[redacted] (b) (6)	9/12/22 1600
	9/13/22 1534	Fedex	
Fedex		[redacted] (b) (6)	9/20/22

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

15:07

FORM NO: 01-01(I-NJ) (rev. 5-JAN-12)

ORIGIN ID:HIKA (808) 356-5351
[redacted] (b) (6)
AECOM
1001 BISHOP STREET
SUITE 1600
HONOLULU, HI 96813
UNITED STATES US

SHIP DATE: 13SEP22
ACTWGT: 20.00 LB
CAD: 5070931/INET4532
DIMS: 18x18x18 IN

BILL SENDER

TO [redacted] (b) (6)

ALPHA ANALYTICAL
320 FORBES BLVD.

MANSFIELD MA 02048
(508) 822-9300 REF:
INV:
PO: DEPT:

581J1/ECBC/FE20

FedEx Express

FedEx
TRK# 0201 7779 2607 3445

THU - 15 SEP AA
PRIORITY OVERNIGHT
ADG
02048
MA-US
BOS

XE PYMA

76313 14Sep2022 IONLA 581G1/ECBC/C088

After printing this label:
CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH
1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com. FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim. Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss. Maximum for items of extraordinary value is $1,000, e.g. jewelry, precious metals, negotiable instruments and other items listed in our Service Guide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

GC-FID Chromatogram

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File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292286.D
Operator   : FID6:WR
Acquired   : 01 Oct 2022  11:22 pm using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: l2250426-01,42,,
Misc Info  : WG1693640,WG1693518,ICAL19333
Vial Number: 43
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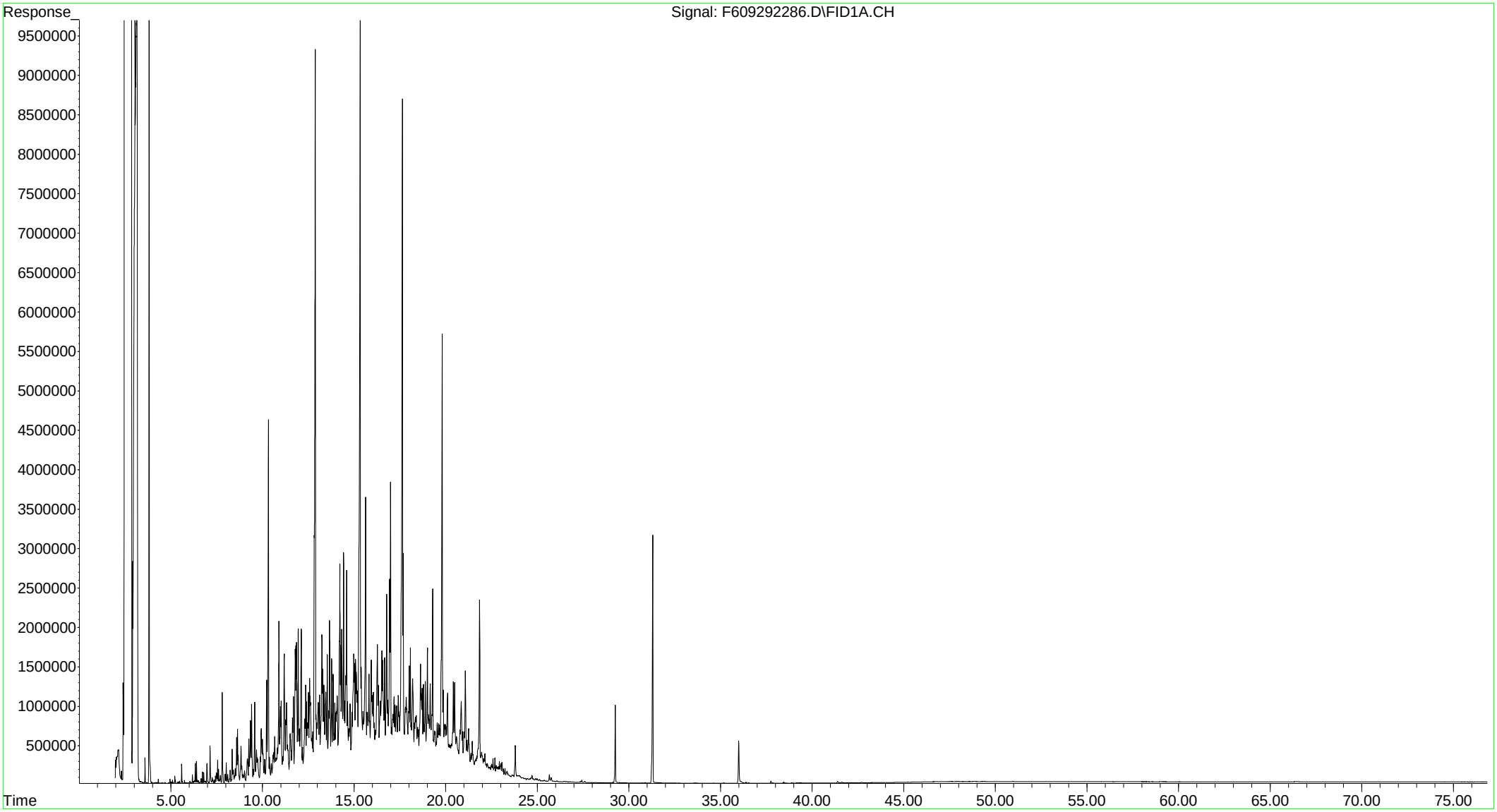

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File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292288.D
Operator   : FID6:WR
Acquired   : 02 Oct 2022  12:49 am using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: l2250426-02,42,,
Misc Info  : WG1693640,WG1693518,ICAL19333
Vial Number: 44
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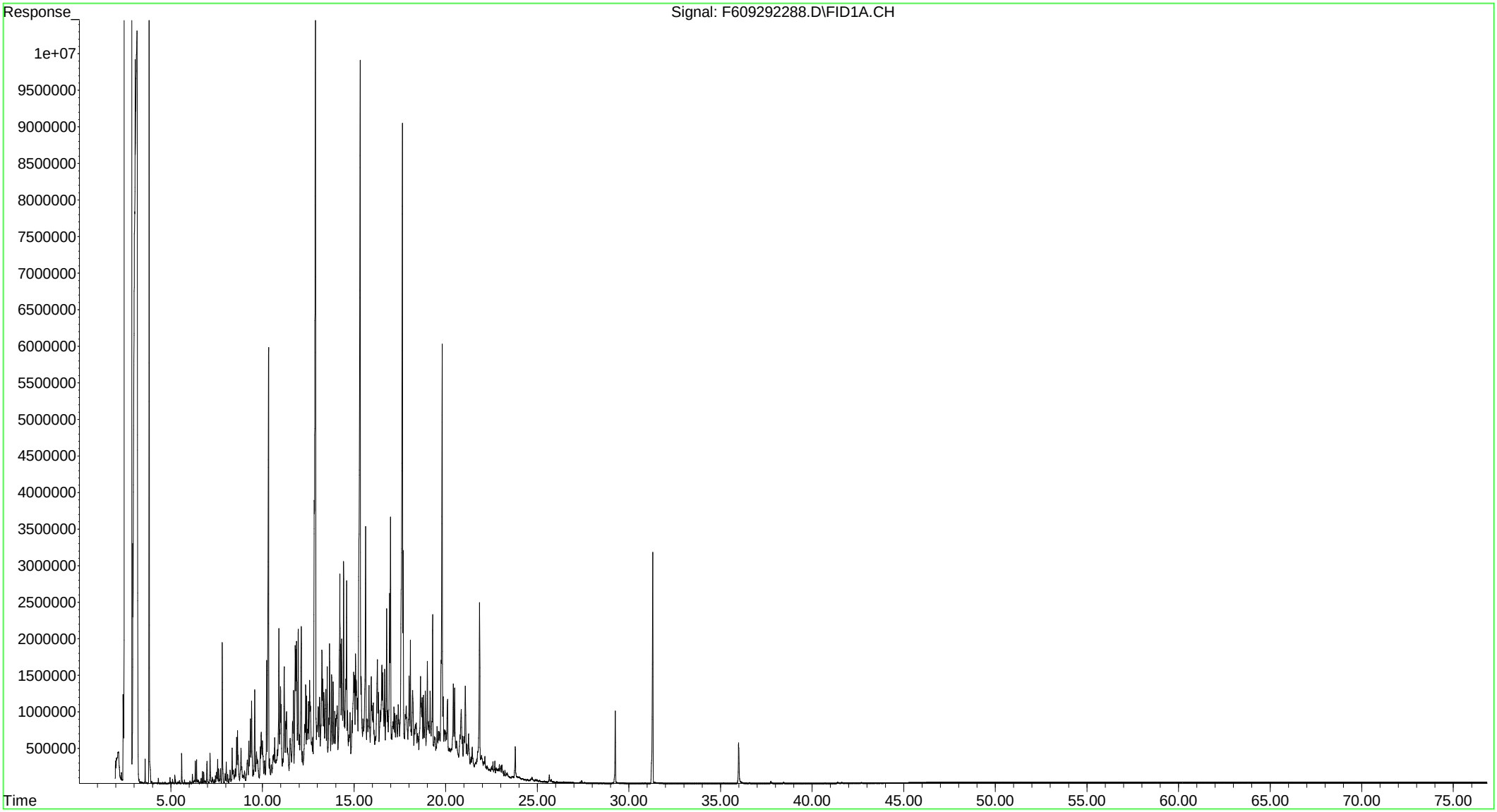

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File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292262.D
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Acquired   : 01 Oct 2022   5:57 am using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: WG1693518-1,42,,
Misc Info  : WG1693640,WG1693518,ICAL19333
Vial Number: 31
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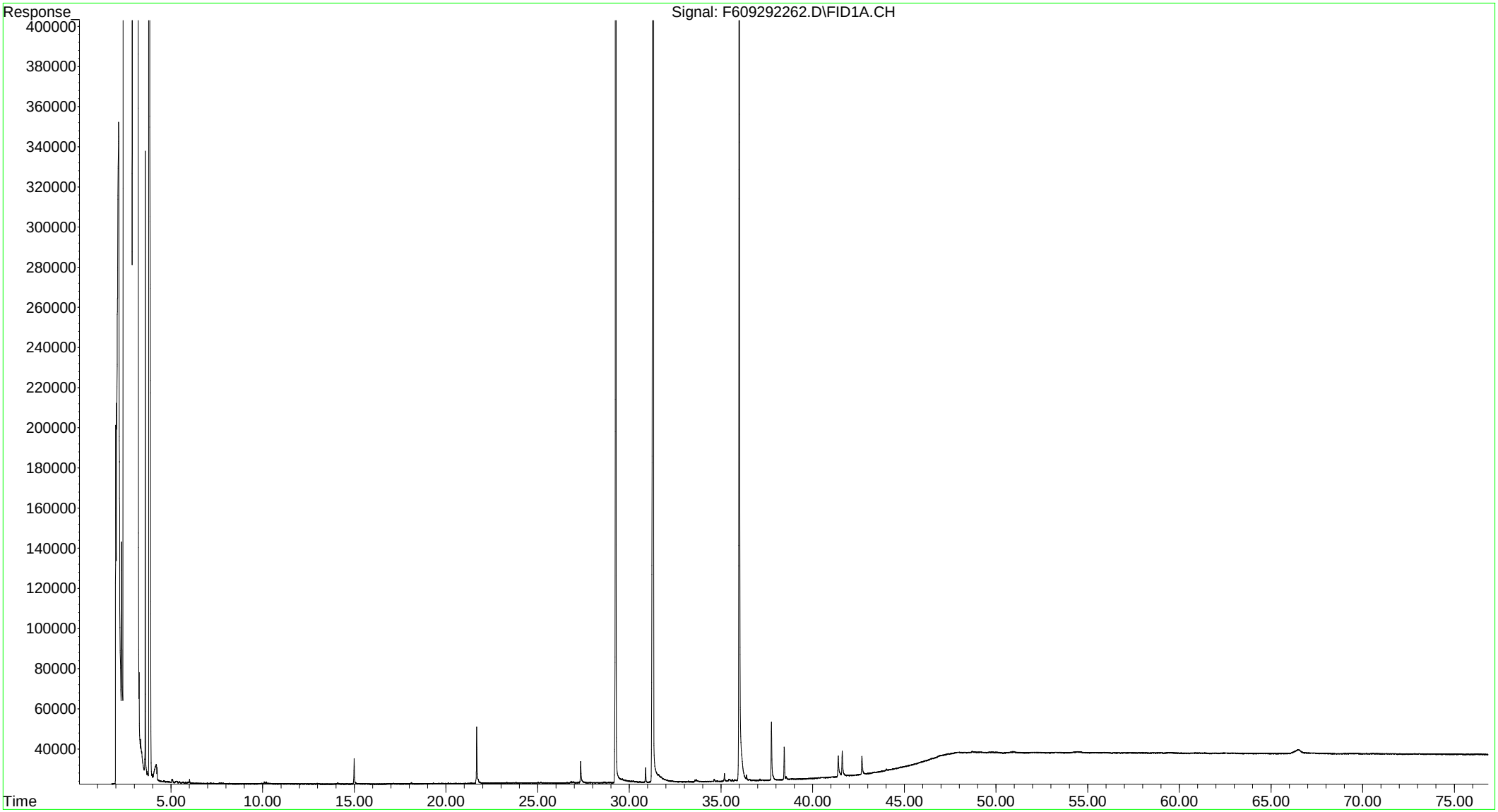

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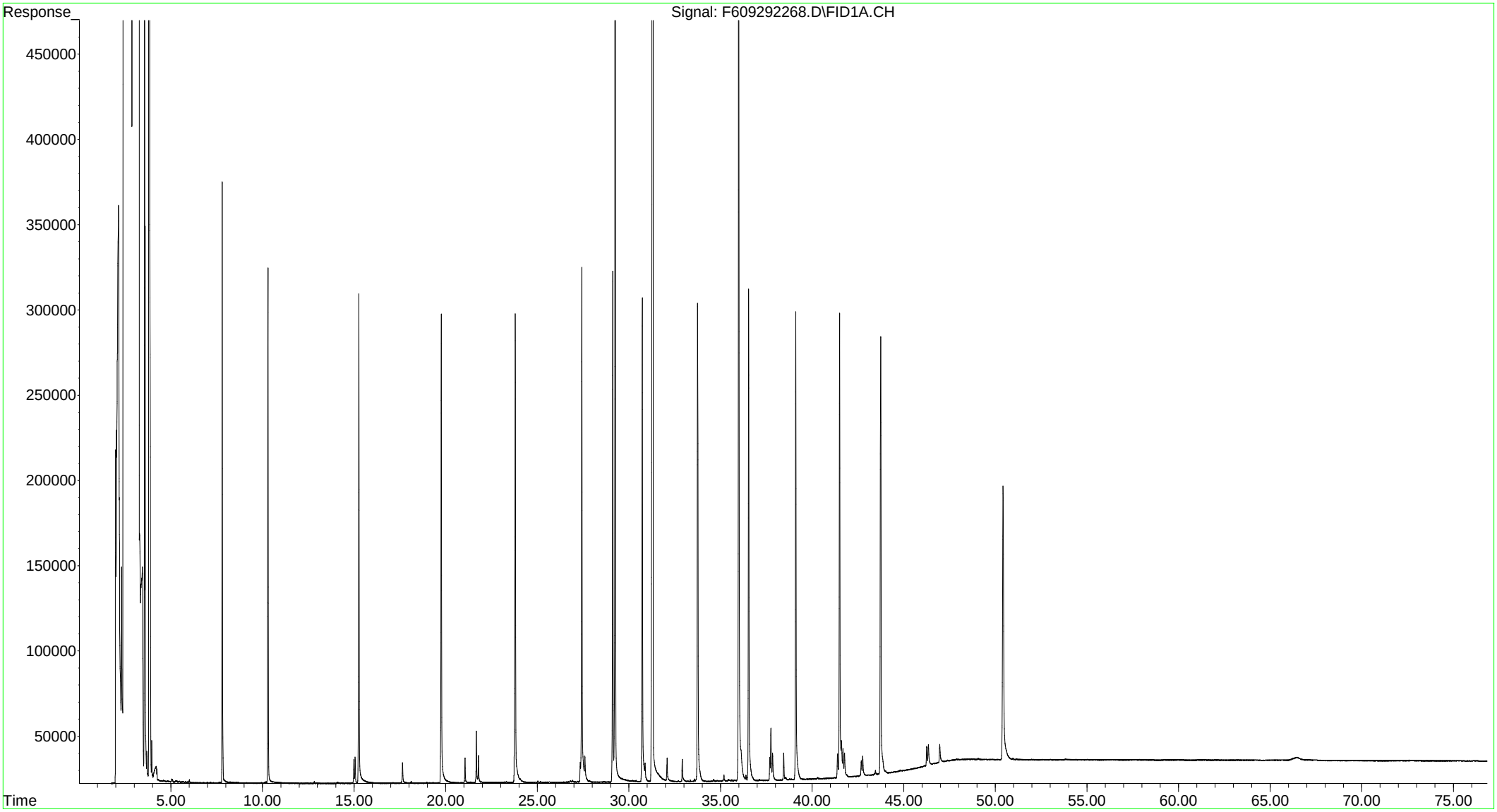
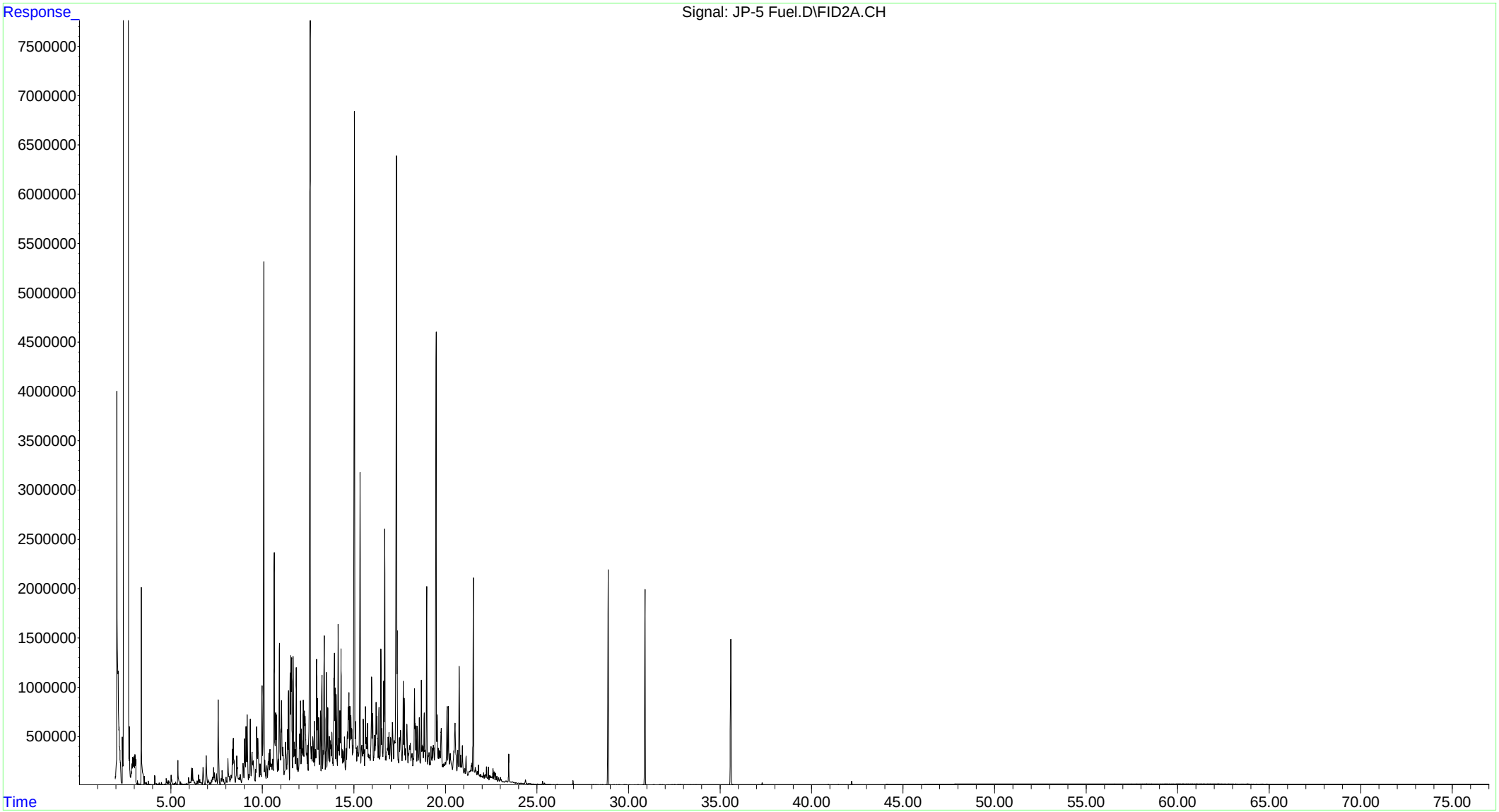
File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292268.D
Operator   : FID6:WR
Acquired   : 01 Oct 2022  10:18 am using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: WG1693518-2,42,,
Misc Info  : WG1693640,WG1693518,ICAL19333
Vial Number: 34
```



Petroleum Reference Standards

```
File       :O:\Forensics\LIBRARY\Hydrocarbon Reference Standards\JP-5 Fu
...         el.D
Operator  : PAH2:AC
Instrument :   PAH 2
Acquired  : 19 Nov 2011   4:22 pm using AcqMethod FRNC2AF.M
Sample    : JP-5 FUEL
Misc Info : F042710P
```



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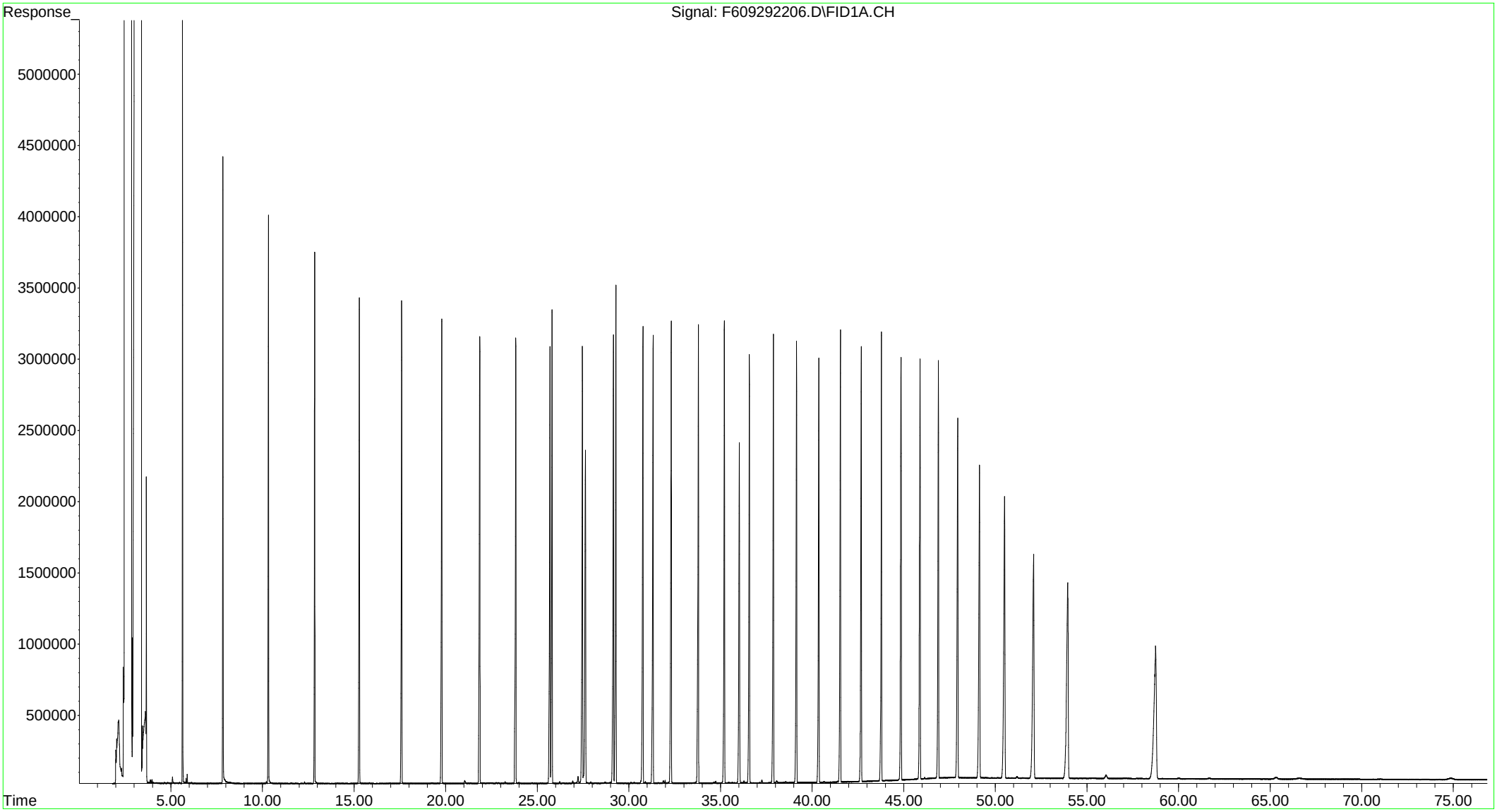
File       :O:\Forensics\Data\FID6\2022\SEP\SEP29\F609292206.D
Operator   : FID6:WR
Acquired   : 29 Sep 2022   1:18 pm using AcqMethod FID6A.M
Instrument :   FID6
Sample Name: WG1693640-1
Misc Info  : WG1693640,FRBE91,ICAL19333
Vial Number: 3
```



Appendix E – Analytical Chemistry Data Validation Reports

Data Validation Report for 2202482AR1

Facility:	JBPHH Site Characterization
Event:	Red Hill Site Characterization Vapor
SDG:	2202482AR1
Guidance Document:	2022 JBPHH Site Characterization UFP-QAPP
Prime Contractor:	AECOM, Honolulu, HI
Project Manager:	(b) (6)
Contract Laboratory(ies):	Eurofins Air Toxics, Inc., Folsom, CA
Data Review Contractor:	AECOM
Data Review Level:	S2BVEM
Primary Data Reviewer:	(b) (6), Chemist
Second Reviewer:	(b) (6), Senior Scientist
Date Submitted:	June 20, 2022

Field Sample ID	Lab Sample ID	Matrix	Type/Type Code	TO15
2S075-GSFD01-000.0-021822	2202482AR1-04A	Gas	Field Duplicate/FD	X
2S075-GSFD01-000.0-021822	2202482AR1-04B	Gas	Field Duplicate/FD	X
2S075-GSN01-000.0-021822	2202482AR1-03A	Gas	Field Sample/N	X
2S075-GSN01-000.0-021822	2202482AR1-03B	Gas	Field Sample/N	X
A3250-GSN01-000.0-021822	2202482AR1-02A	Gas	Field Sample/N	X
A3250-GSN01-000.0-021822	2202482AR1-02B	Gas	Field Sample/N	X
A3B-150-GSN01-000.0-021822	2202482AR1-01A	Gas	Field Sample/N	X
A3B-150-GSN01-000.0-021822	2202482AR1-01B	Gas	Field Sample/N	X

This report assesses the analytical data quality associated with the analyses listed on the preceding cover page at S2BVEM data validation level. This assessment has been made through a combination of automated data review (ADR) and supplemental manual review, the details of which are described below. The approach taken in the review of this data set is consistent with the requirements contained in the 2022 JBPHH Site Characterization UFP-QAPP and the additional guidance documents incorporated by reference to the extent possible. Where definitive guidance is not provided, results have been evaluated in a conservative manner using professional judgment.

Sample collection was managed and directed by AECOM, Honolulu, HI; analyses were performed by Eurofins Air Toxics, Inc., Folsom, CA and were reported under sample delivery group (SDG) 2202482AR1. Data have been evaluated electronically based on electronic data deliverables (EDDs) provided by the laboratory, and hard copy data summary forms have also been reviewed during this effort and compared to the automated review output by the reviewers whose signatures appear on the following page. Findings based on the automated data submission and manual data verification processes are detailed in the ADR narrative and throughout this report.

All quality control (QC) elements associated with this SDG have been reviewed by a project chemist in accordance with the requirements defined for the project. This review is documented in the attached Data Review Checklists. The QC elements listed below were supported by the electronic deliverable and were evaluated using ADR processes.

- Continuing Calibration Verification
- Field Duplicate RPD
- Lab Blank
- Lab Replicate RPD
- LCS Recovery
- LCS RPD
- Prep Hold Time
- Surrogate
- Test Hold Time

Results of the ADR process were subsequently reviewed and updated as applicable by the data review chemists identified on the signature page. Quality control elements that were not included in the electronic deliverable were reviewed manually and findings are documented within this report. Summaries of findings and associated qualified results are documented throughout this report.

A total of 0 results (0.00%) out of the 252 results (sample and field QC samples) reported are qualified based on review and 0 results (0.00%) have been rejected or deemed a serious deficiency (X qualifier). Trace values, defined as results that are qualified as estimated because they fall between the detection limit and the reporting limit/limit of quantitation, are not counted as qualified results in the above count. The qualified results are detailed throughout this report and discussed in the narrative below, where appropriate.

Narrative Comments

Field duplicates relative percent differences were calculated and within criteria.

Analytical Method	Data Reviewer Comment
TO15	No additional comments; see Checklist for detail.

[redacted] May 24, 2022

[redacted]hemist, AECOM

As the First Reviewer, I certify that I have performed a data review process in accordance with the requirements of the project guidance document, and have compared the electronic data to the laboratory's hard copy report and have verified the consistency of the reported sample results and method quality control data between the two deliverables.

[redacted] Senior Scientist, AECOM June 20, 2022

As the Second Reviewer, I certify that I have performed a quality assurance review of the report generated by the First Reviewer.

Quality Control Outliers for test method TO15, Field Duplicate RPD

Field duplicate analyses are performed in order to assess sample collection/laboratory precision for each sample matrix. Summary forms were evaluated and compared to electronic data deliverables. Field duplicate results that were outside of the acceptance criteria are listed below.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
2S075-GSFD01-000.0-021822 (N)	Acetone	78.26	< 30	< 30	rpd	J/None	D3	
2S075-GSFD01-000.0-021822 (N)	Isopropanol	108.9	< 30	< 30	rpd	J/None	D3	
2S075-GSFD01-000.0-021822 (N)	Naphthalene	43.90	< 30	< 30	rpd	J/None	D3	

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

No results associated with this QC element required qualification.

Quality Control Outliers for test method TO15, Test Hold Time

Hold times are ascertained based on project requirements. Holding times were determined by comparing the chain of custody records with the dates of analysis found in the electronic data deliverable and laboratory summary forms. Findings of this review, and any associated qualified results, are listed below.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
2S075-GSFD01-000.0-021822 (FD)		300.8	< 0	< 0		J/X	H1	Test Exceeds UCL
2S075-GSFD01-000.0-021822 (FD)		344.4	< 0	< 0		J/X	H1	Test Exceeds UCL
2S075-GSN01-000.0-021822 (N)		300.3	< 0	< 0		J/X	H1	Test Exceeds UCL
2S075-GSN01-000.0-021822 (N)		344.0	< 0	< 0		J/X	H1	Test Exceeds UCL
A3250-GSN01-000.0-021822 (N)		300.7	< 0	< 0		J/X	H1	Test Exceeds UCL
A3250-GSN01-000.0-021822 (N)		344.5	< 0	< 0		J/X	H1	Test Exceeds UCL
A3B-150-GSN01-000.0-021822 (N)		299.8	< 0	< 0		J/X	H1	Test Exceeds UCL
A3B-150-GSN01-000.0-021822 (N)		343.0	< 0	< 0		J/X	H1	Test Exceeds UCL

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

No results associated with this QC element required qualification.

Qualified Results

No results associated with this sample delivery group required qualification.

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,1,1-Trichloroethane	460	260 U	260 X	260 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,1,2,2-Tetrachloroethane	570	420 U	420 X	420 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,1,2-Trichloro-1,2,2-trifluoroethane	640	470 U	470 X	470 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,1,2-Trichloroethane	460	340 U	340 X	340 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,1-Dichloroethane	340	190 U	190 X	190 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,1-Dichloroethene	330	240 U	240 X	240 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,2,4-Trichlorobenzene	2500	2100 U	2100 X	2100 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,2,4-Trimethylbenzene	1600	16000	16000 J	16000	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,2-Dibromoethane (EDB)	640	470 U	470 X	470 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,2-Dichlorobenzene	500	370 U	370 X	370 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,2-Dichloroethane	340	250 U	250 X	250 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,2-Dichloropropane	380	280 U	280 X	280 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,2-Dichlorotetrafluoroethane	580	430 U	430 X	430 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,3,5-Trimethylbenzene	1600	4600	4600 J	4600	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,3-Butadiene	180	170 U	170 X	170 U	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,3-Dichlorobenzene	500	370 U	370 X	370 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,4-Dichlorobenzene	500	370 U	370 X	370 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	1,4-Dioxane	1200	450 U	450 X	450 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	2,2,4-Trimethylpentane	390	290 U	290 X	290 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	2-Butanone (MEK)	980	1300	1300 J	1300	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	2-Hexanone	1400	1200 U	1200 X	1200 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	4-Ethyltoluene	410	7500	7500 J	7500	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	4-Methyl-2-pentanone (MIBK)	340	250 U	250 X	250 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Acetone	2000	420 J	420 J	420 J	TR
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Allyl chloride (3-Chloropropene)	1000	390 U	390 X	390 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Benzene	270	200 U	200 X	200 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Benzyl chloride	430	320 U	320 X	320 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Bromodichloromethane	560	310 U	310 X	310 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Bromoform	860	640 U	640 X	640 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Bromomethane	3200	1100 U	1100 X	1100 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Carbon disulfide	1000	880 U	880 X	880 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Carbon Tetrachloride	520	390 U	390 X	390 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Chlorobenzene	380	220 U	220 X	220 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Chloroethane	880	750 U	750 X	750 U	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Chloroform	410	230 U	230 X	230 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Chloromethane	1700	590 U	590 X	590 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	cis-1,2-Dichloroethene	330	240 U	240 X	240 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	cis-1,3-Dichloropropene	380	280 U	280 X	280 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Cumene	410	480	480 J	480	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Cyclohexane	290	210 U	210 X	210 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Dibromochloromethane	710	530 U	530 X	530 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Dichlorodifluoromethane	410	300 U	300 X	300 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Ethanol	1600	530 U	530 X	530 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Ethylbenzene	360	260 J	260 J	260 J	TR
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Hexachlorobutadiene	3600	3000 U	3000 X	3000 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Isopropanol	820	280 J	280 J	280 J	TR
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	m,p-Xylene	360	1400	1400 J	1400	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Methyl tert-butyl ether (MTBE)	1200	450 U	450 X	450 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Methylene chloride	2900	990 U	990 X	990 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Naphthalene	880	1600	1600 J	1600	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	n-Heptane	1400	250 U	250 X	250 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	n-Hexane	290	220 U	220 X	220 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	n-Propylbenzene	410	1600	1600 J	1600	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	o-Xylene	360	910	910 J	910	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Styrene	360	260 U	260 X	260 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Toluene	310	110 J	110 J	110 J	TR
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	trans-1,2-Dichloroethene	330	240 U	240 X	240 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	trans-1,3-Dichloropropene	380	280 U	280 X	280 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Trichlorofluoromethane	470	350 U	350 X	350 U	
2S075-GSFD01-000.0-021822 2202482AR1-04A	FD	Vinyl chloride	210	160 U	160 X	160 U	
2S075-GSFD01-000.0-021822 2202482AR1-04B	FD	Tetrachloroethene (PCE)	140	85.0 U	85.0 X	85.0 U	
2S075-GSFD01-000.0-021822 2202482AR1-04B	FD	Tetrahydrofuran	62.0	37.0 U	37.0 X	37.0 U	
2S075-GSFD01-000.0-021822 2202482AR1-04B	FD	Trichloroethene (TCE)	110	67.0 U	67.0 X	67.0 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,1,1-Trichloroethane	460	260 U	260 X	260 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,1,2,2-Tetrachloroethane	580	430 U	430 X	430 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,1,2-Trichloro-1,2,2-trifluoroethane	640	480 U	480 X	480 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,1,2-Trichloroethane	460	340 U	340 X	340 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,1-Dichloroethane	340	190 U	190 X	190 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,1-Dichloroethene	330	250 U	250 X	250 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,2,4-Trichlorobenzene	2500	2100 U	2100 X	2100 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,2,4-Trimethylbenzene	1600	18000	18000 J	18000	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,2-Dibromoethane (EDB)	640	480 U	480 X	480 U	

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Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,2-Dichlorobenzene	500	370 U	370 X	370 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,2-Dichloroethane	340	250 U	250 X	250 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,2-Dichloropropane	390	290 U	290 X	290 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,2-Dichlorotetrafluoroethane	590	430 U	430 X	430 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,3,5-Trimethylbenzene	1600	5100	5100 J	5100	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,3-Butadiene	180	170 U	170 X	170 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,3-Dichlorobenzene	500	370 U	370 X	370 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,4-Dichlorobenzene	500	370 U	370 X	370 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	1,4-Dioxane	1200	450 U	450 X	450 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	2,2,4-Trimethylpentane	390	290 U	290 X	290 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	2-Butanone (MEK)	990	1400	1400 J	1400	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	2-Hexanone	1400	1200 U	1200 X	1200 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	4-Ethyltoluene	410	8100	8100 J	8100	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	4-Methyl-2-pentanone (MIBK)	340	250 U	250 X	250 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Acetone	2000	960 J	960 J	960 J	TR
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Allyl chloride (3-Chloropropene)	1000	390 U	390 X	390 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Benzene	270	200 U	200 X	200 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Benzyl chloride	430	320 U	320 X	320 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Bromodichloromethane	560	320 U	320 X	320 U	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Bromoform	870	640 U	640 X	640 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Bromomethane	3300	1100 U	1100 X	1100 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Carbon disulfide	1000	890 U	890 X	890 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Carbon Tetrachloride	530	390 U	390 X	390 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Chlorobenzene	390	220 U	220 X	220 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Chloroethane	890	750 U	750 X	750 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Chloroform	410	230 U	230 X	230 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Chloromethane	1700	590 U	590 X	590 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	cis-1,2-Dichloroethene	330	250 U	250 X	250 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	cis-1,3-Dichloropropene	380	280 U	280 X	280 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Cumene	410	510	510 J	510	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Cyclohexane	290	210 U	210 X	210 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Dibromochloromethane	720	530 U	530 X	530 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Dichlorodifluoromethane	420	310 U	310 X	310 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Ethanol	1600	540 U	540 X	540 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Ethylbenzene	360	220 J	220 J	220 J	TR
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Hexachlorobutadiene	3600	3000 U	3000 X	3000 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Isopropanol	820	950	950 J	950	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	m,p-Xylene	360	1300	1300 J	1300	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Methyl tert-butyl ether (MTBE)	1200	450 U	450 X	450 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Methylene chloride	2900	990 U	990 X	990 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Naphthalene	880	2500	2500 J	2500	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	n-Heptane	1400	250 U	250 X	250 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	n-Hexane	300	220 U	220 X	220 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	n-Propylbenzene	410	1800	1800 J	1800	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	o-Xylene	360	890	890 J	890	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Styrene	360	260 U	260 X	260 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Toluene	320	84.0 J	84.0 J	84.0 J	TR
2S075-GSN01-000.0-021822 2202482AR1-03A	N	trans-1,2-Dichloroethene	330	250 U	250 X	250 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	trans-1,3-Dichloropropene	380	280 U	280 X	280 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Trichlorofluoromethane	470	350 U	350 X	350 U	
2S075-GSN01-000.0-021822 2202482AR1-03A	N	Vinyl chloride	210	160 U	160 X	160 U	
2S075-GSN01-000.0-021822 2202482AR1-03B	N	Tetrachloroethene (PCE)	140	85.0 U	85.0 X	85.0 U	
2S075-GSN01-000.0-021822 2202482AR1-03B	N	Tetrahydrofuran	62.0	37.0 U	37.0 X	37.0 U	
2S075-GSN01-000.0-021822 2202482AR1-03B	N	Trichloroethene (TCE)	110	68.0 U	68.0 X	68.0 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,1,1-Trichloroethane	450	250 U	250 X	250 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,1,2,2-Tetrachloroethane	570	420 U	420 X	420 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,1,2-Trichloro-1,2,2-trifluoroethane	640	470 U	470 X	470 U	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,1,2-Trichloroethane	450	340 U	340 X	340 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,1-Dichloroethane	340	190 U	190 X	190 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,1-Dichloroethene	330	240 U	240 X	240 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,2,4-Trichlorobenzene	2500	2100 U	2100 X	2100 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,2,4-Trimethylbenzene	1600	300 U	300 X	300 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,2-Dibromoethane (EDB)	640	470 U	470 X	470 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,2-Dichlorobenzene	500	370 U	370 X	370 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,2-Dichloroethane	340	250 U	250 X	250 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,2-Dichloropropane	380	280 U	280 X	280 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,2-Dichlorotetrafluoroethane	580	430 U	430 X	430 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,3,5-Trimethylbenzene	1600	300 U	300 X	300 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,3-Butadiene	180	160 U	160 X	160 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,3-Dichlorobenzene	500	370 U	370 X	370 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,4-Dichlorobenzene	500	370 U	370 X	370 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	1,4-Dioxane	1200	450 U	450 X	450 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	2,2,4-Trimethylpentane	390	290 U	290 X	290 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	2-Butanone (MEK)	980	830 U	830 X	830 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	2-Hexanone	1400	1200 U	1200 X	1200 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	4-Ethyltoluene	410	300 U	300 X	300 U	

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Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3250-GSN01-000.0-021822 2202482AR1-02A	N	4-Methyl-2-pentanone (MIBK)	340	250 U	250 X	250 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Acetone	2000	670 U	670 X	670 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Allyl chloride (3-Chloropropene)	1000	390 U	390 X	390 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Benzene	260	200 U	200 X	200 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Benzyl chloride	430	320 U	320 X	320 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Bromodichloromethane	560	310 U	310 X	310 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Bromoform	860	630 U	630 X	630 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Bromomethane	3200	1100 U	1100 X	1100 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Carbon disulfide	1000	880 U	880 X	880 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Carbon Tetrachloride	520	390 U	390 X	390 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Chlorobenzene	380	210 U	210 X	210 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Chloroethane	880	740 U	740 X	740 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Chloroform	400	230 U	230 X	230 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Chloromethane	1700	580 U	580 X	580 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	cis-1,2-Dichloroethene	330	240 U	240 X	240 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	cis-1,3-Dichloropropene	380	280 U	280 X	280 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Cumene	410	300 U	300 X	300 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Cyclohexane	280	210 U	210 X	210 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Dibromochloromethane	710	520 U	520 X	520 U	

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Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Dichlorodifluoromethane	410	300 U	300 X	300 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Ethanol	1600	530 U	530 X	530 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Ethylbenzene	360	270 U	270 X	270 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Hexachlorobutadiene	3500	3000 U	3000 X	3000 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Isopropanol	820	530 U	530 X	530 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	m,p-Xylene	360	270 U	270 X	270 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Methyl tert-butyl ether (MTBE)	1200	450 U	450 X	450 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Methylene chloride	2900	980 U	980 X	980 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Naphthalene	870	170 U	170 X	170 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	n-Heptane	1400	250 U	250 X	250 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	n-Hexane	290	220 U	220 X	220 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	n-Propylbenzene	410	300 U	300 X	300 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	o-Xylene	360	270 U	270 X	270 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Styrene	350	260 U	260 X	260 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Toluene	310	230 U	230 X	230 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	trans-1,2-Dichloroethene	330	240 U	240 X	240 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	trans-1,3-Dichloropropene	380	280 U	280 X	280 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Trichlorofluoromethane	470	340 U	340 X	340 U	
A3250-GSN01-000.0-021822 2202482AR1-02A	N	Vinyl chloride	210	160 U	160 X	160 U	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3250-GSN01-000.0-021822 2202482AR1-02B	N	Tetrachloroethene (PCE)	140	85.0 U	85.0 X	85.0 U	
A3250-GSN01-000.0-021822 2202482AR1-02B	N	Tetrahydrofuran	61.0	37.0 U	37.0 X	37.0 U	
A3250-GSN01-000.0-021822 2202482AR1-02B	N	Trichloroethene (TCE)	110	67.0 U	67.0 X	67.0 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,1,1-Trichloroethane	450	250 U	250 X	250 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,1,2,2-Tetrachloroethane	560	420 U	420 X	420 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,1,2-Trichloro-1,2,2-trifluoroethane	630	460 U	460 X	460 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,1,2-Trichloroethane	450	330 U	330 X	330 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,1-Dichloroethane	330	180 U	180 X	180 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,1-Dichloroethene	320	240 U	240 X	240 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,2,4-Trichlorobenzene	2400	2100 U	2100 X	2100 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,2,4-Trimethylbenzene	1600	2600	2600 J	2600	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,2-Dibromoethane (EDB)	630	470 U	470 X	470 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,2-Dichlorobenzene	490	360 U	360 X	360 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,2-Dichloroethane	330	240 U	240 X	240 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,2-Dichloropropane	380	280 U	280 X	280 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,2-Dichlorotetrafluoroethane	570	420 U	420 X	420 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,3,5-Trimethylbenzene	1600	2900	2900 J	2900	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,3-Butadiene	180	160 U	160 X	160 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,3-Dichlorobenzene	490	360 U	360 X	360 U	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,4-Dichlorobenzene	490	360 U	360 X	360 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	1,4-Dioxane	1200	440 U	440 X	440 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	2,2,4-Trimethylpentane	380	280 U	280 X	280 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	2-Butanone (MEK)	970	1600	1600 J	1600	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	2-Hexanone	1300	1100 U	1100 X	1100 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	4-Ethyltoluene	400	1400	1400 J	1400	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	4-Methyl-2-pentanone (MIBK)	340	250 U	250 X	250 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Acetone	1900	1200 J	1200 J	1200 J	TR
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Allyl chloride (3-Chloropropene)	1000	380 U	380 X	380 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Benzene	260	190 U	190 X	190 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Benzyl chloride	420	310 U	310 X	310 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Bromodichloromethane	550	310 U	310 X	310 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Bromoform	850	630 U	630 X	630 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Bromomethane	3200	1100 U	1100 X	1100 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Carbon disulfide	1000	870 U	870 X	870 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Carbon Tetrachloride	520	380 U	380 X	380 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Chlorobenzene	380	58.0 J	58.0 J	58.0 J	TR
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Chloroethane	860	740 U	740 X	740 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Chloroform	400	220 U	220 X	220 U	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Chloromethane	1700	580 U	580 X	580 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	cis-1,2-Dichloroethene	320	240 U	240 X	240 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	cis-1,3-Dichloropropene	370	280 U	280 X	280 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Cumene	400	200 J	200 J	200 J	TR
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Cyclohexane	280	210 U	210 X	210 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Dibromochloromethane	700	520 U	520 X	520 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Dichlorodifluoromethane	400	300 U	300 X	300 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Ethanol	1500	520 U	520 X	520 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Ethylbenzene	360	260 U	260 X	260 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Hexachlorobutadiene	3500	3000 U	3000 X	3000 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Isopropanol	810	520 U	520 X	520 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	m,p-Xylene	360	470	470 J	470	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Methyl tert-butyl ether (MTBE)	1200	440 U	440 X	440 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Methylene chloride	2800	970 U	970 X	970 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Naphthalene	860	170 U	170 X	170 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	n-Heptane	1300	250 U	250 X	250 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	n-Hexane	290	210 U	210 X	210 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	n-Propylbenzene	400	300 J	300 J	300 J	TR
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	o-Xylene	360	490	490 J	490	

Table of Results with Modified Qualifiers

Modified Qualifiers for test method TO15

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Styrene	350	260 U	260 X	260 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Toluene	310	56.0 J	56.0 J	56.0 J	TR
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	trans-1,2-Dichloroethene	320	240 U	240 X	240 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	trans-1,3-Dichloropropene	370	280 U	280 X	280 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Trichlorofluoromethane	460	340 U	340 X	340 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01A	N	Vinyl chloride	210	160 U	160 X	160 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01B	N	Tetrachloroethene (PCE)	140	84.0 U	84.0 X	84.0 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01B	N	Tetrahydrofuran	61.0	36.0 U	36.0 X	36.0 U	
A3B-150-GSN01-000.0-021822 2202482AR1-01B	N	Trichloroethene (TCE)	110	66.0 U	66.0 X	66.0 U	

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Reason Code Definitions

Code	Definition
D3	Field Duplicate RPD
H1	Test Hold Time
TR	Trace Level Detect

Flag Code and Definitions

Flag	Definition
J	Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

Bias

-	The result may be biased low
+	The result may be biased high

Note - The bias field is a separate field; however, it is an integral part of the final flag (qualifier) on the sample result

Data Validation Report for 2202482AR1

Review Questions

Method: TO15 (Determination of Volatile Organic Compounds in Air Collected in Specially-Prepared Canisters and Analyzed by GC/MS)				
Review Questions	Yes	No	NA	Comment
Were all samples documented correctly on the chain-of-custody (COC)?	•			Methods TO-3 and ASTM D-1946 were reported separately on different SDGs.
Did samples listed on COCs match the sample labels?	•			
Were samples relinquished properly on the COC?	•			
Were all samples properly preserved?	•			
Were sampling dates/times, date and time of laboratory receipt of samples, and sample conditions upon receipt at the laboratory (including preservation, pH, and temperature) are documented?	•			
Were sample results reported with percent moisture correction if required?			•	
Were analytical methods performed and analysis dates present?	•			
Were all requested target analytes reported?	•			
Were QAPP specified laboratory PQLs achieved?	•			
Were holding times met?	•			Samples were analyzed within holding time criteria. Flags automatically applied by EDMS for hold time exceedance were revised and removed.
Were trip blanks analyzed at the proper frequency and in control?			•	
Were field blanks analyzed at the proper frequency and in control?			•	
Were equipment blanks analyzed at the proper frequency and in control?			•	
Was a method blank prepared and analyzed with each batch?	•			2202482AR1-05A, 2202482AR1-05B
Were target analytes in the method blank less than DL?	•			
Was an LCS/LCSD pair prepared and analyzed with each batch?	•			2202482AR1-07A, 2202482AR1-07AA, 2202482AR1-07B, 2202482AR1-07BB
Were LCS/LCSD recoveries within project acceptance limits?	•			
Was the LCS/LCSD RPD within project acceptance limits?	•			
Was a MS/MSD pair prepared with each batch?		•		
Were MS/MSD recoveries within project acceptance limits?			•	
Was the MS/MSD RPD within project acceptance limits?			•	
If ISM was used for sample collection, were laboratory triplicates analyzed and within project acceptance limits?			•	
Were surrogate recoveries within project acceptance limits?	•			
Were field replicates (duplicates, triplicates, etc.) analyzed at the proper frequency and in control?	•			J-flags applied automatically by EDMS for field duplicate RPD were revised and removed. Associated results were under five times the LOQ and their absolute difference was below twice the LOQ; therefore, no qualification was required.
Were reported sample concentrations within calibration range?	•			
Was the GC/MS system properly tuned based on method criteria?	•			

Review Questions

Method: TO15 (Determination of Volatile Organic Compounds in Air Collected in Specially-Prepared Canisters and Analyzed by GC/MS)				
Review Questions	Yes	No	NA	Comment
Was instrument tuning completed every 24 hours during sample analysis?	•			
Was the Calibration within project acceptance criteria?	•			
Was a ICV performed after each ICAL prior to sample analysis and within project acceptance criteria?	•			
Were CCVs run at the required frequency and within project acceptance criteria?	•			
Were internal standard retention times and area criteria within project acceptance criteria?	•			
Were internal standards spiked for every sample, standard, and QC sample?	•			
Were instrument run logs present and filled out appropriately?	•			
Were sample preparation sheets present and filled out appropriately?	•			
Have all Laboratory Case Narrative comments/findings been addressed in the data review process?	•			
Were DoD QSM corrective actions followed if deviations were noted?	•			
Were any data recommended for exclusion in the data validation process?		•		

Data Validation Report for 2202482BR2

Facility:	JBPHH Site Characterization
Event:	Red Hill Site Characterization Vapor
SDG:	2202482BR2
Guidance Document:	2022 JBPHH Site Characterization UFP-QAPP
Prime Contractor:	AECOM, Honolulu, HI
Project Manager:	(b) (6)
Contract Laboratory(ies):	Eurofins Air Toxics, Inc., Folsom, CA
Data Review Contractor:	AECOM
Data Review Level:	S2BVEM
Primary Data Reviewer:	(b) (6), Chemist
Second Reviewer:	(b) (6), Senior Scientist
Date Submitted:	June 20, 2022

Field Sample ID	Lab Sample ID	Matrix	Type/Type Code	TO3
2S075-GSFD01-000.0-021822	2202482BR2-04A	Gas	Field Duplicate/FD	X
2S075-GSN01-000.0-021822	2202482BR2-03A	Gas	Field Sample/N	X
A3250-GSN01-000.0-021822	2202482BR2-02A	Gas	Field Sample/N	X
A3B-150-GSN01-000.0-021822	2202482BR2-01A	Gas	Field Sample/N	X

This report assesses the analytical data quality associated with the analyses listed on the preceding cover page at S2BVEM data validation level. This assessment has been made through a combination of automated data review (ADR) and supplemental manual review, the details of which are described below. The approach taken in the review of this data set is consistent with the requirements contained in the 2022 JBPHH Site Characterization UFP-QAPP and the additional guidance documents incorporated by reference to the extent possible. Where definitive guidance is not provided, results have been evaluated in a conservative manner using professional judgment.

Sample collection was managed and directed by AECOM, Honolulu, HI; analyses were performed by Eurofins Air Toxics, Inc., Folsom, CA and were reported under sample delivery group (SDG) 2202482BR2. Data have been evaluated electronically based on electronic data deliverables (EDDs) provided by the laboratory, and hard copy data summary forms have also been reviewed during this effort and compared to the automated review output by the reviewers whose signatures appear on the following page. Findings based on the automated data submission and manual data verification processes are detailed in the ADR narrative and throughout this report.

All quality control (QC) elements associated with this SDG have been reviewed by a project chemist in accordance with the requirements defined for the project. This review is documented in the attached Data Review Checklists. The QC elements listed below were supported by the electronic deliverable and were evaluated using ADR processes.

- Continuing Calibration Verification
- Field Duplicate RPD
- Lab Blank
- Lab Replicate RPD
- LCS Recovery
- LCS RPD
- Prep Hold Time
- Surrogate
- Test Hold Time

Results of the ADR process were subsequently reviewed and updated as applicable by the data review chemists identified on the signature page. Quality control elements that were not included in the electronic deliverable were reviewed manually and findings are documented within this report. Summaries of findings and associated qualified results are documented throughout this report.

A total of 0 results (0.00%) out of the 8 results (sample and field QC samples) reported are qualified based on review and 0 results (0.00%) have been rejected or deemed a serious deficiency (X qualifier). Trace values, defined as results that are qualified as estimated because they fall between the detection limit and the reporting limit/limit of quantitation, are not counted as qualified results in the above count. The qualified results are detailed throughout this report and discussed in the narrative below, where appropriate.

Narrative Comments

Field duplicates relative percent differences were calculated and within criteria.

Analytical Method	Data Reviewer Comment
TO3	No additional comments; see Checklist for detail.

[redacted] June 08, 2022

[redacted]hemist, AECOM

As the First Reviewer, I certify that I have performed a data review process in accordance with the requirements of the project guidance document, and have compared the electronic data to the laboratory's hard copy report and have verified the consistency of the reported sample results and method quality control data between the two deliverables.

[redacted] Senior Scientist, AECOM June 20, 2022

As the Second Reviewer, I certify that I have performed a quality assurance review of the report generated by the First Reviewer.

Quality Control Outliers for test method TO3, Lab Blank

The purpose of laboratory blanks is to determine the existence and magnitude of cross-contamination problems resulting from laboratory activities. Reported results were evaluated to determine compliance with the required acceptance criteria. Summary forms were evaluated and compared to electronic data deliverables. Findings of this review, and contaminants found in laboratory blanks are listed below along with any associated qualified results.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
2202482BR2-05A (LB)	C5-C12 Gasoline Range Organics	65.00	< 12	< 100	ug/m3	U/None*	L	
2202482BR2-05A (LB)	Petroleum Hydrocarbons (as Gasoline)	42.00	< 12	< 100	ug/m3	U/None*	L	

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

*Blank flags displayed in the above table identify qualification of the sample result when it is less than or equal to the LOQ/RL. Sample results above the LOQ will be qualified based on the validation type such as J+ at the sample result.

No results associated with this QC element required qualification.

Data Validation Report for 2202482BR2

Qualified Results

No results associated with this sample delivery group required qualification.

Results with Modified Qualifiers

No qualifiers associated with this sample delivery group were modified manually.

Reason Code Definitions

Code	Definition
L	Lab Blank
TR	Trace Level Detect

Flag Code and Definitions

Flag	Definition

Bias

-	The result may be biased low
+	The result may be biased high

Note - The bias field is a separate field; however, it is an integral part of the final flag (qualifier) on the sample result

Data Validation Report for 2202482BR2

Review Questions

Method: TO3 (Determination of Volatile Organic Compounds in Ambient Air Using Cryogenic Preconcentration, GC/ECD/FID)				
Review Questions	Yes	No	NA	Comment
Were all samples documented correctly on the chain-of-custody (COC)?	•			Methods TO-15 and ASTM D-1946 were reported separately on different SDGs.
Did samples listed on COCs match the sample labels?	•			
Were samples relinquished properly on the COC?	•			
Were all samples properly preserved?	•			
Were sampling dates/times, date and time of laboratory receipt of samples, and sample conditions upon receipt at the laboratory (including preservation, pH, and temperature) are documented?	•			
Were sample results reported with percent moisture correction if required?			•	
Were analytical methods performed and analysis dates present?	•			
Were all requested target analytes reported?	•			
Were QAPP specified laboratory PQLs achieved?	•			
Were holding times met?	•			
Were trip blanks analyzed at the proper frequency and in control?			•	
Were field blanks analyzed at the proper frequency and in control?			•	
Were equipment blanks analyzed at the proper frequency and in control?			•	
Was a method blank prepared and analyzed with each batch?	•			2202482BR2-05A
Were target analytes in the method blank less than DL?		•		Both analytes were detected in the method blank; however, blank concentration was insignificant in comparison to associated sample concentration and no qualification was required.
Was an LCS/LCSD pair prepared and analyzed with each batch?	•			2202482BR2-07A
Were LCS/LCSD recoveries within project acceptance limits?	•			
Was the LCS/LCSD RPD within project acceptance limits?	•			
Was a MS/MSD pair prepared with each batch?		•		
Were MS/MSD recoveries within project acceptance limits?			•	
Was the MS/MSD RPD within project acceptance limits?			•	
If ISM was used for sample collection, were laboratory triplicates analyzed and within project acceptance limits?			•	
Were surrogate recoveries within project acceptance limits?	•			
Were field replicates (duplicates, triplicates, etc.) analyzed at the proper frequency and in control?	•			
Were reported sample concentrations within calibration range?	•			
Was the GC/MS system properly tuned based on method criteria?	•			
Was instrument tuning completed every 24 hours during sample analysis?	•			
Was the Calibration within project acceptance criteria?	•			

Data Validation Report for 2202482BR2

Review Questions

Method: TO3 (Determination of Volatile Organic Compounds in Ambient Air Using Cryogenic Preconcentration, GC/ECD/FID)				
Review Questions	Yes	No	NA	Comment
Was a ICV performed after each ICAL prior to sample analysis and within project acceptance criteria?	•			
Were CCVs run at the required frequency and within project acceptance criteria?	•			
Were internal standard retention times and area criteria within project acceptance criteria?	•			
Were internal standards spiked for every sample, standard, and QC sample?	•			
Were instrument run logs present and filled out appropriately?	•			
Were sample preparation sheets present and filled out appropriately?	•			
Have all Laboratory Case Narrative comments/findings been addressed in the data review process?	•			
Were DoD QSM corrective actions followed if deviations were noted?	•			
Were any data recommended for exclusion in the data validation process?		•		

Data Validation Report for 2202482C

Facility:	JBPHH Site Characterization
Event:	Red Hill Site Characterization Vapor
SDG:	2202482C
Guidance Document:	2022 JBPHH Site Characterization UFP-QAPP
Prime Contractor:	AECOM, Honolulu, HI
Project Manager:	(b) (6)
Contract Laboratory(ies):	Eurofins Air Toxics, Inc., Folsom, CA
Data Review Contractor:	AECOM
Data Review Level:	S2BVEM
Primary Data Reviewer:	(b) (6), Chemist
Second Reviewer:	(b) (6), Senior Scientist
Date Submitted:	June 20, 2022

Field Sample ID	Lab Sample ID	Matrix	Type/Type Code	D1946
2S075-GSFD01-000.0-021822	2202482C-04A	Gas	Field Duplicate/FD	X
2S075-GSN01-000.0-021822	2202482C-03A	Gas	Field Sample/N	X
A3250-GSN01-000.0-021822	2202482C-02A	Gas	Field Sample/N	X
A3B-150-GSN01-000.0-021822	2202482C-01A	Gas	Field Sample/N	X

This report assesses the analytical data quality associated with the analyses listed on the preceding cover page at S2BVEM data validation level. This assessment has been made through a combination of automated data review (ADR) and supplemental manual review, the details of which are described below. The approach taken in the review of this data set is consistent with the requirements contained in the 2022 JBPHH Site Characterization UFP-QAPP and the additional guidance documents incorporated by reference to the extent possible. Where definitive guidance is not provided, results have been evaluated in a conservative manner using professional judgment.

Sample collection was managed and directed by AECOM, Honolulu, HI; analyses were performed by Eurofins Air Toxics, Inc., Folsom, CA and were reported under sample delivery group (SDG) 2202482C. Data have been evaluated electronically based on electronic data deliverables (EDDs) provided by the laboratory, and hard copy data summary forms have also been reviewed during this effort and compared to the automated review output by the reviewers whose signatures appear on the following page. Findings based on the automated data submission and manual data verification processes are detailed in the ADR narrative and throughout this report.

All quality control (QC) elements associated with this SDG have been reviewed by a project chemist in accordance with the requirements defined for the project. This review is documented in the attached Data Review Checklists. The QC elements listed below were supported by the electronic deliverable and were evaluated using ADR processes.

- Continuing Calibration Verification
- Field Duplicate RPD
- Lab Blank
- Lab Replicate RPD
- LCS Recovery
- LCS RPD
- Prep Hold Time
- Test Hold Time

Results of the ADR process were subsequently reviewed and updated as applicable by the data review chemists identified on the signature page. Quality control elements that were not included in the electronic deliverable were reviewed manually and findings are documented within this report. Summaries of findings and associated qualified results are documented throughout this report.

A total of 8 results (50.00%) out of the 16 results (sample and field QC samples) reported are qualified based on review and 0 results (0.00%) have been rejected or deemed a serious deficiency (X qualifier). Trace values, defined as results that are qualified as estimated because they fall between the detection limit and the reporting limit/limit of quantitation, are not counted as qualified results in the above count. The qualified results are detailed throughout this report and discussed in the narrative below, where appropriate.

Narrative Comments

Field duplicates relative percent differences were calculated and within criteria.

Analytical Method	Data Reviewer Comment
D1946	No additional comments; see Checklist for detail.

[redacted] May 24, 2022

[redacted]hemist, AECOM

As the First Reviewer, I certify that I have performed a data review process in accordance with the requirements of the project guidance document, and have compared the electronic data to the laboratory's hard copy report and have verified the consistency of the reported sample results and method quality control data between the two deliverables.

[redacted] Senior Scientist, AECOM June 20, 2022

As the Second Reviewer, I certify that I have performed a quality assurance review of the report generated by the First Reviewer.

No Outliers were associated with this sample delivery group.

Table of All Qualified Results

Test Method: D1946		**Extraction Method: METHOD**						
FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
2S075-GSFD01-000.0-021822 2202482C-04A	FD	Carbon Dioxide	0.0210	0.0700	0.0700 J		percent	V1
2S075-GSFD01-000.0-021822 2202482C-04A	FD	Oxygen	0.210	20.0	20.0 J		percent	V1
2S075-GSN01-000.0-021822 2202482C-03A	N	Carbon Dioxide	0.0210	0.0680	0.0680 J		percent	V1
2S075-GSN01-000.0-021822 2202482C-03A	N	Oxygen	0.210	20.0	20.0 J		percent	V1
A3250-GSN01-000.0-021822 2202482C-02A	N	Carbon Dioxide	0.0210	2.40	2.40 J		percent	V1
A3250-GSN01-000.0-021822 2202482C-02A	N	Oxygen	0.210	17.0	17.0 J		percent	V1
A3B-150-GSN01-000.0-021822 2202482C-01A	N	Carbon Dioxide	0.0210	0.710	0.710 J		percent	V1
A3B-150-GSN01-000.0-021822 2202482C-01A	N	Oxygen	0.210	20.0	20.0 J		percent	V1

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Table of Results with Modified Qualifiers

Modified Qualifiers for test method D1946

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
2S075-GSFD01-000.0-021822 2202482C-04A	FD	Carbon Dioxide	0.0210	0.0700	0.0700	0.0700 J	V1
2S075-GSFD01-000.0-021822 2202482C-04A	FD	Oxygen	0.210	20.0	20.0	20.0 J	V1
2S075-GSN01-000.0-021822 2202482C-03A	N	Carbon Dioxide	0.0210	0.0680	0.0680	0.0680 J	V1
2S075-GSN01-000.0-021822 2202482C-03A	N	Oxygen	0.210	20.0	20.0	20.0 J	V1
A3250-GSN01-000.0-021822 2202482C-02A	N	Carbon Dioxide	0.0210	2.40	2.40	2.40 J	V1
A3250-GSN01-000.0-021822 2202482C-02A	N	Oxygen	0.210	17.0	17.0	17.0 J	V1
A3B-150-GSN01-000.0-021822 2202482C-01A	N	Carbon Dioxide	0.0210	0.710	0.710	0.710 J	V1
A3B-150-GSN01-000.0-021822 2202482C-01A	N	Oxygen	0.210	20.0	20.0	20.0 J	V1

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Reason Code Definitions

Code	Definition
TR	Trace Level Detect
V1	ICV

There are no Flag Code definitions to display.

Bias

-	The result may be biased low
+	The result may be biased high

Note - The bias field is a separate field; however, it is an integral part of the final flag (qualifier) on the sample result

Data Validation Report for 2202482C

Review Questions

Method: D1946 (Determination of Fixed or Reformed Gases by GC)				
Review Questions	Yes	No	NA	Comment
Were all samples documented correctly on the chain-of-custody (COC)?	•			Methods TO-15 and TO-3 were reported separately on different SDGs.
Did samples listed on COCs match the sample labels?	•			
Were samples relinquished properly on the COC?	•			
Were all samples properly preserved?	•			
Were sampling dates/times, date and time of laboratory receipt of samples, and sample conditions upon receipt at the laboratory (including preservation, pH, and temperature) are documented?	•			
Were sample results reported with percent moisture correction if required?			•	
Were analytical methods performed and analysis dates present?	•			
Were all requested target analytes reported?	•			
Were QAPP specified laboratory PQLs achieved?	•			
Were holding times met?	•			
Were trip blanks analyzed at the proper frequency and in control?			•	
Were field blanks analyzed at the proper frequency and in control?			•	
Were equipment blanks analyzed at the proper frequency and in control?			•	
Was a method blank prepared and analyzed with each batch?	•			2202482C-05A, 2202482C-05B
Were target analytes in the method blank less than DL?	•			
Was an LCS/LCSD pair prepared and analyzed with each batch?	•			2202482C-07A, 2202482C-07AA
Were LCS/LCSD recoveries within project acceptance limits?	•			
Was the LCS/LCSD RPD within project acceptance limits?	•			
Was a MS/MSD pair prepared with each batch?		•		
Were MS/MSD recoveries within project acceptance limits?			•	
Was the MS/MSD RPD within project acceptance limits?			•	
If ISM was used for sample collection, were laboratory triplicates analyzed and within project acceptance limits?			•	
Were surrogate recoveries within project acceptance limits?			•	
Were field replicates (duplicates, triplicates, etc.) analyzed at the proper frequency and in control?	•			
Were reported sample concentrations within calibration range?	•			
Were Instrument Performace Checks (Degradation Checks) performed and within acceptace criteria?	•			
Was the Calibration within project acceptance criteria?	•			
Was a ICV performed after each ICAL prior to sample analysis and within project acceptance criteria?		•		ICV recoveries for carbon dioxide AND oxygen were below criteria. Associated detections were qualified as estimated "J".
Were CCVs run at the required frequency and within project acceptance criteria?	•			

Data Validation Report for 2202482C

Review Questions

Method: D1946 (Determination of Fixed or Reformed Gases by GC)				
Review Questions	Yes	No	NA	Comment
Were internal standard retention times and area criteria within method requirements?	•			
Were internal standards spiked for every sample, standard, and QC sample?	•			
Were instrument run logs present and filled out appropriately?	•			
Were sample preparation sheets present and filled out appropriately?	•			
Was a Cleanup Procedure required (Cleanup Recovery Checks) verified and within acceptance limits?	•			
Was a Second Column/Detector used and the column difference within acceptance limits?	•			
Have all Laboratory Case Narrative comments/findings been addressed in the data review process?	•			
Were DoD QSM corrective actions followed if deviations were noted?	•			
Were any data recommended for exclusion in the data validation process?		•		

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-111187-1
Analyses/Method:	Volatile Organic Compounds (BTEX) by EPA Method 8260D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) /AECOM Completed on: 10/05/2022
Reviewed by:	[redacted] (b) (6) /AECOM File Name: 580-111187-1_BTEX_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 4 and 5, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3MIS-375-SON01-000.0	580-111187-1	Soil
A3MIS-150-SOFT01-000.0	580-111187-2	Soil
A3MIS-150-SOFT02-000.0	580-111187-3	Soil
A3MIS-150-SOFT03-000.0	580-111187-4	Soil
A3MIS000-SON01-000.0	580-111187-5	Soil
A3MIS215-SON01-000.0	580-111187-6	Soil
2SMIS75-SON01-000.0	580-111187-7	Soil

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody [COC])/sample integrity
- ✓ Holding times and sample preservation
- ✓ Instrument tuning
- ✓ Initial calibration/initial and continuing calibration verification
- ✓ Laboratory blanks/field blanks/equipment blanks
- ✓ Surrogate spike recoveries
- ✓ Matrix spike (MS) and matrix spike duplicate (MSD) results
- ✓ Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
- ✓ Field duplicate/triplicate results
- ✓ Internal standard results
- ✓ Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as reported and may be used for decision making purposes. There were no data points qualified as a result of this data review.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

The laboratory noted that the applied labels did not match the times written on the bags of several samples, and the field sampler was not listed on the COC. No actions were taken except to note these discrepancies.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This "J" qualifier is retained during data validation.

Sample A3MIS000-150-SON01-000.0 (580-111187-5) was received at the laboratory with significantly lower sample weight than required by the method. The laboratory limit of detection (LOD) met the screening criteria for all nondetect results except benzene, as noted in the table below.

All soil samples were analyzed at reduced volumes due to high concentrations of non-target analytes. The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor. The adjusted laboratory LOD did not meet the screening criteria for the nondetect results noted below:

Sample Name	Analyte	Result	LOD	Screening Criteria	Units
A3MIS000-150-SON01-000.0	Benzene		0.32	0.30	mg/kg
A3MIS215-150-SON01-000.0	Benzene		2.2	0.30	mg/kg
A3MIS215-150-SON01-000.0	Toluene		4.3	3.2	mg/kg
A3MIS215-150-SON01-000.0	Ethylbenzene		4.3	3.7	mg/kg
A3MIS215-150-SON01-000.0	m-Xylene & p-Xylene		2.2	2.1	mg/kg
A3MIS215-150-SON01-000.0	o-Xylene		2.2	2.1	mg/kg

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-111187-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B (using Level IV data package)	**Date**: 09/09/22	
		Validator: (b) (6)	
Number of Samples/Matrix:	7 soils	**Reviewer and Date:** (b) (6)	10/5/22
Analysis (Include Method #):	BTEX SW846 8260D		

QAPP (QSM 5.4), DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	**No**	**No**	The applied labels did not match the times written on the bags of several samples, and the field sampler was not listed on the COC as noted in the case narrative. The sample IDs for 580-111187-5, 6, 7 did not match the COC. A revision was requested. ID for sample -6 was revised to A3MIS215-SON01-000.0. See IDs below.
Sample Preservation	Yes	No	0.4º C and 1.3º C.
Holding Time	Yes	No	Collected 03/04/22, 03/05/22, analyzed within 14d.
Quantitation Limits	**No**	**No**	No dilutions. ND results at LOD do not meet action limits for some samples/compounds - see below. Positive results for BTEX compounds are below project screening levels. Sample A3MIS000-150-SON01-000.0 (580-111187-5) was received at the laboratory with significantly lower sample weight than required by the method. The laboratory limit of detection (LOD) met the screening criteria for all nondetect results except benzene.
Quantitation Limits	**No**	**No**	The following samples were analyzed at reduced volume due to high concentrations of non-target analytes: A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), A3MIS000-SON01-000.0 (580-111187-5), A3MIS225-SON01-000.0 (580-111187-6), 2SMIS75-SON01-000.0 (580-111187-7), (580-111187-A-7-C MS) and (580-111187-A-7-D MSD). The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor. It was noted in the case narrative that several samples were received in pre-weighed containers with a label that was added in the field, which would add bias to the final results. Based on professional judgement, the difference does not significantly impact sample results.
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-383770/1-A
Other Laboratory Blanks[1,2]	NA	NA	
Trip/Equipment Blanks	NA	NA	Trip blank, Equipment blank not submitted with the samples in this data set.
Initial Calibration	Yes	No	02/09/22 Inst SEA046, 02/22/22 Inst SEA046 criteria met
Initial Calibration Verification	Yes	No	ICV 580-380850/12 within %D ≤20%
Continuing Calibration Verification	Yes	No	CCVIS 580-383776/2 and CCVC 580-383776/32 %D within criteria.
Matrix Spike	Yes	No	An MS/MSD was analyzed on sample 2MIS75-150-SON01-000.0 (580-111187-7).
Matrix Spike Duplicate RPD[2]	Yes	No	
Laboratory Duplicate[2]	NA	NA	Not applicable to these analyses.
Surrogate Standards[2]	Yes	No	Surrogate %Rs within QSM limits
Laboratory Control Standards	Yes	No	LCS 580-383770/2-A, LCSD 580-383770/3-A: %Rs within QSM limits, RPDs within lab limits.
Internal Standards[2,3]	Yes	No	
Field Duplicate	NA	NA	FDs not submitted with the samples in this data set.
ISM Triplicates	Yes	No	Samples A3MIS-150-SOFT01-000.0, A3MIS-150-SOFT0221-000.0, A3MIS-150-SOFT03-000.0 submitted as ISM triplicates. BTEX results were nondetect in all three samples.
GC/MS Tunes[2]	**No**	**No**	BFB tune B0822002.D 02/09/22 assoc with calibration: %RI (94.8) below criteria of 95-105% of m/z174. Rounds to 95%; ICAL meets criteria, no actions.
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.

[2]May not be applicable to all analyses.

[3]Level IV validation only. See full NFG worksheets for details.

Note: it may not be appropriate to make a direct quantitative comparison for aqueous field blanks (such as equipment blanks reported as µg/mL) to a solid parent sample (such as a soil sample reported as mg/kg). At best, only a qualitative comparison can be made.

Sample	Compound	Result (mg/kg)	PAL (mg/kg)
A3MIS000-150-SON01-000.0	Benzene	0.32 U	0.30
A3MIS225-150-SON01-000.0	Benzene	2.2 U	0.30
A3MIS225-150-SON01-000.0	Toluene	4.3 U	3.2
A3MIS225-150-SON01-000.0	Ethylbenzene	4.3 U	3.7
A3MIS225-150-SON01-000.0	m-Xylene & p-Xylene	2.2 U	2.1
A3MIS225-150-SON01-000.0	o-Xylene	2.2 U	2.1

BTEX*

0	Sample concentration
0	Duplicate concentration
0	Triplicate concentration
0	Sum of concentrations
0	Square of sum of concentrations/number of concentrations
0	Sum of squares of concentrations
0	Difference of sum of concentrations/number of concentrations and sum of squares of concentrations
0	Variance
0	Standard deviation
0	Mean
#DIV/0!	Relative standard deviation

* All results ND for Benzene, Toluene, Ethylbenzene, Xylenes

Lab ID	Sample ID
580-111187-2	A3MIS-150-SOFT01-000.0
580-111187-3	A3MIS-150-SOFT02-000.0
580-111187-4	A3MIS-150-SOFT03-000.0

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-111187-1
Analyses/Method:	TPH-Gasoline Range Organics (TPH-g, C6-C10) by EPA Method 8260D TPH-Diesel Range Organics (TPH-d, C10-C24) by EPA Method 8015D TPH-Residual Range Organics (TPH-o, C24-C40) by EPA Method 8015D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) /AECOM Completed on: 10/05/2022
Reviewed by:	[redacted] (b) (6) /AECOM File Name: 580-111187-1_GRO_DRO_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 4 and 5, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3MIS-375-SON01-000.0	580-111187-1	Soil
A3MIS-150-SOFT01-000.0	580-111187-2	Soil
A3MIS-150-SOFT02-000.0	580-111187-3	Soil
A3MIS-150-SOFT03-000.0	580-111187-4	Soil
A3MIS000-SON01-000.0	580-111187-5	Soil
A3MIS215-SON01-000.0	580-111187-6	Soil
2SMIS75-SON01-000.0	580-111187-7	Soil
A3MIS-375-SON01-000.0-1	580-111187-8	Soil
A3MIS-150-SOFT01-000.0-1	580-111187-9	Soil
A3MIS-150-SOFT02-000.0-1	580-111187-10	Soil
A3MIS-150-SOFT03-000.0-1	580-111187-11	Soil
A3MIS000-SON01-000.0-1	580-111187-12	Soil
A3MIS215-SON01-000.0-1	580-111187-13	Soil
2SMIS75-SON01-000.0-1	580-111187-14	Soil

The laboratory revised the sample IDs to make ORO a separate fraction in order to report the incremental sampling methodology (ISM) results in the EDMS database. The sample IDs containing only the ORO fraction were renamed to add -1 to the end of the client ID.

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *SW-846 Method 8015D: Nonhalogenated Organics Using GC/FID* (June 2003)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC, Department of Defense*, Revision 1 (March 2021)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓ Data completeness (chain-of-custody [COC])/sample integrity
✓ Holding times and sample preservation
✓ Instrument tuning
✓ Initial calibration/initial and continuing calibration verification
✓ Laboratory blanks/field blanks/equipment blanks
✓ Surrogate spike recoveries
✗ Matrix spike (MS) and matrix spike duplicate (MSD) results
✓ Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
✓ Field duplicate/triplicate results
✓ Internal standard results
✓ Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Select data points were estimated due to nonconformances of certain QC criteria (see discussion below). Qualified sample results are presented in Table 1.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

The laboratory noted that the applied labels did not match the times written on the bags of several samples, and the field sampler was not listed on the COC. No actions were taken except to note these discrepancies.

MS/MSD Results

The following TPH-o (C24-C40) matrix spike recoveries were above the project control limits:

Sample	Analyte	Recovery	Recovery Limits
A3MIS-375-SON01-000.0-1	TPH-o (C24-C40)	136	39-106
A3MIS-375-SON01-000.0-1	TPH-o (C24-C40)	129	39-106

The result for TPH-o in sample A3MIS-375-SON01-000.0-1 was qualified as estimated (J) and may be biased high.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation.

Samples A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), and 2SMIS75-SON01-000.0 (580-111187-7) were analyzed for TPH-g at reduced volume due to high concentrations of target analytes. The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor.

The laboratory limit of detection (LOD) met the screening criteria for TPH-g (100 mg/kg) and TPH-d/TPH-o (220 mg/kg).

The following positive results exceeded the site screening criteria:

Sample Name	Analyte	Result	Screening Criteria	Units
A3MIS-150-SOFT01-000.0	TPH-g	200	100	mg/kg
A3MIS-150-SOFT02-000.0	TPH-g	220	100	mg/kg
A3MIS-150-SOFT03-000.0	TPH-g	190	100	mg/kg
A3MIS-375-SON01-000.0	TPH-g	130	100	mg/kg
2MIS75-SON01-000.0	TPH-d	400	220	mg/kg
A3MIS000-SON01-000.0	TPH-d	4200	220	mg/kg
A3MIS-150-SOFT01-000.0	TPH-d	1300	220	mg/kg
A3MIS-150-SOFT02-000.0	TPH-d	1400	220	mg/kg
A3MIS-150-SOFT03-000.0	TPH-d	1000	220	mg/kg
A3MIS215-SON01-000.0	TPH-d	260	220	mg/kg
A3MIS-375-SON01-000.0	TPH-d	6200	220	mg/kg
2MIS75-SON01-000.0-1	TPH-o	250	220	mg/kg
A3MIS000-SON01-000.0-1	TPH-o	280	220	mg/kg
A3MIS-375-SON01-000.0-1	TPH-o	310	220	mg/kg

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-111187-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-111187-1	A3MIS-375-SON01-000.0-1	580-111187-8	8015D	C24-C40	310	mg/kg	310 J	M

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-111187-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B (using Level IV data package)	**Date**: 10/5/22 **Validator**: [redacted]	
Number of Samples/Matrix:	7soils	**Reviewer and Date:** (b) (6)	10/5/22
Analysis (Include Method #):	GRO C6-C10 SW-846 8260D		

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	**No**	**No**	The applied labels did not match the times written on the bags of several samples, and the field sampler was not listed on the COC as noted in the case narrative. The sample IDs for 580-111187-5, 6, 7 did not match the COC. A revision was requested. ID for sample -6 was revised to A3MIS215-SON01-000.0. See IDs below.
Sample Preservation	Yes	No	0.4º C and 1.3º C.
Holding Time	Yes	No	Collected 03/04/22, 03/05/22 analyzed within 14d for methanol preserved samples
Quantitation Limits	No	No	No dilutions, no ND results. Lab LODs for GRO meet PAL (100 mg/kg). Sample A3MIS000-150-SON01-000.0 (580-111187-5) was provided to the laboratory with a significantly different initial weight than that required by the reference method: Deviations in the weight by more than 20% may affect reporting limits and potentially method performance. The method specifies 150g.
Quantitation Limits	No	No	The following samples were analyzed at reduced volume due to high concentrations of target analytes: A3MIS-375-SON01-000.0 (580-111187-1), A3MIS-150-SOFT01-000.0 (580-111187-2), A3MIS-150-SOFT02-000.0 (580-111187-3), A3MIS-150-SOFT03-000.0 (580-111187-4), 2SMIS75-SON01-000.0 (580-111187-7), (580-111187-A-7-C MS) and (580-111187-A-7-D MSD). The calculation was performed using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor. The results for GRO in samples A3MIS-150-SOFT01-000.0, A3MIS-150-SOFT02-000.0, A3MIS-150-SOFT03-000.0, A3MIS-375-SON01-000.0 exceed the project screening level of 100 mg/kg - see below. It was noted in the case narrative that several samples were received in pre-weighed containers with a label that was added in the field, which would add bias to the final results. Based on professional judgement, the difference does not significantly impact sample results.
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-383770/1-A, MB 580-383903/1-A were ND.
Trip/Equipment Blanks	NA	NA	Trip blank / Equipment blank not submitted with these samples.
Initial Calibration	Yes	No	SEA046 02/09/22
Initial Calibration Verification	Yes	No	ICV 580-380867/12 and ICV 580-381937/13 meet criteria.
Continuing Calibration Verification	Yes	No	CCVIS 580-383779/22, CCVIS 580-383779/23, CCV 580-383779/30, CCVIS 580-383933/3, CCV 580-383933/12 within criteria for GRO C6-C10
Matrix Spike	Yes	No	An MS/MSD was performed on sample 2MIS75-150-SON01-000.0 (580-111187-7). %R and RPD within criteria.
Matrix Spike Duplicate RPD[2]	Yes	No	
Laboratory Duplicate[2]	NA	NA	
Surrogate Standards[2]	Yes	No	Surrogate BFB within QSM limits
Laboratory Control Standards	Yes	No	LCS 580-383770/4-A, LCS 580-383903/4-A, LCSD 580-383770/5-A, LCSD 580-383903/5-A
Field Duplicate	NA	NA	FDs not submitted in this data set.
ISM Triplicates	Yes	No	Samples A3MIS-150-SOFT01-000.0, A3MIS-150-SOFT0221-000.0, A3MIS-150-SOFT03-000.0 submitted as ISM triplicates. RSD for GRO 7.5%, within 50% criteria.
Internal Standards[2,3]	Yes	No	
GC/MS Tunes[2]	**No**	**No**	Tune info incomplete on Form V for 03/15/2022. From Analysis Run Log, tune was analyzed 03/15/2022 11:14 on Inst SEA046. Tune criteria not met on Inst SEA046, 02/09/22. *See note below. Nonconformances noted for the BFB tunes are not applicable to the GRO analysis and data validation actions are not required.
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Sample	Compound	Result (mg/kg)	PAL (mg/kg)
A3MIS-375-SON01-000.0 (580-111187-1)	GRO C6-C10	130	100
A3MIS-150-SOFT01-000.0 (580-111187-2)	GRO C6-C10	200	100
A3MIS-150-SOFT02-000.0 (580-111187-3)	GRO C6-C10	220	100
A3MIS-150-SOFT03-000.0 (580-111187-4)	GRO C6-C10	190	100

*The relative abundance of specific ions is not applicable to the GRO method since the analysis performed on the GC/MS is based on the total ion chromatograph and not a selected quantitation ion. The qualitative identification of the presence or absence of GRO in the samples is based on defining the retention time window with the analysis of a retention time standard that includes compounds which mark the start and end of the C6-C12 window, and not as the result of comparison to a reference spectrum. Quantitation is based on the use of an initial calibration which is determined using the total ion chromatograph and not a selected quantitation ion. Therefore, nonconformances noted for the BFB tunes are not applicable and data validation actions are not required.

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-111187-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B (using Level IV data package)	**Date**: 10/5/22 **Validator**: (b) (6)	
Number of Samples/Matrix:	7 soils	**Reviewer and Date:** (b) (6) 10/5/22	
Analysis (Include Method #):	DRO/ORO SW-846 8015C		

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	No	No	The applied labels did not match the times written on the bags of several samples, and the field sampler was not listed on the COC as noted in the case narrative. The sample IDs for 580-111187-5, 6, 7 did not match the COC. A revision was requested. ID for sample -6 was revised to A3MIS215-SON01-000.0. See IDs below.
Sample Preservation	Yes	No	0.4º C and 1.3º C.
Holding Time	Yes	No	Collected 03/04/22, 03/05/22, extracted within 14d, analyzed within 40d.
Quantitation Limits	**No**	**No**	**No dilutions, no ND results. LODs meet PAL (220 mg/kg). Results for DRO and/or ORO were above PALs in some samples - see below.**
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-383748/1-A, MB 580-383968/1-A, MB 580-384294/1-A, All ND
Equipment Blanks	NA	NA	Equipment blank not submitted with these samples.
Initial Calibration	Yes	No	TAC013 11/28/21, TAC013 12/27/21
Initial Calibration Verification	Yes	No	ICV 580-376805/14 within criteria
Continuing Calibration Verification	Yes	No	CCVRT 580-383879/3, CCV 580-383879/10, CCV 580-383879/13, CCV 580-383879/24, CCVRT 580-384047/3, CCV 580-384047/10, CCV 580-384047/21, CCV 580-384047/28, CCV 580-384047/38, CCVRT 580-384352/3, CCV 580-384352/5, CCV 580-384352/14 within criteria.
Matrix Spike	**No**	**Yes**	A3MIS000-SON01-000.0 (580-111187-5) MS/MSD %R and RPD within criteria for DRO C10-C24. **A3MIS-375-SON01-000.0-1 (580-111187-8) MS and MSD %R above criteria for ORO (C24-C40), RPD within limits. The positive results for ORO in sample A3MIS-375-SON01-000.0-1 were qualified (J) as estimated and may be biased high.**
Matrix Spike Duplicate RPD[2]	Yes	No	
Laboratory Duplicate[2]	NA	NA	
Surrogate Standards[2]	Yes	No	
Laboratory Control Standards	Yes	No	DRO C10-C24 limits per QSM 5.4 are 38-132%R. Lab used 75-125%R. LCS 580-383748/2-A, LCSD 580-383748/3-A, LCS 580-383968/2-A, LCSD 580-383968/3-A, LCS 580-384294/2-A, LCSD 580-384294/3-A within limits for %R and RPD (≤20% lab limits)
Field Duplicate	NA	NA	FDs not submitted with the samples in this data set.
ISM Triplicates	Yes	No	Samples A3MIS-150-SOFT01-000.0, A3MIS-150-SOFT0221-000.0, A3MIS-150-SOFT03-000.0 submitted as ISM triplicates. RSD for DRO 16.9% and ORO 12.5% within 50% criteria. Note the ORO sample IDs were appended with '-1' to report the Incremental Sampling Methodology (ISM) results in EDMS.
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C10)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Sample	Compound	Result (mg/kg)	PAL (mg/kg)
2SMIS75-150-SON01-000.0	DRO C10-C24	400	220
A3MIS000-SON01-000.0	DRO C10-C24	4200	220
A3MIS-150-SOFT01-000.0	DRO C10-C24	1300	220
A3MIS-150-SOFT02-000.0	DRO C10-C24	1400	220
A3MIS-150-SOFT03-000.0	DRO C10-C24	1000	220
A3MIS225-SON01-000.0	DRO C10-C24	260	220
A3MIS-375-SON01-000.0	DRO C10-C24	6200	220
2SMIS75-SON01-000.0	ORO C24-C40	250	220
A3MIS000-SON01-000.0	ORO C24-C40	280	220
A3MIS-375-SON01-000.0	ORO C24-C40	310	220

GRO

200	Sample concentration
220	Duplicate concentration
190	Triplicate concentration
610	Sum of concentrations
124033.3333	Square of sum of concentrations/number of concentrations
124500	Sum of squares of concentrations
466.6666667	Difference of sum of concentrations/number of concentrations and sum of squares of concentrations
233.3333333	Variance
15.27525232	Standard deviation
203.3333333	Mean
7.512419172	Relative standard deviation

Lab ID	Sample ID
580-111187-2	A3MIS-150-SOFT01-000.0
580-111187-3	A3MIS-150-SOFT02-000.0
580-111187-4	A3MIS-150-SOFT03-000.0

A3MIS-150-SOFT01-000.0 / A3MIS-150-SOFT02-000.0 / A3MIS-150-SOFT03-000.0

DRO

1300	Sample concentration
1400	Duplicate concentration
1000	Triplicate concentration
3700	Sum of concentrations
4563333.333	Square of sum of concentrations/number of concentrations
4650000	Sum of squares of concentrations
86666.66667	Difference of sum of concentrations/number of concentrations and sum of squares of concentrations
43333.33333	Variance
208.1665999	Standard deviation
1233.333333	Mean
16.87837297	Relative standard deviation

Lab ID	Sample ID
580-111187-2	A3MIS-150-SOFT01-000.0
580-111187-3	A3MIS-150-SOFT02-000.0
580-111187-4	A3MIS-150-SOFT03-000.0

ORO

160	Sample concentration
190	Duplicate concentration
150	Triplicate concentration
500	Sum of concentrations
83333.33333	Square of sum of concentrations/number of concentrations
84200	Sum of squares of concentrations
866.6666667	Difference of sum of concentrations/number of concentrations and sum of squares of concentrations
433.3333333	Variance
20.81665999	Standard deviation
166.6666667	Mean
12.489996	Relative standard deviation

Lab ID	Sample ID
580-111187-9	A3MIS-150-SOFT01-000.0-1
580-111187-10	A3MIS-150-SOFT02-000.0-1
580-111187-11	A3MIS-150-SOFT03-000.0-1

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-111187-1
Analyses/Method:	Semivolatile Organic Compounds by EPA Method 8270E-SIM (1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene)
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) /AECOM Completed on: 10/05/2022
Reviewed by:	[redacted] (b) (6) /AECOM File Name: 580-111187-1_SVOC_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 4 and 5, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3MIS-375-SON01-000.0	580-111187-1	Soil
A3MIS-150-SOFT01-000.0	580-111187-2	Soil
A3MIS-150-SOFT02-000.0	580-111187-3	Soil
A3MIS-150-SOFT03-000.0	580-111187-4	Soil
A3MIS000-SON01-000.0	580-111187-5	Soil
A3MIS215-SON01-000.0	580-111187-6	Soil
2SMIS75-SON01-000.0	580-111187-7	Soil

Data validation activities were conducted with reference to:

- *SW-846 Method 8270E: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody [COC])/sample integrity
- ✓ Holding times and sample preservation
- ✓ Instrument tuning
- ✓ Initial calibration/initial and continuing calibration verification
- ✓ Laboratory blanks/field blanks/equipment blanks
- ✓ Surrogate spike recoveries
- ✓ Matrix spike (MS) and matrix spike duplicate (MSD) results
- ✓ Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
- ✓ Field duplicate/triplicate results
- ✓ Internal standard results
- ✓ Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as reported and may be used for decision making purposes. There were no data points qualified as a result of this data review.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

The laboratory noted that the applied labels did not match the times written on the bags of several samples, and the field sampler was not listed on the COC. No actions were taken except to note these discrepancies.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is

retained during data validation. Laboratory limits of detection (LOD) meet screening criteria for all samples.

The following results exceeded the project screening criteria:

Sample Name	Compound	Result	LOD	Screening Criteria	Units
A3MIS-375-SON01-000.0	1-Methylnaphthalene	15	0.015	4.2	mg/kg
A3MIS-375-SON01-000.0	2-Methylnaphthalene	16	0.030	4.1	mg/kg
A3MIS-375-SON01-000.0	Naphthalene	5.0	0.0039	4.4	mg/kg

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-111187-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B	**Date**: 10/05/22	
	(using Level IV data package)	**Validator**: (b) (6)	
Number of Samples/Matrix:	7 soils	**Reviewer and Date:** (b) (6)	10/5/22
Analysis (Include Method #):	SVOCs, SW846 8270E-SIM (Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene)		

DoD QSM 5.4, DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	No	No	The applied labels did not match the times written on the bags of several samples, and the field sampler was not listed on the COC as noted in the case narrative. The sample IDs for 580-111187-5, 6, 7 did not match the COC. A revision was requested. ID for sample -6 was revised to A3MIS215-SON01-000.0. See IDs below.
Sample Preservation	Yes	No	0.4º C and 1.3º C.
Holding Time	Yes	No	Collected 03/04/22, 03/05/22, extracted within 14d, analyzed within 40d.
Quantitation Limits	**No**	**No**	**A3MIS-375-SON01-000.0 (10X) for 1MN, 2MN. ND results were not reported from dilutions; LODs meet PALs. Positive results exceed PALs in sample A3MIS-375-SON01-000.0. It was noted in the case narrative that several samples were received in pre-weighed containers with a label that was added in the field, which would add bias to the final results. Based on professional judgement, the difference does not significantly impact sample results.**
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-383752/1-A
Other Laboratory Blanks[1,2]	NA	NA	Not applicable to these analyses.
Trip/Equipment Blanks	NA	NA	EB not submitted with the samples in this data set.
Initial Calibration	Yes	No	ICAL 01/14/2022 Inst TAC050, criteria met
Initial Calibration Verification	Yes	No	ICV 580-378263/18 %D ≤20%
Continuing Calibration Verification	Yes	No	CCVIS 580-383876/3, CCVC 580-383876/28, CCVIS 580-384094/3, CCVIS 580-384094/5 %D ≤20%
Matrix Spike	Yes	No	A3MIS-150-SOFT03-000.0 (580-111187-4) MS/MSD: %R and RPD within QSM criteria for all compounds.
Matrix Spike Duplicate RPD[2]	Yes	No	
Laboratory Duplicate[2]	NA	NA	Not applicable to these analyses.
Surrogate Standards[2]	Yes	No	%Rs within lab limits (per QSM) for PAH surrogates fluoranthene-d10 and 2-methylnaphthalene-d10
Laboratory Control Standards	Yes	No	LCS 580-383752/2-A QSM criteria met for %R
Internal Standards[2,3]	Yes	No	
Field Duplicate	NA	NA	FDs not submitted with the samples in this data set.
ISM Triplicates	Yes	No	Samples A3MIS-150-SOFT01-000.0, A3MIS-150-SOFT0221-000.0, A3MIS-150-SOFT03-000.0 submitted as ISM triplicates. RSD for Naphthalene 13.9%, 2-Methylnaphthalene 21.3%, amd 1-Methylnaphthalene 27.6% were within 50% criteria.
GC/MS Tunes[2]	Yes	No	
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Sample	Compound	Result (mg/kg)	PAL (mg/kg)
A3MIS-375-SON01-000.0	1-Methylnaphthalene	15	4.2
	2-Methylnaphthalene	16	4.1
	Naphthalene	5.0	4.4

Naphthalene

0.037	Sample concentration
0.046	Duplicate concentration
0.036	Triplicate concentration
0.119	Sum of concentrations
0.004720333	Square of sum of concentrations/number of concentrations
0.004781	Sum of squares of concentrations
6.06667E-05	Difference of sum of concentrations/number of concentrations and sum of squares of concentrations
3.03333E-05	Variance
0.005507571	Standard deviation
0.039666667	Mean
13.88463163	Relative standard deviation

Lab ID	Sample ID
580-111187-2	A3MIS-150-SOFT01-000.0
580-111187-3	A3MIS-150-SOFT02-000.0
580-111187-4	A3MIS-150-SOFT03-000.0

2-Methylnaphthalene

0.033	Sample concentration
0.045	Duplicate concentration
0.051	Triplicate concentration
0.129	Sum of concentrations
0.005547	Square of sum of concentrations/number of concentrations
0.005715	Sum of squares of concentrations
0.000168	Difference of sum of concentrations/number of concentrations and sum of squares of concentrations
8.4E-05	Variance
0.009165151	Standard deviation
0.043	Mean
21.31430556	Relative standard deviation

Lab ID	Sample ID
580-111187-2	A3MIS-150-SOFT01-000.0
580-111187-3	A3MIS-150-SOFT02-000.0
580-111187-4	A3MIS-150-SOFT03-000.0

1-Methylnaphthalene

0.055	Sample concentration
0.093	Duplicate concentration
0.094	Triplicate concentration
0.242	Sum of concentrations
0.019521333	Square of sum of concentrations/number of concentrations
0.02051	Sum of squares of concentrations
0.000988667	Difference of sum of concentrations/number of concentrations and sum of squares of concentrations
0.000494333	Variance
0.022233608	Standard deviation
0.080666667	Mean
27.56232421	Relative standard deviation

Lab ID	Sample ID
580-111187-2	A3MIS-150-SOFT01-000.0
580-111187-3	A3MIS-150-SOFT02-000.0
580-111187-4	A3MIS-150-SOFT03-000.0

Facility:	RHBFS Site Characterization
Event:	Site Characterization Tunnel Cutouts
SDG:	5801111871
Guidance Document:	Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP
Prime Contractor:	AECOM, Honolulu, HI
Project Manager:	
Contract Laboratory(ies):	Eurofins Environment Testing TestAmerica, Tacoma, WA
Data Review Contractor:	
Data Review Level:	
Primary Data Reviewer:	,
Date Submitted:	

Field Sample ID	Lab Sample ID	Matrix	Type/Type Code	BNASIM	SW8015D	SW8260	SW8260D
2SMIS75-SON01-000.0	580-111187-7	Solid	Field Sample/N	X	X	X	X
2SMIS75-SON01-000.0-1	580-111187-14	Solid	Field Sample/N		X		
A3MIS000-SON01-000.0	580-111187-5	Solid	Field Sample/N	X	X	X	X
A3MIS000-SON01-000.0-1	580-111187-12	Solid	Field Sample/N		X		
A3MIS-150-SOFT01-000.0	580-111187-2	Solid	Field Triplicate/FT	X	X	X	X
A3MIS-150-SOFT01-000.0-1	580-111187-9	Solid	Field Triplicate/FT		X		
A3MIS-150-SOFT02-000.0	580-111187-3	Solid	Field Triplicate/FT	X	X	X	X
A3MIS-150-SOFT02-000.0-1	580-111187-10	Solid	Field Triplicate/FT		X		
A3MIS-150-SOFT03-000.0	580-111187-4	Solid	Field Triplicate/FT	X	X	X	X
A3MIS-150-SOFT03-000.0-1	580-111187-11	Solid	Field Triplicate/FT		X		
A3MIS215-SON01-000.0	580-111187-6	Solid	Field Sample/N	X	X	X	X
A3MIS215-SON01-000.0-1	580-111187-13	Solid	Field Sample/N		X		
A3MIS-375-SON01-000.0	580-111187-1	Solid	Field Sample/N	X	X	X	X
A3MIS-375-SON01-000.0-1	580-111187-8	Solid	Field Sample/N		X		

This report assesses the analytical data quality associated with the analyses listed on the preceding cover page at data validation level. This assessment has been made through a combination of automated data review (ADR) and supplemental manual review, the details of which are described below. The approach taken in the review of this data set is consistent with the requirements contained in the Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP and the additional guidance documents incorporated by reference to the extent possible. Where definitive guidance is not provided, results have been evaluated in a conservative manner using professional judgment.

Sample collection was managed and directed by AECOM, Honolulu, HI; analyses were performed by Eurofins Environment Testing TestAmerica, Tacoma, WA and were reported under sample delivery group (SDG) 5801111871. Data have been evaluated electronically based on electronic data deliverables (EDDs) provided by the laboratory, and hard copy data summary forms have also been reviewed during this effort and compared to the automated review output by the reviewers whose signatures appear on the following page. Findings based on the automated data submission and manual data verification processes are detailed in the ADR narrative and throughout this report.

All quality control (QC) elements associated with this SDG have been reviewed by a project chemist in accordance with the requirements defined for the project. This review is documented in the attached Data Review Checklists. The QC elements listed below were supported by the electronic deliverable and were evaluated using ADR processes.

Continuing Calibration Verification

Field Triplicate RSD

Lab Blank

LCS Recovery

LCS RPD

MS Recovery

MS RPD

Prep Hold Time

Surrogate

Test Hold Time

Results of the ADR process were subsequently reviewed and updated as applicable by the data review chemists identified on the signature page. Quality control elements that were not included in the electronic deliverable were reviewed manually and findings are documented within this report. Summaries of findings and associated qualified results are documented throughout this report.

A total of 1 results (1.19%) out of the 84 results (sample and field QC samples) reported are qualified based on review and 0 results (0.00%) have been rejected or deemed a serious deficiency (X qualifier). Trace values, defined as results that are qualified as estimated because they fall between the detection limit and the reporting limit/limit of quantitation, are not counted as qualified results in the above count. The qualified results are detailed throughout this report and discussed in the narrative below, where appropriate.

Narrative Comments

Analytical Method	Data Reviewer Comment

Reviewed by , ,

As the First Reviewer, I certify that I have performed a data review process in accordance with the requirements of the project guidance document, and have compared the electronic data to the laboratory's hard copy report and have verified the consistency of the reported sample results and method quality control data between the two deliverables.

(b) (6) [redacted]

October 05, 2022

As the Second Reviewer, I certify that I have performed a quality assurance review of the report generated by the First Reviewer.

Quality Control Outliers for test method SW8015D, MS Recovery

Data for matrix spikes/matrix spike duplicates (MS/MSD) are generated to determine long-term precision and accuracy of the analytical method on various matrices and to demonstrate acceptable compound recovery by the laboratory at the time of sample analysis. These data alone cannot be used to evaluate the precision and accuracy of individual samples. However, when exercising professional judgment, MS/MSD data can be used in conjunction with other available QC information. Reported results were evaluated to determine compliance with the required acceptance criteria, and summary forms were evaluated and compared to electronic data deliverables. Findings of this review, and any associated qualified results, are listed below.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
A3MIS-375-SON01-000.0-1 (MS)	C24-C40 Petroleum Hydrocarbons	161.0	39 - 106	20 - 106	percent	J/None	M	
A3MIS-375-SON01-000.0-1 (SD)	C24-C40 Petroleum Hydrocarbons	150.0	39 - 106	20 - 106	percent	J/None	M	

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

Qualified Results associated with the MS Recovery for SW8015D

FieldSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3MIS-375-SON01-000.0-1 580-111187-8	N	C24-C40 Petroleum Hydrocarbons	46.0	310	310 J		mg/kg	M

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.

Table of All Qualified Results

Test Method: SW8015D		**Extraction Method: SW3546**						
FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3MIS-375-SON01-000.0-1 580-111187-8	N	C24-C40 Petroleum Hydrocarbons	46.0	310	310 J		mg/kg	M

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Results with Modified Qualifiers

No qualifiers associated with this sample delivery group were modified manually.

Reason Code Definitions

Code	Definition
M	MS Recovery
TR	Trace Level Detect

Flag Code and Definitions

Flag	Definition
J	Estimated Value
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a tentative identification.
NJ	The analyte has been tentatively identified or presumptively as present and the associated numerical value was the estimated concentration in the sample.
R	The data are rejected due to deficiencies in meeting QC criteria and may not be used for decision making.
U	Undetected: The analyte was analyzed for, but not detected.
UJ	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
X	Result may require rejection; PDT attention required

Bias

-	The result may be biased low
+	The result may be biased high

Note - The bias field is a separate field; however, it is an integral part of the final flag (qualifier) on the sample result

Review Questions

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-111395-1
Analyses/Method:	Total Petroleum Hydrocarbon (TPH)-Diesel Range Organics (DRO)/Oil Range Organics (ORO) by SW-846 Method 8015C
Validation Level:	Stage 4
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) /AECOM — Completed on: 08/6/2022
Reviewed by:	[redacted] (b) (6) /AECOM — File Name:580-111395-1_Stage 4_DRO-ORO_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 11, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3215-SON01-002.0	580-111395-1	Soil
A3325-SON01-002.0	580-111395-2	Soil
A3-150-SON01-002.0	580-111395-3	Soil
A3000-SON01-002.0	580-111395-4	Soil
A3325-WGN01-002.0	580-111395-5	Groundwater
A3215-WGN01-002.0	580-111395-6	Groundwater

Data validation activities were conducted with reference to:

- *SW--846 Method 8015D: Nonhalogenated Organics Using GC/FID* (June 2003)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC* (March 2021)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✓	Holding times and sample preservation
✓	Initial calibration/initial and continuing calibration verification
✗	Laboratory blanks/equipment blanks/trip blanks
✓	Surrogate spike recoveries
NA	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
NA	Field duplicate results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Select data points were qualified as estimated due to nonconformances of certain QC criteria (see discussion below). Qualified sample results are presented in Table 1.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

The case narrative noted instances of missing collection times. Corrected sample IDs and dates of sample collection were provided to the laboratory by AECOM after the samples were received at the laboratory.

Holding Times and Sample Preservation

Sample preservation and analytical holding times were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met.

Initial Calibration/Initial and Continuing Calibration Verification

Calibration data were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met. Select results were recalculated as part of the Stage 4 validation.

Laboratory Blanks/Equipment Blanks/Trip Blanks

Laboratory blanks and equipment blanks are evaluated as to whether there are contaminants detected above the method detection limit (MDL). An equipment blank was not submitted with this data set.

DRO (C10-C24) was detected at a concentration of 73.7 µg/L in the laboratory method blank associated with all groundwater samples.

Samples were qualified as follows:

Actions: (Based on DoD Revised Table A)

Sample		
Result	**Validated Result**	**Validation Qualifier**
Non-detect or detect ≤ LOD	Report at LOD	U
> LOD but ≤ 5x blank	Report at Sample Result	J+
> 5x blank	Report at Sample Result	None
LOD = Limit of Detection		

Qualified sample results are summarized in Table 1.

Surrogate Spike Recoveries

The surrogate percent recoveries (%Rs) were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met. Select surrogate recovery results were recalculated as part of the Stage 4 validation.

MS/MSD Results

MS/MSD analyses were not performed on a sample in this data set. No data validation actions were taken on this basis.

LCS/LCSD Results

The LCSLCSD %Rs and relative percent differences (RPDs) were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met. Select spike recovery results were recalculated as part of the Stage 4 validation.

Field Duplicate Results

Field duplicate samples were not submitted with the samples in this data set. No data validation actions were taken on this basis.

Sample Results/Reporting Issues

When applicable, compounds detected at concentrations less than the reporting limit (RL) but greater than the method detection limit (MDL) are qualified by the laboratory as estimated (J). This "J" qualifier is retained during data validation.

For the samples undergoing Stage 4 validation, detected sample results were reviewed to ensure that all identification criteria are met. Additionally, the chromatograms for samples where all results are nondetect were reviewed to ensure against laboratory reporting of false negative results.

The laboratory defined the TPH-DRO and TPH-ORO hydrocarbon ranges as follows:

TPH-DRO: C10-C24
TPH-ORO: C24-C40

It should be noted that the project screening criterion has not been established for the TPH-ORO (C24-C40) hydrocarbon range.

The detected sample results or the limit of detection (LOD) for each target compound met the project screening criteria tabulated below with the following exceptions.

Sample ID	Compound	Concentration (units)
A3000-SON01-002.0	DRO (C10-C24)	3800 mg/kg
A3325-WGN01-002.0	DRO (C10-C24)	570 µg/L

Compound	Screening Criteria (soils)	Units	Screening Criteria* (groundwaters)	Units
DRO (C10-C24)	220	mg/kg	500/400	µg/L
* The DRO range is not specified for the groundwater screening criteria, and it is simply listed as TPH-d.				

Verification of calculations was performed on a subset of the sample results using the provided data. No significant discrepancies were noted.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

ATTACHMENTS

Attachment A: Qualifier Codes and Explanations

Attachment B: Reason Codes and Explanations

AECOM

Summary Data Quality Review
Joint Base Pearl Harbor-Hickam, Hawaii
Red Hill Bulk Fuel Storage Facility

Table 1 - Data Validation Summary of Qualified Data

Sample Name	Compound	Result	Units	LOD	LOQ	Validation qualifier	Reason code
A3215-WGN01-002.0	C10-C24	230	ug/L	110	120	J+	L

Attachment A

Qualifier Codes and Explanations

Qualifier	Explanation
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J-	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a potential low bias.
J+	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a potential high bias.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
U	The analyte was analyzed for but was not detected above the reported sample quantitation limit.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

Attachment B

Reason Codes and Explanations

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds Linear Calibration Range

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank
V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degrees C.
Y1	False Positive
Y2	Data rejected due to radiological anomalies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or opening CCV.

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	**580-111395-1**	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 4	**Date**: 7/20/2022	
	(using Level IV data package)	**Validator**: (b) (6)	
Number of Samples/Matrix :	4 soils, 2 GWs	**Reviewer and Date:** (b) (6)	08172022
Analysis (Include Method #):	DRO/ORO SW-846 8015C		

QSM 5.4, DoD Module 4,

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	Yes	No	The lab reported the DRO range as C10-C24 and the ORO range as C24-C40. Screening limits are only provided for the DRO range.
Sample Preservation	Yes	No	Cooler: 0.6C
Holding Time	Yes	No	
Quantitation Limits	see comments		All detects and NDs met the DRO screening limits except the following: A3000-SON01-002.0 (3800 mg/kg) A3325-WGN01-002.0 (570 ug/L)
Percent Solids (>30%)	Yes	No	
Method Blanks	No	Yes	MB 580-384051/1-A [Associated with all soils]: ND for DRO and ORO MB 580-384319/1-A [Associated with all GWs]: C10-C24 (73.7 J ug/l) J+ in A3215-WGN01-002.0 [reason code L]
Equipment Blanks	NA	NA	None submitted
Initial Calibration	Yes	No	
Initial Calibration Verification	Yes	No	
Continuing Calibration Verification	Yes	No	The RTC standard is used to establish the RTW for each range. The RT listed on the Form 7 notes the RT of the apex of the peak. Therefore, the RTW noted on the subsequent CCV std is slightly different because per the lab response, it is set to mark the start of the peak rather than the apex of the peak for the first marker alkane and the end of the peak rather than the apex for the ending marker alkane. The lab also responded that the start of the range on the quant report for C24-C40 differs from the other C24 ranges (C24-C32 and C24-C36) because they are lesser requested ranges and the RTW has not consistently updated for those other ranges. Going forward, the lab will update them to avoid confusion. (see email 8/2/2022)
Matrix Spike	NA	NA	None performed
Matrix Spike Duplicate RPD[2]	NA	NA	
Laboratory Duplicate[2]	NA	NA	
Surrogate Standards[2]	Yes	No	
Laboratory Control Standards	Yes	No	LCS/LCSD 580-384051/2-A &3-A [Associated with all soils] all met LCS/LCSD 580-384319/2-A &3-A [Associated with all GWs] all met note: the lab limits for the DRO range (75-125) are tighter than those in Appendix C. QSM and lab limits were met.
Field Duplicate	NA	NA	None submitted
Compound Identification	see comments		No discrepancies noted
Calculation Spot Checks[3]	see comments		The lab confirmed (in email 6/7/2022) that the surrogate contribution is subtracted from the appropriate DRO/ORO area as applicable. No significant discrepancies noted.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C12)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Calibration Level and Response

concentration (xi)	peak area (yi)
10	4502450
20	7056016
50	15622925
100	28760124
200	55498526
500	137331838
1000	282184903
2000	544096320
5000	1349700201
10000	2694423591
	avg(yi)
	511917689.4

Weighted Least-Squares Linear Regression

$$m = \frac{\sum_{i=1}^{n}(w_i)\sum_{i=1}^{n}(w_i y_i x_i) - \sum_{i=1}^{n}(w_i x_i)\sum_{i=1}^{n}(w_i y_i)}{\sum_{i=1}^{n}(w_i)\sum_{i=1}^{n}(w_i x_i^2) - \sum_{i=1}^{n}(w_i x_i)\sum_{i=1}^{n}(w_i x_i)} \qquad b = \frac{\sum_{i=1}^{n}(w_i y_i) - m\sum_{i=1}^{n}(w_i x_i)}{\sum_{i=1}^{n}(w_i)}$$

Weighted Least-Squares Regression Parameters (1/concentration squared)		
	AECOM Calculated	Lab Calculated
Slope (m)	2.717E+05	2.717E+05
Offset (b)	1.760E+06	1.760E+06

Weighted Least-Squares Linear Regression

weighting factor	normalized weighting factor				
w_i^t	W_i	$W_i*x_i*y_i$	W_i*x_i	W_i*y_i	$Wi*x_i^2$
0.01	4.605111674	207342850.6	46.05111674	20734285.06	460.5111674
0.0025	1.151277918	162468708.3	23.02555837	8123435.413	460.5111674
0.0004	0.184204467	143890628.6	9.210223348	2877812.572	460.5111674
0.0001	0.046051117	132443582.8	4.605111674	1324435.828	460.5111674
0.000025	0.011512779	127788455	2.302555837	638942.2749	460.5111674
0.000004	0.001842045	126485690.1	0.921022335	252971.3802	460.5111674
0.000001	0.000460511	129949299.1	0.460511167	129949.2991	460.5111674
0.00000025	0.000115128	125281215.7	0.230255584	62640.60787	460.5111674
0.00000004	1.84204E-05	124310403	0.092102233	24862.08061	460.5111674
0.00000001	4.60511E-06	124081215.3	0.046051117	12408.12153	460.5111674
	sum	sum	sum	sum	sum
	6.000599	1404042048	86.9445084	34181742.63	4.605E+03

avg(w_i^t)
0.0021715

Coefficient of Determination

$W_i*[(y_i-f(x_i))^2]$	$Y_i = y_i*W_i$	$W_i*[(y_i-avg(Y_i))^2]$
3.016E+09	20734285.06	5.41402E+12
21724502354	8123435.413	1.52359E+13
14437504371	2877812.572	2.74383E+13
1260991758	1324435.828	2.95747E+13
4039521133	638942.2749	3.12268E+13
119633877.3	252971.3802	3.30331E+13
3.543E+10	129949.2991	3.57867E+13
1.082E+08	62640.60787	3.36556E+13
1.963E+09	24862.08061	3.33866E+13
2.623E+09	12408.12153	3.3348E+13
sum	sum	sum
84726841984	34181742.63	2.781E+14
	avg(Y_i)	
	3418174.263	

AECOM Calculated	Lab reported
Coefficient of Determination R^2	Coefficient of Determination R^2
0.9997	1.000

CCV 580-384575/25		
Compound	**C10-C24**	
Instrument Response	134581710	
AECOM calculated conc. (ng/ul)	488.94	%D=
Lab reported conc. (ng/ul)	489	-0.012642253
Concentration of CCV (ng/ul)	500.000	
AECOM calculated %D	-2.2	%D=
Lab reported %D	-2.2	0.562005606

LCS ID	**580-384051/2-A**	
Compound	**C10-C24**	
Instrument Response	135860254	
AECOM calculated Concentration	493.6	%D=
Lab reported conc. (ng/ul= ug/ml)	494.0	-0.071919403
Sample weight (g)	10.00	
Final extract volume (ml)	10.00	
AECOM calculated conc. (mg/kg)	494	%D=
Lab reported conc. (mg/kg)	494	-0.071919403
LCS spike conc. (mg/kg)	500.00	
AECOM calculated % Recovery	99	%D=
Lab reported % Recovery	99	-0.273794313
LCSD %R	99	
AECOM calculated RPD	0	%D=
Lab reported RPD	0	#DIV/0!

MS Sample		
Compound	C10-C24	None in this SDG
Instrument Response		
AECOM calculated Concentration	-6.48	%D=
Lab reported conc. (ng/ul= ug/ml)		#DIV/0!
Sample weight (g)		
Final extract volume (ml)		
% solids		
Dilution		
AECOM calculated conc. (mg/kg)	#DIV/0!	%D=
Lab reported conc. (mg/kg)		#DIV/0!
MS spike conc. (mg/kg)		
Parent sample conc. (mg/kg)		
AECOM calculated % Recovery	#DIV/0!	%D=
Lab reported % Recovery		#DIV/0!
MSD %R		
AECOM calculated RPD	#DIV/0!	%D=
Lab reported RPD		#DIV/0!

LOQ		
Sample ID	A3325-SON01-002.0	
Compound	C10-C24	
Low standard concentration	50	
Sample weight (g)	10.53	
Final extract volume (ml)	10.0	
% solids	0.686	
Dilution	1.00	
AECOM calculated LOQ	69.19	%D=
Lab reported LOQ	69	0.277496713

The LOQ is based on the 50 standard rather than the lowest calibration sta

Sample ID	A3325-SON01-002.0	
Compound	C10-C24	
Instrument Response	5299779.00	
AECOM calculated Concentration	13.03	%D=
Lab reported conc. (ng/ul= ug/ml)	13.00	0.22551957
Sample weight (g)	10.53	
Final extract volume (ml)	10.00	
% solids	0.69	
Dilution	1.00	
AECOM calculated conc. (mg/kg)	18	%D=
Lab reported conc. (mg/kg)	18	0.168629953

Surrogate

Sample ID	**A3325-SON01-002.0**
Surrogate compound	o-Terphenyl

Surrogate Compound (ug) = Ac*DF/RRFical

Ac=	2205800
CFical	256674.437
Dilution factor	1.00
AECOM calculated result (ug) =	8.5938
Lab reported result (ug) =	8.59

%Recovery of surrogate

%R = [surrogate result (ug) /surrogate spike concentration(ug)*100

Surrogate Spike Concentration (ug)	10.2	
AECOM calculated recovery (%)	84.3	
Lab reported recovery (%)	85	slight difference due to rounding

key:

A=area
CFical=ical average calibration factor
c=compound
DF = dilution factor
%R = percent recovery

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-111395-1
Analyses/Method:	Select Semivolatile Organic Compounds by SW-846 Method 8270E-SIM (Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene)
Validation Level:	Stage 4
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) /AECOM — Completed on: 08/6/2022
Reviewed by:	[redacted] (b) (6) /AECOM — File Name:580-111395-1_Stage 4_SVOC SIM_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 11, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3215-SON01-002.0	580-111395-1	Soil
A3325-SON01-002.0	580-111395-2	Soil
A3-150-SON01-002.0	580-111395-3	Soil
A3000-SON01-002.0	580-111395-4	Soil
A3325-WGN01-002.0	580-111395-5	Groundwater
A3215-WGN01-002.0	580-111395-6	Groundwater

Data validation activities were conducted with reference to:

- *SW-846 Method 8270E: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✓	Holding times and sample preservation
✓	Instrument tuning
✓	Initial calibration/initial and continuing calibration verification
✓	Laboratory blanks/equipment blanks
✓	Surrogate spike recoveries
✓	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
NA	Field duplicate results
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as reported and may be used for decision making purposes. There were no data points qualified as a result of this data review.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

The case narrative noted that sample IDs were not noted on any sample containers. The sample ID was determined by comparing the collection date and time from the sample container to the collection date and time on the COC.

Holding Times and Sample Preservation

Sample preservation and analytical holding times were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met.

Instrument Tuning

Instrument tuning results were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met.

Initial Calibration/Initial and Continuing Calibration Verification

Calibration data were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met. Select results were recalculated as part of the Stage 4 validation.

Laboratory Blanks/Equipment Blanks

Laboratory blanks and equipment blanks are evaluated as to whether there are contaminants detected above the method detection limit (MDL).

Target compounds were not detected in the laboratory blanks associated with the samples in this data set. An equipment blank was not submitted with this data set.

Surrogate Spike Recoveries

The surrogate percent recoveries (%Rs) were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met. Select surrogate recovery results were recalculated as part of the Stage 4 validation.

MS/MSD Results

The MS/MSD %Rs and relative percent differences (RPDs) were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met. Select spike recovery and relative percent difference results were recalculated as part of the Stage 4 validation.

LCS/LCSD Results

The LCS %Rs and RPDs were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met. Select spike recovery results were recalculated as part of the Stage 4 validation.

Field Duplicate Results

Field duplicate samples were not submitted with this data set. No data validation actions were taken on this basis.

Internal Standard Results

Internal standard results were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met.

Sample Results/Reporting Issues

When applicable, compounds detected at concentrations less than the reporting limit (RL) but greater than the method detection limit (MDL) are qualified by the laboratory as estimated (J). This "J" qualifier is retained during data validation.

For the samples undergoing Stage 4 validation, detected sample results were reviewed to ensure that all identification criteria are met. Additionally, the chromatograms for samples where all results are nondetect were reviewed to ensure against laboratory reporting of false negative results.

The detected sample results or the limit of detection (LOD) for each target compound met the project screening criteria tabulated below with the following exceptions.

Sample ID	Compound	Concentration (mg/kg)
A3000-SON01-002.0	1-Methylnaphthalene	8.6
	2-Methylnapthalene	11
	Naphthalene	4.8

Compound	Screening Criteria (soils)	Units	Screening Criteria (groundwaters)	Units
1-Methylnaphthalene	4.2	mg/kg	21/17	µg/L
2-Methylnapthalene	4.1	mg/kg	10/27	µg/L
Naphthalene	4.4	mg/kg	10/24	µg/L

Verification of calculations was performed on a subset of the sample results using the provided data. No significant discrepancies were noted.

QUALIFICATION ACTIONS

There were no sample results qualified as a result of this data review.

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	**580-111395-1**	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 4	**Date**: 7/19/2022	
	(using Level IV data package)	**Validator**: [redacted] (b) (6)	
Number of Samples/Matrix:	4 soils, 2 GWs	**Reviewer and Date:** [redacted] (b) (6)	08172022
Analysis (Include Method #):	SVOCs, SW846 8270E-SIM (Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene)		

DoD QSM 5.4, DoD Module 1

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	Yes	No	The case narrative noted that sample IDs were not noted on any sample containers. The sample ID was determined by comparing the collection date and time from the COC.
Sample Preservation	Yes	No	Case narrative indicates all samples rec'd properly preserved. Cooler: 0.6C
Holding Time	Yes	No	
Quantitation Limits	see comments		All PALs met with the following exceptions: A3000-SON01-002.0: 1-methylnaphthalene (8.6 mg/kg), 2-methylnaphthalene (11 mg/kg) and napthalene (4.8 mg/kg).
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	All MBs: ND for all targets
Other Laboratory Blanks[1,2]	NA	NA	Not applicable to these analyses.
Equipment Blanks	NA	NA	None submitted
Initial Calibration	Yes	No	
Initial Calibration Verification	Yes	No	
Continuing Calibration Verification	Yes	No	
DDT degradation	Yes	No	
Matrix Spike	Yes	No	Performed on A3325-SON01-002.0
Matrix Spike Duplicate RPD[2]	Yes	No	
Laboratory Duplicate[2]	NA	NA	Not applicable to these analyses.
Surrogate Standards[2]	Yes	No	
Laboratory Control Standards	Yes	No	LCS and LCS/LCSD
Internal Standards[2,3]	Yes	No	
Field Duplicate	NA	NA	None in this SDG
GC/MS Tunes[2]	Yes	No	
Compound Identification	see comments		No discrepancies noted
Calculation Spot Checks[3]	see comments		No significant discrepancies were noted.

[1]May include reagent blanks, calibration blanks, etc.

[2]May not be applicable to all analyses.

[3]Level IV validation only. See full NFG worksheets for details.

DFTPP Tuning Relative abundance

Date of tune	1/14/2022	
File ID	SIM011322b012.D	

% relative abundance = area of ion/area of M/z 95 (or m/z 174 or M/z 176)*100

m/z	51	
Area of ion	424768	
Area of m/z 198 (or 442 or 69, as appropriate)	2490368	
AECOM calculated reltive abundance =	17.056	%D=
Lab reported relative abundance =	17.1	-0.25477

DDT Breakdown

Date of DFTPP for Breakdown evaluation	1/14/2022 (ICAL)	

% DDT breakdown= (DDD area + DDE area)/(DDT area + DDE area + DDD area)*100

DDD area	85436	
DDE area	2920	
DDT area	5483688	
DDD area + DDE area	88356	
DDD area + DDE area + DDT area	5572044	
AECOM calculated breakdown=	1.59	%D=
Lab reported breakdown =	1.59	-0.27033

Initial Calibration

Relative Response Factor

Date of ICAL	1/14/2022
Standard ID	LVL 2
Compound	Naphthalene

RRF = Ac * Ci/Ai * Cc

Ac=	13345
Ai=	170304
Cc	1
Ci	5
AECOM calculated RRF=	0.7835987
Lab reported RRF =	1.1832

Average RRF and %RSD

Date of ICAL	1/14/2022		
Compound	Naphthalene		
LVL 2 RRF	1.1832		
LVL 3 RRF	1.1041		
LVL 4 RRF	1.0790		
LVL 5 RRF	1.0850		
LVL 6 RRF	1.0572		
LVL 7 RRF	1.0588		
LVL 8 RRF	1.0251		
LVL 9 RRF	1.0709		
LVL 10 RRF	1.0433		
LVL 11 RRF	0.9985		
LVL 12 RRF	1.0347		
LVL 13 RRF	0.9521		
AECOM calculated average RRF =	1.0576583		
AECOM calculated SD =	0.056995206		
AECOM calculated %RSD	5.388810798		
Lab reported average RRF	1.0577	%D=	-0.003939365
Lab reported %RSD	5.4	%D=	-0.207207448

key:

A=area
C=concentration
is=internal standard
SD=standard deviation
c=compound
i=internal standard

Relative Response Factor of CCAL

Date of CCAL	3/21/2022	
Standard ID	CCVIS 580-384521/3	
Compound	Naphthalene	

RRF = Ac * Cis/Ais * Cc

Ac=	92956	
Ais=	19142	
Cis	100	
Cc	500	

AECOM calculated RRF=	0.9712256	%D=
Lab reported RRF =	0.9712	0.002634

%D=RRFccal - RRFical/RRFical*100

Lab reported average RRF in ICAL=	1.058	
AECOM calculated % D=	-8.201741279	%D=
LAB reported %D=	-8.2	0.021235

key:

A=area
C=concentration
c=compound
is=internal standard
%D=percent difference

Labeled Compound Percent Recovery

Surrogate

Sample ID	A3215-SON01-002.0	
Surrogate compound	2-methylnaphthalene-d10	

Surrogate Compound (ug) = Ac* Cis*DF/Ais* RRFical

Ac=	81802	
Ais=	16209	
Cis	100	
RRFical	0.592	
Dilution factor	1.00	
AECOM calculated result (ug) =	853.0599	%D=
Lab reported result (ug) =	853.1	-0.004698902

%Recovery of surrogate

%R = [surrogate result (ug) /surrogate spike concentration(ug)*100

Surrogate Spike Concentration (ug)	1000	
AECOM calculated recovery (%)	85.3	%D=
Lab reported recovery (%)	85	0.359989843

key:

A=area
C=concentration
RRFical=ical average response factor
is=internal standard
c=compound
DF = dilution factor
%R = percent recovery

OPR Percent Recovery and RPD

Concentration of LCS Compound		
LCS ID	LCS 580-384185/2-A	
Labeled Compound	Naphthalene	
Compound (ug/Kg) = (Ac*Cis*Vex)/(Ais * RRFical*WS)		
Ac=	160745	
Ais=	14271	
Cis (ng/ml)	100	
RRFical	1.0577	
Vex= (ml)	10	
Weight of solid (g)	10.00	
AECOM calculated result (ug/Kg)	1064.929	
AECOM calculated result (mg/Kg)	1.065	%D=
Lab reported result (mg/Kg) =	1.06	0.464979
%Recovery of LCS Compound		
%R = (LCS reported result/LCS spike concentration)*100		
LCS spike concentration (mg/kg)	1.00	
AECOM calculated recovery (%)	106.5	%D=
Lab reported recovery (%)	106	0.464979
RPD of LCS/LCS duplicate compound		
RPD = (LCS conc. -LCS duplicate conc.)/((LCS conc. + LCS duplicate conc.)/2)*100		
Lab reported LCS duplicate spike conc.=	0.978	
AECOM calculated LCS/LCS duplicate RPD	8.5	%D=
Lab reported LCS/LCS duplicate RPD	9	-5.4421

key:

A=area
C=concentration
RRFical=ical average response factor
is=internal standard
c=compound
Vex= Final extract volume
%R = percent recovery
RPD = relative percent difference

MS/MSD

Sample ID	A3325-SON01-002.0	
Labeled Compound	Naphthalene	

Compound (ug/Kg) = (Ac* Cis*Vex*DF)/(Ais* RRFical*WS*%solids)

As=	167006	
Ais=	16419	
Cis (ng/mL)	100	
RRFical	1.0577	
Vex (ml)	10.000	
Weight of solid	12.45	
%Solids	0.69	
Dilution Factor	1.0	
AECOM calculated result (ug/Kg) =	1125.977	
AECOM calculated result (mg/Kg) =	1.126	%D=
Lab reported result (mg/Kg) =	1.13	-0.35605

%Recovery of MS or MSD Compound

%R = (MS calculated result - concentration native to sample/MS spike added)*100

Spike added	1.17	
Concentration native to sample	0.03	
AECOM calculated recovery (%)	93.67	%D=
Lab reported recovery (%)	94	-0.34764

RPD of MS/MSD compound

RPD = [MS conc. -MSD conc.]/[MS conc. + MSD conc./2]*100

Lab reported MSD concentration =	1.22	
AECOM calculated MS/MSD duplicate RPD	8.0	%D=
Lab reported MS/MSD duplicate RPD	8	0.19634

key:

A=area
C=concentration
RRFical=ical average response factor
is=internal standard
c=compoiund
Ws = weight of solid
%R = percent recovery
RPD = relative percent difference
Vex=final extract volume

Sample Calculation

Compound Quantitation		
Sample ID	A3000-SON01-002.0	
Labeled Compound	Naphthalene	

Compound (ug/Kg) = (Ac* Cis*Vex*DF)/(Ais* RRFical*WS*%solids)

As=	1180903	
Ais=	38252	
Cis (ng/mL)	100	
RRFical	1.0577	
Vex (ml)	10.000	
Weight of solid	11.01	
%Solids	0.56	
Dilution Factor	1.0	
AECOM calculated result (ug/Kg) =	4767.991	
AECOM calculated result (mg/Kg) =	4.7680	%D=
Lab reported result (mg/Kg) =	4.8	-0.666845721

LOQ		
Low standard concentration	5.00	LOQ is based on the 5.0 standard rather than the lowest standard of the curve which is 2.0
AECOM calculated LOQ (ug/Kg)	8.168	
AECOM calculated LOQ (mg/Kg)	0.00817	%D=
Lab reported result (mg/Kg) =	0.0082	-0.392040989

key:

A=area
C=concentration
RRFical=ical average response factor
DF=dilution factor
Vex=final extract volume
WS = weight of solid

Facility:	RHBFS Site Characterization
Event:	Site Characterization Tunnel Cutouts
SDG:	5801113951
Guidance Document:	Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP
Prime Contractor:	AECOM, Honolulu, HI
Project Manager:	
Contract Laboratory(ies):	Eurofins Environment Testing TestAmerica, Tacoma, WA
Data Review Contractor:	
Data Review Level:	
Primary Data Reviewer:	,
Date Submitted:	

Field Sample ID	Lab Sample ID	Matrix	Type/Type Code	BNASIM	SW8015D
A3000-SON01-002.0	580-111395-4	Solid	Field Sample/N	X	X
A3-150-SON01-002.0	580-111395-3	Solid	Field Sample/N	X	X
A3215-SON01-002.0	580-111395-1	Solid	Field Sample/N	X	X
A3325-SON01-002.0	580-111395-2	Solid	Field Sample/N	X	X
A3215-WGN01-002.0	580-111395-6	Water	Field Sample/N	X	X
A3325-WGN01-002.0	580-111395-5	Water	Field Sample/N	X	X

This report assesses the analytical data quality associated with the analyses listed on the preceding cover page at data validation level. This assessment has been made through a combination of automated data review (ADR) and supplemental manual review, the details of which are described below. The approach taken in the review of this data set is consistent with the requirements contained in the Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP and the additional guidance documents incorporated by reference to the extent possible. Where definitive guidance is not provided, results have been evaluated in a conservative manner using professional judgment.

Sample collection was managed and directed by AECOM, Honolulu, HI; analyses were performed by Eurofins Environment Testing TestAmerica, Tacoma, WA and were reported under sample delivery group (SDG) 5801113951. Data have been evaluated electronically based on electronic data deliverables (EDDs) provided by the laboratory, and hard copy data summary forms have also been reviewed during this effort and compared to the automated review output by the reviewers whose signatures appear on the following page. Findings based on the automated data submission and manual data verification processes are detailed in the ADR narrative and throughout this report.

All quality control (QC) elements associated with this SDG have been reviewed by a project chemist in accordance with the requirements defined for the project. This review is documented in the attached Data Review Checklists. The QC elements listed below were supported by the electronic deliverable and were evaluated using ADR processes.

Continuing Calibration Verification

Lab Blank

LCS Recovery

LCS RPD

MS Recovery

MS RPD

Prep Hold Time

Surrogate

Test Hold Time

Results of the ADR process were subsequently reviewed and updated as applicable by the data review chemists identified on the signature page. Quality control elements that were not included in the electronic deliverable were reviewed manually and findings are documented within this report. Summaries of findings and associated qualified results are documented throughout this report.

A total of 1 results (3.33%) out of the 30 results (sample and field QC samples) reported are qualified based on review and 0 results (0.00%) have been rejected or deemed a serious deficiency (X qualifier). Trace values, defined as results that are qualified as estimated because they fall between the detection limit and the reporting limit/limit of quantitation, are not counted as qualified results in the above count. The qualified results are detailed throughout this report and discussed in the narrative below, where appropriate.

Narrative Comments

Analytical Method	Data Reviewer Comment

Reviewed by , ,

As the First Reviewer, I certify that I have performed a data review process in accordance with the requirements of the project guidance document, and have compared the electronic data to the laboratory's hard copy report and have verified the consistency of the reported sample results and method quality control data between the two deliverables.

(b) (6) [redacted]

September 15, 2022

As the Second Reviewer, I certify that I have performed a quality assurance review of the report generated by the First Reviewer.

Quality Control Outliers for test method SW8015D, Lab Blank

The purpose of laboratory blanks is to determine the existence and magnitude of cross-contamination problems resulting from laboratory activities. Reported results were evaluated to determine compliance with the required acceptance criteria. Summary forms were evaluated and compared to electronic data deliverables. Findings of this review, and contaminants found in laboratory blanks are listed below along with any associated qualified results.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
MB5803843191A (LB)	C10-C24 Petroleum Hydrocarbons	73.70	< 65	< 110	ug/l	U/None*	L	

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

*Blank flags displayed in the above table identify qualification of the sample result when it is less than or equal to the LOQ/RL. Sample results above the LOQ will be qualified based on the validation type such as J+ at the sample result.

Qualified Results associated with the Lab Blank for SW8015D

FieldSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3215-WGN01-002.0 580-111395-6	N	C10-C24 Petroleum Hydrocarbons	120	230 B	230 J	+	ug/l	L

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.

Table of All Qualified Results

Test Method: SW8015D		**Extraction Method: SW3510**						
FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3215-WGN01-002.0 580-111395-6	N	C10-C24 Petroleum Hydrocarbons	120	230 B	230 J	+	ug/l	L

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Data Validation Report for 5801113951

Table of Results with Modified Qualifiers

Modified Qualifiers for test method SW8015D

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3215-WGN01-002.0 580-111395-6	N	C10-C24 Petroleum Hydrocarbons	120	230 B	230	230 J	L

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Reason Code Definitions

Code	Definition
L	Lab Blank
TR	Trace Level Detect

Flag Code and Definitions

Flag	Definition
J	Estimated Value
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a tentative identification.
NJ	The analyte has been tentatively identified or presumptively as present and the associated numerical value was the estimated concentration in the sample.
R	The data are rejected due to deficiencies in meeting QC criteria and may not be used for decision making.
U	Undetected: The analyte was analyzed for, but not detected.
UJ	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
X	Result may require rejection; PDT attention required

Bias

-	The result may be biased low
+	The result may be biased high

Note - The bias field is a separate field; however, it is an integral part of the final flag (qualifier) on the sample result

Review Questions

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978 905 2101 fax

Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-112035-1
Analyses/Method:	Volatile Organic Compounds (BTEX) by EPA Method 8260D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM — Completed on: 06/03/2022
Reviewed by:	[redacted] (b) (6) / AECOM — File Name: 580-112035-1_BTEX_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 29, 2022 and March 30, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3000MISH-SOFT01-000.0	580-112035-1	Soil
A3000MISH-SOFT02-000.0	580-112035-2	Soil
A3000MISH-SOFT03-000.0	580-112035-3	Soil
A3-010-SON01-002.0	580-112035-4	Soil
A3325H-SON01-001.0	580-112035-5	Soil
Trip Blank	580-112035-6	Trip Blank

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✗	Holding times and sample preservation
✓	Instrument tuning
✓	Initial calibration/initial and continuing calibration verification
✗	Laboratory blanks/field blanks/equipment blanks
✓	Surrogate spike recoveries
✗	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
NA	Field duplicate results
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Select data points were estimated due to nonconformances of certain QC criteria (see discussion below).

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation.

Several samples were received with significantly lower sample weights than required by the method (10g). The laboratory limit of detection (LOD) met the screening criteria for all nondetect results.

Holding Times

Sample A3325H-SON01-001.0 and the trip blank were reanalyzed outside of holding time. VOC results for these samples were qualified as estimated “J/UJ” as shown in Table 1, below.

MS and MSD Results

The following matrix spike percent recoveries were outside the control limits:

Sample	Compound	%MS/MSD Recovery	%Recovery Limits	RPD	RPD Limits
A3-010-SON01-002.0	Benzene	19/26	77-121	30	20
A3-010-SON01-002.0	Toluene	16/24	77-121	34	20
A3-010-SON01-002.0	Ethylbenzene	9/19	76-122	27	20
A3-010-SON01-002.0	m/p-xylene	-4/11	77-124	25	20
A3-010-SON01-002.0	o-xylene	-4/9	77-123	22	20
A3-010-SON01-002.0	Total Xylenes	-4/10	78-124	23	20

Results qualified due to low MS/MSD recovery are shown below in Table 1.

Blank Results

Ethylbenzene was detected in the trip blank, and xylenes were detected in method blanks. The detected results for the samples were qualified as estimated "J+", or nondetect “U”, as shown in Table 1, below. Blank concentration insignificant in comparison to the concentration of the samples did not require qualification.

The following analytes exceeded the project screening criteria:

Sample Name	Analyte	Result	LOD	Screening Criteria	Units
A3000MISH-SOFT01-000.0	Total Xylenes	15	23	2.1	mg/kg
A3-010-SON01-002.0	Total Xylenes	9600	310	2.1	mg/kg
A3325H-SON01-001.0	Total Xylenes	65	23	2.1	mg/kg

QUALIFICATION ACTIONS

Qualification of data is shown in Table 1, below.

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Memorandum

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-112035-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-112035-1	A3000MISH-SOFT01-000.0	580-112035-1	8260D	m,p-xylene	0.015 J	mg/kg	0.015 J	D4
580-112035-1	A3000MISH-SOFT02-000.0	580-112035-2	8260D	m,p-xylene	0.012 U	mg/kg	0.012 UJ	D4
580-112035-1	A3000MISH-SOFT03-000.0	580-112035-3	8260D	m,p-xylene	0.011 U	mg/kg	0.011 UJ	D4
580-112035-1	A3000MISH-SOFT01-000.0	580-112035-1	8260D	Total xylenes	0.015 J	mg/kg	0.015 J	D4
580-112035-1	A3000MISH-SOFT02-000.0	580-112035-2	8260D	Total xylenes	0.012 U	mg/kg	0.012 UJ	D4
580-112035-1	A3000MISH-SOFT03-000.0	580-112035-3	8260D	Total xylenes	0.011 U	mg/kg	0.011 UJ	D4
580-112035-1	Trip Blank	580-112035-6	8260D	Benzene	0.015 U	mg/kg	0.015 UJ	H1
580-112035-1	Trip Blank	580-112035-6	8260D	Ethylbenzene	0.012	mg/kg	J	H1
580-112035-1	Trip Blank	580-112035-6	8260D	Toluene	0.030 U	mg/kg	0.030 UJ	H1
580-112035-1	Trip Blank	580-112035-6	8260D	m-Xylene & p-Xylene	0.014	mg/kg	0.015 UJ	L/H1
580-112035-1	Trip Blank	580-112035-6	8260D	o-Xylene	0.0068	mg/kg	0.015 UJ	L/H1
580-112035-1	Trip Blank	580-112035-6	8260D	Xylenes, Total	21	ug/kg	15 UJ	H1
580-112035-1	A3325H-SON01-001.0	580-112035-5	8260D	Benzene	0.023 U	mg/kg	0.023 UJ	H1
580-112035-1	A3325H-SON01-001.0	580-112035-5	8260D	Ethylbenzene	0.014	mg/kg	0.045 UJ	T/H1
580-112035-1	A3325H-SON01-001.0	580-112035-5	8260D	Toluene	0.045 U	mg/kg	0.045 UJ	H1
580-112035-1	A3325H-SON01-001.0	580-112035-5	8260D	m-Xylene & p-Xylene	0.035	mg/kg	0.035 J+	L/H1
580-112035-1	A3325H-SON01-001.0	580-112035-5	8260D	o-Xylene	0.030	mg/kg	0.030 J+	L/H1
580-112035-1	A3325H-SON01-001.0	580-112035-5	8260D	Xylenes, Total	65	ug/kg	65 J+	L/H1
580-112035-1	A3-010-SON01-002.0	580-122035-4	8260D	Benzene	0.31 U	mg/kg	0.31 UJ	M
580-112035-1	A3-010-SON01-002.0	580-122035-4	8260D	Ethylbenzene	1.7	mg/kg	1.7 J	M/T
580-112035-1	A3-010-SON01-002.0	580-122035-4	8260D	m-Xylene & p-Xylene	4.7	mg/kg	4.7 J-	M
580-112035-1	A3-010-SON01-002.0	580-122035-4	8260D	o-Xylene	4.9	mg/kg	4.9 J-	M
580-112035-1	A3-010-SON01-002.0	580-122035-4	8260D	Toluene	0.31	mg/kg	0.31 J-	M
580-112035-1	A3-010-SON01-002.0	580-122035-4	8260D	Xylenes, Total	9600	ug/kg	9600 J-	M

Laboratory: Eurofins Seattle
Laboratory SDG/Job No: 580-112035-1
Validation Level: Stage 2B
(using Level IV data package)
Number of Samples/Matrix: 5 soils, 1 TB
Analysis (Include Method #): BTEX SW846 8260D

QAPP (QSM 5.4), DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)
Chain of Custody	No	No
Sample Preservation	Yes	No
Holding Time	No	Yes
Quantitation Limits	Yes	No
Percent Solids (>30%)	Yes	No
Method Blanks	No	No
Other Laboratory Blanks[1,2]	NA	NA
Trip/Equipment Blanks	No	Yes
Initial Calibration	Yes	No
Initial Calibration Verification	Yes	No
Continuing Calibration Verification	Yes	No
Matrix Spike	No	Yes
Matrix Spike Duplicate RPD[2]	No	Yes
Laboratory Duplicate[2]	Yes	No
Surrogate Standards[2]	Yes	No
Laboratory Control Standards	Yes	No
Internal Standards[2,3]	Yes	No
ISM Relative Standard Deviation	No	Yes
Field Duplicate	NA	NA
GC/MS Tunes[2]	Yes	No
Calculation Spot Checks[3]	NA	NA

[1]May include reagent blanks, calibration blanks, etc.

[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Samples	Lab ID
A3000MISH-SOFT01-000.0	580-112035-1
A3000MISH-SOFT02-000.0	580-112035-2
A3000MISH-SOFT03-000.0	580-112035-3
A3-010-SON01-002.0	580-112035-4
A3325H-SON01-001.0	580-112035-5
Trip Blank	580-112035-6

Client/Site Name: Red Hill Site Characterization
Project Number: 60674414.00.50.01
Date: 06/03/22
Validator: [redacted]
Reviewer and Date: [redacted] **7/27/22**

Comments
Trip Blank not listed on COC.
1.5°C
Collected 3/29/22 and 3/30/22, analyzed within HT except for the trip blank and sample A3325H-SON01-001.0. Associated results were qualifed as estimated "J/UJ".
No dilutions. Several samples were received with significantly lower sample weights than required by method (10g). ND results at LOD meet action limits.
MB 580-386132/1-A, MB 580-388281/1-A, MB 388466/1-A. m,p-xylenes, o-xylene, and total xylenes were detected in 580-388281/1-A and 580-388466/1-A. Associated detections below the LOD were qualified as nondetect "U". Associated detections above the LOD and below 5x the blank concentation were qualified as estimated "J+". Nondetect results did not require qualification.
Ethylbenzene and xylenes were detected in the trip blank. Xylenes were previously qualified as nondetect in the trip blank due to method blank contamination and since total xylenes is determined by summing the individual xylene results, those are ND where applicable. Nondetect results or those above 5x the blank concentration did not require qualification. Results below the LOD were qualified as nondetect and those above the LOD but below 5x the blank concentration were qualified as estimated "J".
02/09/22 Inst SEA046, 04/07/22 Inst SEA046, criteria met
ICV 580-380580/12, ICV 580-386730/12, within %D ≤20%
CCVIS 580-386136/2, CCVC 580-386136/13, CCVIS 580-388335/2, CCVC 580-388355/51, CCVIS 580-388538/2, CCVC 580-388538/31 within criteria.
Sample A3-010-SON01-002.0 was spiked. All results recovered below criteria in the MS and MSD and RPDs were above criteria. Associated results were qualified as estimated "J/UJ".
Duplicate/Triplicate for A3000MISH-SOFT01-000.0
Surrogate %Rs within QSM limits
LCS 580-386132/2-A, LCSD 580-386132/3-A, LCS 580-388281/2-A, LCSD 580-388281/3-A, LCS 580-388466/2-A, and LCSD 580-388466/3-A, RPDs within lab limits.
RSD for total and m,p-xylenes exceeded criteria for the triplicate pair: A3000MISH-SOFT01-000.0/A3000MISH-SOFT02-000.0/A3000MISH-SOFT03-000.0. Associated results were qualified as estimated "J/UJ".
Not a required validation element for this project.

Note: it may not be appropriate to make a direct quantitative comparison for aqueous field blanks (such as equipment blanks reported as µg/mL) to a solid parent sample (such as a soil sample reported as mg/kg). At best, only a qualitative comparison can be made.

5pt calibration, RSD ≤15% or r2 ≥ 0.99, min RF suggested per Method 8260D (see Cal Mod 1 tab)
ICV %D ≤20%

CCV %D ≤20%

see DoD QSM QC limits tab

see DoD QSM QC limits tab

see DoD QSM QC limits tab

see DoD QSM QC limits tab

Table B-3: Preparation and Analytical Requirements for Field and QC Samples

Matrix	Analytical Group	Preparation Reference/Method SOP Analytical Reference/Method SOP	Containers	Sample Volume	Preser Requir
Unconsolidated Material	TPH-g, VOCs	Preparation Method: EPA 5035C Preparation SOP: ANA8260 Analysis Method: EPA 8260C Analysis SOP: ANA8260	2 × 10mL water-preserved; 1 × 5mL methanol-preserved; Teflon-lined septum caps	40 mL	Cool t
	TPH-d, TPH-o	Preparation Method: EPA 3550C Preparation SOP: SON004 Analysis Method: EPA 8015C Analysis SOP: ANA8015	1 × 8-oz glass jar, Teflon-lined lid	30 g	Cool t
	TPH-d, TPH-o with Silica Gel Cleanup	Preparation Method: EPA 3550C/EPA 3630 Preparation SOP: SON004/CLN004 Analysis Method: EPA 8015C Analysis SOP: ANA8015		30 g	Cool t
	PAHs	Preparation Method: EPA 3550C Preparation SOP: SON009 Analysis Method: EPA 8270D SIM Analysis SOP: ANA8270SIM		30 g	Cool t

Notes:

g	gram
H_2SO_4	sulfuric acid
HCl	hydrogen chloride
L	liter
mL	milliliter
$NaHSO_4$	sodium bisulfate
oz	ounce

vation rement	Maximum Holding Time (preparation/analysis)
o ≤6°C	7 days (water-preserved); 14 days (methanol-preserved)
o ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
o ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
o ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.

Data validation activities were conducted with reference to:

SW-846 Method 8260D Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/M

Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Departme

General Data Validation Guidelines, Department of Defense, Revision 1 (November 2019)

USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data

DoD Module 1

Note DoD Module 1 criteria (below) are based on Method 8260B; lab analyzed samples using 8260D. QSM 5.4 Table B-4 criteria of RSD ≤15% or r2 ≥ 0.99 was used to evaluate the ICAL data. Per Method 8260D, minimum RFs on Table 4 are used as guidance.

SPCCs and CCCs should have been included in the calibration standards and reported, even if individual SPCCs and CCCs are not project target analytes.

Table VIII lists those VOCs that have poor sensitivity and are considered "poor performers". The minimum average RF for the "poor performers" is 0.01. The minimum average RF for all other volatile target analytes should be ≥ 0.05.

An additional criterion is that all volatile target analytes should have a percent Relative Standard Deviation (%RSD) of ≤ 15%.

Table VI: SPCCs average RFs should meet the following criteria (Method 8260B):

Analyte	Minimum Average RF (method uses the term "mean")
Chloromethane	0.1
1,1-Dichloroethane	0.1
Bromoform	0.1
Chlorobenzene	0.3
1,1,2,2-Tetrachloroethane	0.3

Table

Analy
1,1-D
Chlor
1,2-D

Table

Analy
Aceto
2-But
Carbo
Chlor
Cyclo
1,2-D
Dichl
1,2-D
cis-1,
1,4-D
1,2-D

VII: CCCs (Method 8260B)

yte	
ichloroethene	Toluene
oform	Ethylbenzene
ichloropropane	Vinyl Chloride

VIII: VOC Poor Performers (Method 8260B):

yte	
ne	1,2-Dibromo-3-chloropropane
anone	Isopropylbenzene
on disulfide	Methyl acetate
oethane	Methylene chloride
hexane	Methylcyclohexane
ibromoethane	Methyl-tert-butyl ether
orodifluoromethane	trans-1,2-Dichloroethene
ichloropropane	4-Methyl-2-pentanone
2-Dichloroethene	2-Hexanone
ioxane	Trichlorofluoroethane
ibromo-3-chloropropane	1,1,2-Trichloro-1,2,2-triflouroethane

Matrix Unconsolidated Material

Analyte	CAS Number	Screening Criterion [a] (mg/kg)	Project LOQ Goal (mg/kg)	Project LOD Goal (mg/kg)	Laboratory-Specific Limits (mg/kg)		
					LOQ	LOD	D
TPH							
TPH-g (C5–C11)	-3547	100	33	10	TBD	TBD	TE
TPH-d (C10–C24)	-3527	220	73	22	TBD	TBD	TE
VOCs							
Benzene	71-43-2	0.30	0.10	0.030	TBD	TBD	TE
Ethylbenzene	100-41-4	3.7	1.2	0.37	TBD	TBD	TE
Toluene	108-88-3	3.2	1.1	0.32	TBD	TBD	TE
Total Xylenes	1330-20-7	2.1	0.70	0.21	TBD	TBD	TE
PAHs							
1-Methylnaphthalene	90-12-0	4.2	1.4	0.42	TBD	TBD	TE
2-Methylnaphthalene	91-57-6	4.1	1.4	0.41	TBD	TBD	TE
Naphthalene	91-20-3	4.4	1.5	0.44	TBD	TBD	TE

Notes:

mg/kg milligrams per kilogram

[a] DOH Tier 1 EALs (Summer 2016, updated January 2017),

)L

BD
BD

BD
BD
BD
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BD
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BD

DoD QSM Criteria Table C-23 Method 8260 Solid Matrix

Table C-23. Method 8260 Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
630-20-6	1,1,1,2-Tetrachloroethane	11115	101.1	7.8	78	125
71-55-6	1,1,1-Trichloroethane	12156	101.6	9.4	73	130
79-34-5	1,1,2,2-Tetrachloroethane	11670	97	8.9	70	124
79-00-5	1,1,2-Trichloroethane	11772	99.7	7.2	78	121
76-13-1	1,1,2-Trifluoro-1,2,2-trichloroethane [Freon-113]	9760	100.8	11.7	66	136
75-34-3	1,1-Dichloroethane	11856	100.4	8.1	76	125
75-35-4	1,1-Dichloroethene	12352	100.3	10.1	70	131
563-58-6	1,1-Dichloropropene	10793	100.5	8.3	76	125
87-61-6	1,2,3-Trichlorobenzene	10572	97.8	10.6	66	130
96-18-4	1,2,3-Trichloropropane	10925	99.1	8.8	73	125
526-73-8	1,2,3-Trimethylbenzene	1948	99.8	6	82	118
120-82-1	1,2,4-Trichlorobenzene	10980	98	10.4	67	129
95-63-6	1,2,4-Trimethylbenzene	11085	98.7	7.9	75	123
96-12-8	1,2-Dibromo-3-chloropropane	11380	96.6	11.7	61	132
106-93-4	1,2-Dibromoethane	11408	100.1	7.3	78	122
95-50-1	1,2-Dichlorobenzene	11785	99.1	7.2	78	121
107-06-2	1,2-Dichloroethane	12328	100.5	9.2	73	128
17060-07-0	1,2-Dichloroethane-d4	5951	103.1	10.8	71	136
540-59-0	1,2-Dichloroethene	7748	99.9	7.3	78	122
78-87-5	1,2-Dichloropropane	12145	99.5	7.8	76	123
354-23-4	1,2-Dichlorotrifluoroethane [Freon 123a]	1269	97.8	11.3	64	132
108-70-3	1,3,5-Trichlorobenzene	4723	99.4	9.6	71	128
108-67-8	1,3,5-Trimethylbenzene	11080	98.4	8.4	73	124
541-73-1	1,3-Dichlorobenzene	11619	98.9	7.4	77	121
142-28-9	1,3-Dichloropropane	10713	99.1	7.3	77	121
542-75-6	1,3-Dichloropropene	3714	101.6	8.1	77	126
106-46-7	1,4-Dichlorobenzene	11848	97.5	7.6	75	120
105-05-5	1,4-Diethylbenzene	1896	96.6	5.9	79	114
123-91-1	1,4-Dioxane	7698	96.4	13.7	55	138
544-10-5	1-Chlorohexane	2543	100.4	9.8	71	130
594-20-7	2,2-Dichloropropane	10703	99.7	11.1	67	133

Table C-23. Method 8260 Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
78-93-3	2-Butanone [MEK]	11514	99.6	16.3	51	148
126-99-8	2-Chloro-1,3-butadiene	6667	99	11.3	65	133
110-75-8	2-Chloroethyl vinyl ether	6957	96.1	17.6	43	149
95-49-8	2-Chlorotoluene	10838	98.5	7.9	75	122
591-78-6	2-Hexanone	11004	99.1	15.4	53	145
79-46-9	2-Nitropropane	4969	98.3	17.1	47	150
67-63-0	2-Propanol [Isopropyl alcohol]	1696	99.8	13.4	60	140
460-00-4	4-Bromofluorobenzene	6267	98.9	6.8	79	119
106-43-4	4-Chlorotoluene	10785	98.3	8.6	72	124
108-10-1	4-Methyl-2-pentanone [MIBK]	11364	99.6	11.6	65	135
67-64-1	Acetone	11089	99.6	21.4	36	164
75-05-8	Acetonitrile	5697	98.5	14.8	54	143

107-02-8	Acrolein [Propenal]	7528	101.1	18	47	155
107-13-1	Acrylonitrile	8293	99.7	11.4	65	134
107-05-1	Allyl chloride	6908	101.1	11.2	68	135
71-43-2	Benzene	12853	99.2	7.4	77	121
100-44-7	Benzyl chloride	2743	92.1	9.4	64	120
108-86-1	Bromobenzene	10974	99.3	7.3	78	121
74-97-5	Bromochloromethane	11023	101.4	7.8	78	125
75-27-4	Bromodichloromethane	11850	101	8.5	75	127
75-25-2	Bromoform	11890	99.1	10.8	67	132
74-83-9	Bromomethane	11416	98.3	15	53	143
75-15-0	Carbon disulfide	11132	97.9	11.5	63	132
56-23-5	Carbon tetrachloride	12090	102.3	10.7	70	135
108-90-7	Chlorobenzene	12382	99.7	6.9	79	120
124-48-1	Chlorodibromomethane	11852	100.2	8.7	74	126
75-00-3	Chloroethane	11444	98.8	13.3	59	139
67-66-3	Chloroform	12344	100.3	7.6	78	123
74-87-3	Chloromethane	11876	93.3	14.3	50	136
156-59-2	cis-1,2-Dichloroethene	11645	99.9	7.6	77	123
10061-01-5	cis-1,3-Dichloropropene	11805	99.8	8.7	74	126
1476-11-5	cis-1,4-Dichloro-2-butene	977	106	12.4	69	143

Table C-23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
110-82-7	Cyclohexane	8827	98.9	10.6	67	131
108-94-1	Cyclohexanone	3764	93.2	20.9	30	156
1868-53-7	Dibromofluoromethane	2142	98.1	6.8	78	119
74-95-3	Dibromomethane	10913	101.1	7.9	78	125
75-71-8	Dichlorodifluoromethane [Freon-12]	11467	88.9	20.1	29	149
75-43-4	Dichlorofluoromethane	717	100.8	18	47	155
60-29-7	Diethyl ether	6283	99.6	9.6	71	129
108-20-3	Diisopropyl ether	8542	98.3	9.7	69	127
64-17-5	Ethanol	3958	102.2	18.9	45	159
141-78-6	Ethyl acetate	4516	95.4	14.5	52	139
97-63-2	Ethyl methacrylate	7075	98.9	9.9	69	129
637-92-3	Ethyl tert-butyl ether	7514	98.9	9.1	72	126
100-41-4	Ethylbenzene	12427	99.1	7.7	76	122
462-06-6	Fluorobenzene	689	97.3	5.4	81	114
142-82-5	Heptane	5420	93.4	14.9	49	138
87-68-3	Hexachlorobutadiene	10264	98.1	12.4	61	135
67-72-1	Hexachloroethane	3265	102.5	10.1	72	133
110-54-3	Hexane	7116	93.6	16.1	45	142
74-88-4	Iodomethane	9457	100.9	10.1	71	131
78-83-1	Isobutyl alcohol	6162	97.5	12.6	60	135
108-21-4	Isopropyl acetate [Acetic acid]	2885	94.2	12.2	58	131
98-82-8	Isopropylbenzene	11596	100.8	11.1	68	134
179601-23-1	m/p-Xylene [3/4-Xylene]	10612	100.4	7.7	77	124
126-98-7	Methacrylonitrile	6736	99.2	11.1	66	132
79-20-9	Methyl acetate	8320	98.7	15.2	53	144
80-62-6	Methyl methacrylate	7050	98.4	11.9	63	134
1634-04-4	Methyl tert-butyl ether [MTBE]	11253	98.9	8.7	73	125
108-87-2	Methylcyclohexane	8565	99.4	11.2	66	133
75-09-2	Methylene chloride	12024	98.9	9.7	70	128
123-86-4	n-Butyl acetate	2981	95.1	11	62	128

71-36-3	n-Butyl alcohol	4800	92.9	12.6	55	131

Table C-23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
104-51-8	n-Butylbenzene	10921	98.7	9.7	70	128
103-65-1	n-Propylbenzene	10947	98.9	8.8	73	125
91-20-3	Naphthalene	10602	95.6	11.2	62	129
95-47-6	o-Xylene	11940	100	7.7	77	123
99-87-6	p-Isopropyltoluene [p-Cymene]	10953	100.3	9	73	127
76-01-7	Pentachloroethane	5957	102	11.1	69	135
107-12-0	Propionitrile [Ethyl cyanide]	6734	101	11.1	68	134
135-98-8	sec-Butylbenzene	10960	99	8.8	73	126
100-42-5	Styrene	11809	100.2	8	76	124
994-05-8	tert-Amyl methyl ether [TAME]	7153	99.8	8.9	73	126
75-65-0	tert-Butyl alcohol	7492	100.5	10.7	68	133
98-06-6	tert-Butylbenzene	10974	98.8	8.6	73	125
127-18-4	Tetrachloroethene	12091	100.5	9.2	73	128
109-99-9	Tetrahydrofuran	8039	98	12.4	61	135
108-88-3	Toluene	12499	99.3	7.3	77	121
2037-26-5	Toluene-d8	6232	100.7	5.2	85	116
156-60-5	trans-1,2-Dichloroethene	11849	99.2	8.6	74	125
10061-02-6	trans-1,3-Dichloropropene	11805	100.9	9.8	71	130
110-57-6	trans-1,4-Dichloro-2-butene	8307	98.6	12.3	62	136
79-01-6	Trichloroethene	12440	100.2	7.6	77	123
75-69-4	Trichlorofluoromethane [Freon-11]	11530	101	13.1	62	140
108-05-4	Vinyl acetate	7260	100.3	16.9	50	151
75-01-4	Vinyl chloride	12129	95.6	13.2	56	135
1330-20-7	Xylenes [total]	8623	100.7	7.7	78	124

DoD QSM Criteria Table C-24 Method 8260 Aqueous Matrix

Table C-24. Method 8260 Aqueous Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
630-20-6	1,1,1,2-Tetrachloroethane	24511	101.1	7.6	78	124
71-55-6	1,1,1-Trichloroethane	28223	102.7	9.6	74	131
CAS ID	**Analyte**	**N Records**	**Mean**	**Standard Deviation**	**Lower Control Limit**	**Upper Control Limit**
79-34-5	1,1,2,2-Tetrachloroethane	27450	96.4	8.3	71	121
79-00-5	1,1,2-Trichloroethane	27338	99.5	6.5	80	119
76-13-1	1,1,2-Trifluoro-1,2,2-trichloroethane [Freon-113]	21122	103	11.1	70	136
75-34-3	1,1-Dichloroethane	28154	101.3	8	77	125

75-35-4	1,1-Dichloroethene	29436	101	10	71	131
563-58-6	1,1-Dichloropropene	23631	102	7.8	79	125
87-61-6	1,2,3-Trichlorobenzene	24271	98.7	10.1	69	129
96-18-4	1,2,3-Trichloropropane	24525	97.5	8	73	122
526-73-8	1,2,3-Trimethylbenzene	2965	100.9	6.2	82	120
120-82-1	1,2,4-Trichlorobenzene	25290	99.8	10.1	69	130
95-63-6	1,2,4-Trimethylbenzene	27917	99.6	8	76	124
96-12-8	1,2-Dibromo-3-chloropropane	24955	94.9	11.1	62	128
106-93-4	1,2-Dibromoethane	29096	99	7.2	77	121
95-50-1	1,2-Dichlorobenzene	27583	99.4	6.5	80	119
107-06-2	1,2-Dichloroethane	32965	100.3	9.2	73	128
17060-07-0	1,2-Dichloroethane-d4	8673	99.5	6.1	81	118
540-59-0	1,2-Dichloroethene	18667	100.2	7.1	79	121
78-87-5	1,2-Dichloropropane	27787	100.1	7.2	78	122
354-23-4	1,2-Dichlorotrifluoroethane [Freon 123a]	3144	103.1	10.9	70	136
108-70-3	1,3,5-Trichlorobenzene	10037	102.1	9.2	75	130
108-67-8	1,3,5-Trimethylbenzene	27820	99.5	8.1	75	124
106-99-0	1,3-Butadiene	1202	100.6	19.2	43	158
541-73-1	1,3-Dichlorobenzene	26951	99.7	6.5	80	119
142-28-9	1,3-Dichloropropane	23811	99.1	6.5	80	119
542-75-6	1,3-Dichloropropene	9784	99.9	7.6	77	123
106-46-7	1,4-Dichlorobenzene	27715	98.3	6.5	79	118
105-05-5	1,4-Diethylbenzene	1980	98.4	6.4	79	118
123-91-1	1,4-Dioxane	17866	99	13.4	59	139
544-10-5	1-Chlorohexane	5790	99.6	8	76	124
540-84-1	2,2,4-Trimethylpentane [Isooctane]	5432	95.2	12.3	58	132

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
594-20-7	2,2-Dichloropropane	23775	99.7	13.2	60	139
75-85-4	2-Butanol	4332	92.7	9.1	66	120
78-93-3	2-Butanone [MEK]	26659	99.6	14.6	56	143
126-99-8	2-Chloro-1,3-butadiene	15673	100	11.7	65	135
110-75-8	2-Chloroethyl vinyl ether	18225	94.7	14.7	51	139
95-49-8	2-Chlorotoluene	23750	100	7.2	79	122
591-78-6	2-Hexanone	25368	97.9	13.5	57	139
91-57-6	2-Methylnaphthalene	3754	79.4	20.9	17	142
79-46-9	2-Nitropropane	10213	92.6	14.5	49	136
67-63-0	2-Propanol [Isopropyl alcohol]	2034	98.8	14.4	56	142
624-95-3	3,3-Dimethyl-1-butanol	6491	90.9	13.9	49	133
460-00-4	4-Bromofluorobenzene	9971	99.7	4.9	85	114
106-43-4	4-Chlorotoluene	23616	99.9	7.4	78	122
108-10-1	4-Methyl-2-pentanone [MIBK]	25796	98.5	10.6	67	130
67-64-1	Acetone	25006	99.5	20.1	39	160
75-05-8	Acetonitrile	13308	95.8	15.2	50	142
107-02-8	Acrolein [Propenal]	16380	96.8	19.3	39	155

107-13-1	Acrylonitrile	20173	99	11.9	63	135
107-05-1	Allyl chloride	15758	99	10.4	68	130
71-43-2	Benzene	34376	99.4	6.9	79	120
100-44-7	Benzyl chloride	10675	90.1	15.9	42	138
108-86-1	Bromobenzene	23762	99.7	6.7	80	120
74-97-5	Bromochloromethane	24356	100.8	7.5	78	123
75-27-4	Bromodichloromethane	26888	101.8	7.8	79	125
75-25-2	Bromoform	27675	97.8	10.8	66	130
74-83-9	Bromomethane	26717	97	14.7	53	141
75-15-0	Carbon disulfide	25719	98.8	11.5	64	133
56-23-5	Carbon tetrachloride	28870	103.8	10.7	72	136
108-90-7	Chlorobenzene	29802	100	6.1	82	118
124-48-1	Chlorodibromomethane	27424	100	8.5	74	126
75-45-6	Chlorodifluoromethane	7197	84.4	14.9	40	129
75-00-3	Chloroethane	27069	99	13	60	138

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
67-66-3	Chloroform	29373	101.1	7.5	79	124
74-87-3	Chloromethane	27697	94.5	15	50	139
156-59-2	cis-1,2-Dichloroethene	27935	100.1	7.5	78	123
10061-01-5	cis-1,3-Dichloropropene	27197	99.5	8	75	124
1476-11-5	cis-1,4-Dichloro-2-butene	1524	101.5	14.9	57	146
110-82-7	Cyclohexane	20438	100.4	10	71	130
1868-53-7	Dibromofluoromethane	5702	99.1	6.5	80	119
74-95-3	Dibromomethane	24473	101.1	7.3	79	123
75-71-8	Dichlorodifluoromethane [Freon-12]	25410	92	20.1	32	152
75-43-4	Dichlorofluoromethane	1504	101.5	9.8	72	131
60-29-7	Diethyl ether	17189	98.6	10.2	68	129
108-20-3	Diisopropyl ether	22989	97.5	10.3	67	128
64-17-5	Ethanol	9543	99.2	17.1	48	151
141-78-6	Ethyl acetate	9208	96.8	13.9	55	138
97-63-2	Ethyl methacrylate	16674	98.7	9	72	126
637-92-3	Ethyl tert-butyl ether	19841	98.3	9.4	70	127
100-41-4	Ethylbenzene	33325	99.8	7	79	121
462-06-6	Fluorobenzene	1373	97.9	6.1	80	116
142-82-5	Heptane	11878	94.4	15	49	140
87-68-3	Hexachlorobutadiene	23535	100.1	11.3	66	134
67-72-1	Hexachloroethane	8718	102.9	10.3	72	134
110-54-3	Hexane	15545	95.5	15.9	48	143
74-88-4	Iodomethane	20229	100	10.4	69	131
78-83-1	Isobutyl alcohol	14123	97.7	11.7	63	133
108-21-4	Isopropyl acetate [Acetic acid]	7216	97.8	11.6	63	133
98-82-8	Isopropylbenzene	28636	101.5	9.9	72	131
179601-23-1	m/p-Xylene [3/4-Xylene]	28168	100.5	6.9	80	121
126-98-7	Methacrylonitrile	15982	97.9	11.6	63	133
79-20-9	Methyl acetate	19698	96	13.2	56	136

80-62-6	Methyl methacrylate	16524	97.7	10.2	67	128
1634-04-4	Methyl tert-butyl ether [MTBE]	29660	97.3	8.8	71	124

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
108-87-2	Methylcyclohexane	20025	101.8	10.1	72	132
75-09-2	Methylene chloride	27659	99.4	8.3	74	124
123-86-4	n-Butyl acetate	7247	96.8	9.4	69	125
71-36-3	n-Butyl alcohol	10122	95.1	12	59	131
104-51-8	n-Butylbenzene	24088	101.1	8.8	75	128
109-60-4	n-Propyl acetate	602	100.8	8.3	76	126
103-65-1	n-Propylbenzene	24419	101	8.5	76	126
91-20-3	Naphthalene	27847	94.6	11.3	61	128
95-47-6	o-Xylene	31776	100	7.2	78	122
99-87-6	p-Isopropyltoluene [p-Cymene]	24335	102	8.5	77	127
76-01-7	Pentachloroethane	11688	101.1	10.7	69	133
109-66-0	Pentane	3915	74.8	19.7	16	134
107-12-0	Propionitrile [Ethyl cyanide]	15701	99.9	12	64	136
135-98-8	sec-Butylbenzene	24191	101.1	8.1	77	126
100-42-5	Styrene	26985	100.5	7.6	78	123
994-05-8	tert-Amyl methyl ether [TAME]	19726	98.1	10.1	68	128
75-65-0	tert-Butyl alcohol	21112	98.6	10.1	68	129
762-75-4	tert-Butyl formate	6651	98.1	11.1	65	132
98-06-6	tert-Butylbenzene	23919	101	7.7	78	124
127-18-4	Tetrachloroethene	29017	101.3	9.3	74	129
109-99-9	Tetrahydrofuran	18021	95	12.8	57	133
108-88-3	Toluene	33510	100.1	6.8	80	121
2037-26-5	Toluene-d8	9809	100.4	3.8	89	112
156-60-5	trans-1,2-Dichloroethene	27663	99.5	8.2	75	124
10061-02-6	trans-1,3-Dichloropropene	27134	100	8.9	73	127
110-57-6	trans-1,4-Dichloro-2-butene	19320	91.5	16.1	43	140
79-01-6	Trichloroethene	30150	101.1	7.3	79	123
75-69-4	Trichlorofluoromethane [Freon-11]	26108	103	12.8	65	141
108-05-4	Vinyl acetate	18941	100.2	15.3	54	146
75-01-4	Vinyl chloride	29472	97.4	13.2	58	137
1330-20-7	Xylenes [total]	23426	100.1	7	79	121

Data Qualification Reason Codes

Reason Code	Reason Code Description
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds LinearCalibration Range
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank

Data Qualification Reason Codes

V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degreec C.
Y1	False Positive
Y2	Data rejected due to radiological anomolies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of ana
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or ope

a concentration less than 5X the concentration detected in

lyses for the analyte/compound by the stated method and

ning CCV.

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-112035-1
Analyses/Method:	TPH-Gasoline Range Organics (TPH-g, C6-C12) by EPA Method 8260D TPH-Diesel Range Organics (TPH-d, C10-C24) by EPA Method 8015D TPH-Residual Range Organics (TPH-o, C24-C40) by EPA Method 8015D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM — Completed on: 06/03/2022
Reviewed by:	/ AECOM — File Name: 580-122035-1_GRO_DRO_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 29, 2022 and March 30, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3000MISH-SOFT01-000.0	580-112035-1	Soil
A3000MISH-SOFT02-000.0	580-112035-2	Soil
A3000MISH-SOFT03-000.0	580-112035-3	Soil
A3-010-SON01-002.0	580-112035-4	Soil
A3325H-SON01-001.0	580-112035-5	Soil
Trip Blank	580-112035-6	Trip Blank

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *SW--846 Method 8015D: Nonhalogenated Organics Using GC/FID* (June 2003)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC, Department of Defense*, Revision 1 (March 2021)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✗	Holding times and sample preservation
✓	Instrument tuning
✓	Initial calibration/initial and continuing calibration verification
✗	Laboratory blanks/field blanks/equipment blanks
✓	Surrogate spike recoveries
NA	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
NA	Field duplicate results
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Select data points were estimated due to nonconformances of certain QC criteria (see discussion below). Qualified sample results are presented in Table 1.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation.

Several samples were received with significantly lower sample weights than required by the method (10g). The laboratory limit of detection (LOD) met the screening criteria for all nondetect results.

The following positive results exceeded the site screening criteria:

Sample Name	Analyte	Result	LOD	Screening Criteria	Units
A3-010-SON01-002.0	TPH-d	50000	430	220	mg/kg
A3325H-SON01-001.0	TPH-d	2000	28	220	mg/kg

Holding Time

GRO was analyzed outside of holding time criteria for one sample and the trip blank. Results were qualified estimated as shown below in Table 1.

Trip Blank Results

GRO was detected in the trip blank. The detected results for the samples were qualified as nondetect "U" or estimated "J+" as shown in Table 1, below.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-112035-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-112035-1	Trip Blank	580-112035-6	8260D	TPH-g	80	mg/kg	80 J	H1
580-112035-1	A3325H-SON01-001.0	580-112035-5	8260D	TPH-g	3.7	mg/kg	5.9 UJ	T/H1
580-112035-1	A3-010-SON01-002.0	580-112035	8260D	TPG-g	250	mg/kg	250 J+	T

Laboratory:	Eurofins Seattle
Laboratory SDG/Job No:	580-122035-1
Validation Level:	Stage 2B (using Level IV data package)
Number of Samples/Matrix:	5 soils, 1 TB
Analysis (Include Method #):	GRO C6-C10 SW-846 8260D

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)
Chain of Custody	No	No
Sample Preservation	Yes	No
Holding Time	Yes	No
Quantitation Limits	Yes	No
Percent Solids (>30%)	Yes	No
Method Blanks	No	No
Trip/Equipment Blanks	No	Yes
Initial Calibration	Yes	No
Initial Calibration Verification	Yes	No
Continuing Calibration Verification	Yes	No
Matrix Spike	NA	NA
Matrix Spike Duplicate RPD[2]	NA	NA
Laboratory Duplicate[2]	NA	NA
Surrogate Standards[2]	Yes	No
Laboratory Control Standards	Yes	No
ISM Relative Standard Deviation	Yes	No
Field Duplicate	NA	NA
Internal Standards[2,3]	Yes	No
GC/MS Tunes[2]	Yes	No
Calculation Spot Checks[3]	NA	NA

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C10)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Samples	Lab ID	
A3000MISH-SOFT01-000.0	580-112035-1	Soil
A3000MISH-SOFT02-000.0	580-112521-2	Soil
A3000MISH-SOFT03-000.0	580-112521-3	Soil
A3-010-SON01-002.0	580-112521-4	Soil
A3325H-SON01-001.0	580-112521-5	Soil
Trip Blank	580-112521-6	Trip Blank

*The relative abundance of specific ions is not applicable to the GRO method since the analysis
qualitative identification of the presence or absence of GRO in the samples is based on defining
start and end of the C6-C12 window, and not as the result of comparison to a reference spectru
and not a selected quantitation ion. Therefore, nonconformances noted for the BFB tunes are r

Client/Site Name: Red Hill Site Characterization
Project Number: 60674414.00.50.01
Date: 06/03/22
Validator: [redacted]
Reviewer and Date: [redacted] **10/11/22. Final checklist in EDMS.**

Comments
Trip Blank not listed on COC.
1.5°C
Collected 3/29/22 and 3/30/22. GRO results for A3325-SON01-001.0 and the trip blank were analyzed outside of holdting time criteria and qualified as estimated "J".
No dilutions. Results for GRO meet PAL (100 mg/kg).
MB 580-386132/1-A, MB 580-388466/1-A.
GRO was detected in the Trip Blank. Associated sample results were qualified as nondetect "U" or estimated "J+" depending on concentration relative to reporting limits.
SEA046 02/09/2022, SEA046 02/22/2022, SEA046 04/04/22, SEA046 04/07/2022 meet criteria
ICV 580-380867/12, ICV 580-381937/13, ICV 580-386230/13, ICV 580-386734/12 meet criteria.
CCVIS 580-386139/3, CCV 580-386139/13, CCV 580-386139/32, CCVIS 580-388541/3, CCV 580-388541/14 meet
An MS/MSD was not analyzed on a sample in this SDG.
Surrogate BFB within QSM limits
LCS 580-386132/4-A, LCSD 580-386132/5-A, LCS 580-388466/4-A, LCSD 580-388466/5-A meet criteria
All RSDs below 50%.
Not a required validation element for this project.

s performed on the GC/MS is based on the total ion chromatograph and not a selected quantitation ion. The
g the retention time window with the analysis of a retention time standard that includes compounds which mark the
um. Quantitation is based on the use of an initial calibration which is determined using the total ion chromatograph
not applicable and data validation actions are not required.

Five-pt cal, RSD ≤ 15% or r2 ≥0.99

ICV %D ≤20%
CCV %D ≤20%

see DoD QSM QC limits tab

see DoD QSM QC limits tab
see DoD QSM QC limits tab

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-112035-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B (using Level IV data package)	**Date**: 06/03/22 **Validator:** [redacted]	
Number of Samples/Matrix:	5 soils	**Reviewer and Date:** [redacted]	**7/26/22. Final checklist in EDMS**
Analysis (Include Method #):	DRO/ORO SW-846 8015C DRO C10-C24, ORO C24-C40		

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments	
Chain of Custody	Yes	No		
Sample Preservation	Yes	No	1.5°C	
Holding Time	Yes	No	Collected 3/29/22 and 3/30/22, analyzed within HT	
Quantitation Limits	No	No	Sample A3-010-SON01-002.0 was analyzed at a 10x dilution for DRO.	
Percent Solids (>30%)	Yes	No		
Method Blanks	Yes	No	MB 580-386187/1-A, MB 580-386480/1-A All ND	
Equipment Blanks	NA	NA		
Initial Calibration	Yes	No	TAC020 2/7/22, TAC013 4/1/2022, within criteria	Five-pt cal, RSD ≤ 20% or r2 ≥0.99
Initial Calibration Verification	Yes	No	ICV 580-380510/14, ICV 580-380509/14, ICV 580-386092/14, within criteria	ICV %D ≤20%
Continuing Calibration Verification	Yes	No	CCV 580-386256/53, CCV 580-386256/55, CCV 580-386257/11, 580-386257/18, CCV 580-386539/11, 580-386539/21, CCV 580-386855/45, 580-386855/65, within criteria	CCV %D ≤20%
Matrix Spike	NA	NA	An MS/MSD was not analyzed on a sample in this SDG.	see DoD QSM QC limits tab
Matrix Spike Duplicate RPD[2]	NA	NA		
Laboratory Duplicate[2]	Yes	No		
Surrogate Standards[2]	Yes	No		see DoD QSM QC limits tab
Laboratory Control Standards	Yes	No	LCS 580-386187/2-A, LCSD 580-386187/3-A, LCS 580-386480/2-A, LCSD 580-386480/3-A, within limits	see DoD QSM QC limits tab
ISM Relative Standard Deviation	Yes	No	All RSD under 50%.	
Field Duplicate	NA	NA		
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.	

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C12)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Sample	Compound	Result (mg/kg)	PAL (mg/kg)
A3-010-SON01-002.0	C10-C24	50000	220
A3325H-SON01-001.0	C10-C24	2000	200

Samples	Lab ID	
A3-010-SON01-002.0	580-112035-4	Soil
A3325H-SON01-001.0	580-112035-5	Soil

Data validation activities were conducted with reference to:

SW-846 Method 8260D Volatile Organic Compounds by Gas Chromatography/Mass Sp
SW-846 Method 8015C: Nonhalogenated Organics by Gas Chromatography (February

- Module 1 Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by
General Data Validation Guidelines, Department of Defense , Revision 1 (November 201
USEPA Contract Laboratory Program National Functional Guidelines for Organic Superf

Table B-3: Preparation and Analytical Requirements for Field and QC Samples

Matrix	Analytical Group	Preparation Reference/Method SOP Analytical Reference/Method SOP	Containers
Unconsolidated Material	TPH-g, VOCs	Preparation Method: EPA 5035C Preparation SOP: ANA8260 Analysis Method: EPA 8260C Analysis SOP: ANA8260	2 × 10mL water-preserved; 1 × 5mL methanol-preserved; Teflon-lined septum caps
	TPH-d, TPH-o	Preparation Method: EPA 3550C Preparation SOP: SON004 Analysis Method: EPA 8015C Analysis SOP: ANA8015	1 × 8-oz glass jar, Teflon-lined lid
	TPH-d, TPH-o with Silica Gel Cleanup	Preparation Method: EPA 3550C/EPA 3630 Preparation SOP: SON004/CLN004 Analysis Method: EPA 8015C Analysis SOP: ANA8015	
	PAHs	Preparation Method: EPA 3550C Preparation SOP: SON009 Analysis Method: EPA 8270D SIM Analysis SOP: ANA8270SIM	

Notes:

g	gram
H_2SO_4	sulfuric acid
HCl	hydrogen chloride
L	liter
mL	milliliter
$NaHSO_4$	sodium bisulfate
oz	ounce

Sample Volume	Preservation Requirement	Maximum Holding Time (preparation/analysis)
40 mL	Cool to ≤6°C	7 days (water-preserved); 14 days (methanol-preserved)
30 g	Cool to ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
30 g	Cool to ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
30 g	Cool to ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.

Table C-13. Method 8015 (MOD) Solid Matrix					
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit
460-00-4	4-Bromofluorobenzene	1263	100.7	11.1	67
303-04	Diesel Range Organics (DRO)	2184	85.2	15.7	38
307-27	Gasoline Range Organics (GRO)	1134	100.3	7.2	79
307-51	Motor Oil	658	72.2	11.2	39
84-15-1	o-Terphenyl	314	87.4	14.1	45

Table C-14. Method 8015 (MOD) Aqueous Matrix					
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit
460-00-4	4-Bromofluorobenzene	756	101	10.8	69
303-04	Diesel Range Organics (DRO)	1757	83.7	16	36
307-27	Gasoline Range Organics (GRO)	971	99.9	7.3	78
307-51	Motor Oil	573	76.9	12.1	41
84-15-1	o-Terphenyl	299	90.5	11.4	56
630-02-4	Octacosane	130	101.1	13.8	60

Upper Control Limit
134
132
122
106
130

Upper Control Limit
133
132
122
113
125
142

Matrix Unconsolidated Material

Analyte	CAS Number	Screening Criterion [a] (mg/kg)	Project LOQ Goal (mg/kg)	Project LOD Goal (mg/kg)	Laboratory-Specific Limits (mg/kg)		
					LOQ	LOD	D
TPH							
TPH-g (C5–C11)	-3547	100	33	10	TBD	TBD	TE
TPH-d (C10–C24)	-3527	220	73	22	TBD	TBD	TE
VOCs							
Benzene	71-43-2	0.30	0.10	0.030	TBD	TBD	TE
Ethylbenzene	100-41-4	3.7	1.2	0.37	TBD	TBD	TE
Toluene	108-88-3	3.2	1.1	0.32	TBD	TBD	TE
Total Xylenes	1330-20-7	2.1	0.70	0.21	TBD	TBD	TE
PAHs							
1-Methylnaphthalene	90-12-0	4.2	1.4	0.42	TBD	TBD	TE
2-Methylnaphthalene	91-57-6	4.1	1.4	0.41	TBD	TBD	TE
Naphthalene	91-20-3	4.4	1.5	0.44	TBD	TBD	TE

Notes:

mg/kg milligrams per kilogram

[a] DOH Tier 1 EALs (Summer 2016, updated January 2017),

)L

BD
BD

BD
BD
BD
BD

BD
BD
BD

Data Qualification Reason Codes

Reason Code	Reason Code Description
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds LinearCalibration Range
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank

Data Qualification Reason Codes

V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degreec C.
Y1	False Positive
Y2	Data rejected due to radiological anomolies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of ana
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or ope

: a concentration less than 5X the concentration detected in

lyses for the analyte/compound by the stated method and

ning CCV.

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-112035-1
Analyses/Method:	Semivolatile Organic Compounds by EPA Method 8270E-SIM (1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene)
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM Completed on: 06/03/2022
Reviewed by:	[redacted] (b) (6) / AECOM File Name: 580-112035-1_SVOC SIM_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 29, 2022 and March 30, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3000MISH-SOFT01-000.0	580-112035-1	Soil
A3000MISH-SOFT02-000.0	580-112035-2	Soil
A3000MISH-SOFT03-000.0	580-112035-3	Soil
A3-010-SON01-002.0	580-112035-4	Soil
A3325H-SON01-001.0	580-112035-5	Soil

Data validation activities were conducted with reference to:

- *SW-846 Method 8270E: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✓	Holding times and sample preservation
✓	Instrument tuning
✓	Initial calibration/initial and continuing calibration verification
✓	Laboratory blanks/field blanks/equipment blanks
✓	Surrogate spike recoveries
✓	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
NA	Field duplicate results
✗	Laboratory duplicate/triplicate
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Select data points were estimated due to nonconformances of certain QC criteria (see discussion below).

RESULTS

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation. Laboratory limits of detection (LOD) meet screening criteria for all samples.

Several samples were received with significantly lower sample weights than required by the method (10g). The laboratory limit of detection (LOD) met the screening criteria for all nondetect results.

Surrogate Recoveries

The surrogate 2-Methylnaphthalene-d10 was above criteria in sample A3-010-SON01-002.0. Associated sample detections were qualified as estimated "J".

ISM Relative Standard Deviation

Relative standard deviation for triplicate pair: A3000MISH-SOFT01-000.0/A3000MISH-SOFT02-000.0/A3000MISH-SOFT03-000.0 was above 50% for naphthalene and 1-methylnaphthalene. Associated results were qualified as estimated "J".

Lab Duplicate/Triplicate Relative Percent Difference

The duplicate and triplicate RPD for A3000MISH-SOF01-000.0 were above criteria for naphthalene and 2-methylnaphthalene. Associated results were qualified as estimated "J".

QUALIFICATION ACTIONS

Qualification of data is shown in Table 1, below.

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Memorandum

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-112035-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-112035-1	A3-010-SON01-002.0	580-112035-4	8270E	1-Methylnaphthalene	53	mg/kg	53 J	I
580-112035-1	A3-010-SON01-002.0	580-112035-4	8270E	2-Methylnaphthalene	74	mg/kg	74 J	I
580-112035-1	A3-010-SON01-002.0	580-112035-4	8270E	Naphthalene	32	mg/kg	32 J	I
580-112035-1	A3000MISH-SOFT01-000.0	580-112035-1	8270E	2-Methylnaphthalene	0.00230 J	mg/kg	0.00230 J	D5
580-112035-1	A3000MISH-SOFT01-000.0	580-112035-1	8270E	1-Methylnaphthalene	0.00230 J	mg/kg	0.00230 J	D4
580-112035-1	A3000MISH-SOFT01-000.0	580-112035-1	8270E	Naphthalene	0.00750 J	mg/kg	0.00750 J	D4/D5
580-112035-1	A3000MISH-SOFT02-000.0	580-112035-2	8270E	1-Methylnaphthalene	0.00300	mg/kg	0.00300 J	D4
580-112035-1	A3000MISH-SOFT02-000.0	580-112035-2	8270E	Naphthalene	0.12000	mg/kg	0.12000 J	D4
580-112035-1	A3000MISH-SOFT03-000.0	580-112035-3	8270E	1-Methylnaphthalene	0.00610	mg/kg	0.00610 J	D4
580-112035-1	A3000MISH-SOFT03-000.0	580-112035-3	8270E	Naphthalene	0.24000	mg/kg	0.24000 J	D4

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-112035-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B	**Date**: 06/03/22	
	(using Level IV data package)	**Validator**: [redacted]	
Number of Samples/Matrix:	5 soils	**Reviewer and Date:** (b) (6)	**7/26/22**
Analysis (Include Method #):	SVOCs, SW846 8270E-SIM (Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene)		

DoD QSM 5.4, DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	Yes	No	
Sample Preservation	Yes	No	1.5°C
Holding Time	Yes	No	Collected 3/29/22 and 3/30/22, analyzed within HT
Quantitation Limits	Yes	No	Sample A3-010-SON01-002.0 was diluted to 20x.
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-386287/1-A, MB 580-386580/1-A, All ND
Other Laboratory Blanks[1,2]	Yes	No	
Trip/Equipment Blanks	NA	NA	
Initial Calibration	Yes	No	ICAL 3/24/2022, Inst SEA101, criteria met
Initial Calibration Verification	Yes	No	ICV 580-385060/21, within criteria
Continuing Calibration Verification	Yes	No	CCVIS 580-386376/3, CCVC 580-386376/17, CCVIS 580-386635/3, CCVC 580-386635/18, CCVC 580-386847/3, CCVC 580-386847/10 within criteria
Matrix Spike	NA	NA	An MS/MSD was not analyzed on a sample in this SDG.
Matrix Spike Duplicate RPD[2]	NA	NA	
Laboratory Duplicate[2]	Yes	No	The duplicate and triplicate RPD for A3000MISH-SOF01-000.0 were above criteria for naphthalene and 2-methylnaphthalene. Associated results were qualified as estimated "J".
Surrogate Standards[2]	No	Yes	The surrogate 2-Methylnaphthalene-d10 was above criteria in sample A3-010-SON01-002.0. Associated sample detections were qualified as estimated "J".
Laboratory Control Standards	Yes	No	LCS 580-3862687/2-A, LCSD 580-386287/3-A, within criteria
Internal Standards[2,3]	Yes	No	
ISM Relative Standard Deviation	No	Yes	Relative standard deviation for triplicate pair: A3000MISH-SOFT01-000.0/A3000MISH-SOFT02-000.0/A3000MISH-SOFT03-000.0 was above 50% for naphthalene and 1-methylnaphthalene. Associated results were qualified as estimated "J".
Field Duplicate	NA	NA	
GC/MS Tunes[2]	Yes	No	
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Data validation activities were conducted with reference to:

SW-846 Method 8270E Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS

Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of

General Data Validation Guidelines, Department of Defense, Revision 1 (November 2019)

USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Revi

f Defense, Revision 1 (May 2020)

iew (November 2020)

DoD Module 1

Note DoD Module 1 criteria (below) are based on Method 8270D; lab analyzed samples using 8270E-SIM. QSM 5.4 Table B-22 criteria of RSD ≤20% or r2 ≥ 0.99 was used to evaluate the ICAL data. Per Method 8270E, minimum RFs on Table 4 are used as guidance.

Table IX: SVOC RF (Method 8270D)

Analyte	Minimum Average RF (method uses the term "mean")
Acenaphthylene	0.9
Acenaphthene	0.9
Fluorene	0.9
Phenol	0.8
2-Chlorophenol	0.8
2-Chloronaphthalene	0.8
Dibenzofuran	0.8
Benzo(a)anthracene	0.8
bis(2-Chloroethyl)ether	0.7
2-Methylphenol	0.7
Naphthalene	0.7
Phenanthrene	0.7
Anthracene	0.7
Chrysene	0.7
Benzo(b)fluoranthene	0.7
Benzo(k)fluoranthene	0.7

Analyte	Minimum Average RF (method uses the term "mean")
Benzo(a)pyrene	0.7
4-Methylphenol	0.6
Fluoranthene	0.6
Pyrene	0.6
N-nitroso-di-n-propylamine	0.5
Indeno(1,2,3-cd)pyrene	0.5
Benzo(ghi)peylene	0.5
Isophorone	0.4
2-Methylnaphthalene	0.4
4-Chlorophenylphenylether	0.4
Dibenz(a,h)anthracene	0.4
Hexachloroethane	0.3
bis(2-Chloroethoxy)methane	0.3
Nitrobenzene	0.2

DoD Mod 1

If any SVOC
RF less thar

If the avera
and associa

A minimum
coefficients
instrument
value shoul

A minimum
correlation
Some instru
r2, the valu

2,4-Dimethylphenol	0.2
2,4-Dichlorophenol	0.2
4-Chloro-3-methylphenol	0.2
2,4,6-Trichlorophenol	0.2
2,4,5-Trichlorphenol	0.2
2,6-Dinitrotoluene	0.2
2,4-Dinitrotoluene	0.2
2-Nitrophenol	0.1
4-Bromophenylphenylether	0.1
Hexachlorobenzene	0.1
Hexachlorocyclopentadiene	0.05
Pentachlorophenol	0.05
Benzaldehyde	0.01
2,2'-Oxybis-(1-chloropropane)	0.01

Analyte	**Minimum Average RF (method uses the term "mean")**
Acetophenone	0.01
4-Chloroaniline	0.01
Hexachlorobutadiene	0.01
Caprolactam	0.01
1,1'-Biphenyl	0.01
2-Nitroaniline	0.01
Dimethyl phthalate	0.01
3-Nitroaniline	0.01
2,4-Dinitrophenol	0.01
4-Nitrophenol	0.01
Diethyl phthalate	0.01
1,2,4,5-Tetrachlorobenzene	0.01
4-Nitroaniline	0.01
4,6-Dinitro-2-methylphenol	0.01
N-Nitrosodiphenylamine	0.01
Atrazine	0.01
Carbazole	0.01
Di-n-butyl phthalate	0.01
Butyl benzyl phthalate	0.01
3,3'-Dichlorobenzidine	0.01
bis(2-ethylhexyl)phthalate	0.01
Di-n-octylphthalate	0.01
2,3,4,6-Tetrachlorophenol	0.01

. (8270D)

: analyte listed above (except those with an average RF of 0.01) has an average
ı that listed in the table, qualify detects J and non-detects UJ.

.ge RF for any target analyte is < 0.01, associated detects should be qualified J
ıted non-detects should be qualified X.

ı of five standards is required for a linear regression. Evaluate the correlation
; (r) for all applicable target analytes. The r value should be ≥ 0.995. Some
ation reports coefficient of determination (r2). If the instrument reports r2, the
d be ≥ 0.99.

ı of six standards is required for a second order (quadratic) curve. Evaluate the
coefficients(r) for all applicable target analytes. The r value should be ≥ 0.995.
ımentation reports coefficient of determination (r2). If the instrument reports
e should be ≥ 0.99.

Table C-27 8270 SIM SOLID

Table C-27. Method 8270 SIM Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
90-12-0	1-Methylnaphthalene	2267	76.6	11.3	43	111
95-95-4	2,4,5-Trichlorophenol	169	79.9	14.9	35	125
91-58-7	2-Chloronaphthalene	615	76.7	10.5	45	108
321-60-8	2-Fluorobiphenyl	1961	80.6	11.6	46	115
91-57-6	2-Methylnaphthalene	2535	76.8	12.5	39	114
83-32-9	Acenaphthene	2813	77.7	11.2	44	111
208-96-8	Acenaphthylene	2761	77.1	12.8	39	116
120-12-7	Anthracene	2812	82.1	10.7	50	114
56-55-3	Benz(a)anthracene	2827	88	11.4	54	122
50-32-8	Benzo(a)pyrene	2789	87.3	12.5	50	125
205-99-2	Benzo(b)fluoranthene	2790	90.3	12.6	53	128
191-24-2	Benzo(g,h,i)perylene	2739	87.8	13	49	127
207-08-9	Benzo(k)fluoranthene	2761	89.3	11.2	56	123
111-44-4	Bis(2-chloroethyl) ether	192	65.4	15.8	18	113
117-81-7	Bis(2-ethylhexyl) phthalate	181	108.9	13.9	67	150
85-68-7	Butyl benzyl phthalate	144	103.5	10.6	72	135
86-74-8	Carbazole	183	79.3	14.6	36	123

Table C-27. Method 8270 SIM Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
218-01-9	Chrysene	2812	87.5	10.2	57	118
84-74-2	Di-n-butyl phthalate	150	106.5	12.9	68	145
117-84-0	Di-n-octyl phthalate	144	105.5	16.8	55	156
53-70-3	Dibenzo(a,h)anthracene	2778	89.2	13.2	50	129
132-64-9	Dibenzofuran	282	71.9	12.2	35	108
84-66-2	Diethyl phthalate	147	99.3	10.9	67	132
131-11-3	Dimethyl phthalate	149	99.3	9.3	71	127
206-44-0	Fluoranthene	2782	87.3	10.7	55	119
86-73-7	Fluorene	2795	80.6	11.2	47	114
118-74-1	Hexachlorobenzene	201	81.9	14.2	39	125
193-39-5	Indeno(1,2,3-cd)pyrene	2812	89.6	13.5	49	130
62-75-9	n-Nitrosodimethylamine	117	90.7	10.9	58	124
91-20-3	Naphthalene	2823	74.7	12.2	38	111
87-86-5	Pentachlorophenol	259	82.4	15.5	36	129

85-01-8	Phenanthrene	2792	80.8	10.6	49	113
129-00-0	Pyrene	2792	85.8	10.2	55	117

Table C-28 8270 SIM AQUEOUS

Table C-28. Method 8270 SIM Aqueous Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
92-52-4	1,1-Biphenyl	106	77.3	7.3	56	99
90-12-0	1-Methylnaphthalene	2566	77.9	12.5	41	115
95-95-4	2,4,5-Trichlorophenol	488	84.1	13.4	44	124
118-79-6	2,4,6-Tribromophenol	164	83.7	12.7	46	122
606-20-2	2,6-Dinitrotoluene	118	67.2	15.8	20	115
91-58-7	2-Chloronaphthalene	717	72.4	12.7	34	111
321-60-8	2-Fluorobiphenyl	747	79.2	8.8	53	106
91-57-6	2-Methylnaphthalene	2984	76.5	12.6	39	114
83-32-9	Acenaphthene	3241	80.9	11.1	48	114
208-96-8	Acenaphthylene	3234	77.8	14.4	35	121
120-12-7	Anthracene	3224	85.8	11	53	119

Table C-28. Method 8270 SIM Aqueous Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
56-55-3	Benz(a)anthracene	3277	89.3	10.1	59	120
50-32-8	Benzo(a)pyrene	3284	86.4	11.2	53	120
205-99-2	Benzo(b)fluoranthene	3248	89.7	12.3	53	126
191-24-2	Benzo(g,h,i)perylene	3178	86	14.1	44	128
207-08-9	Benzo(k)fluoranthene	3167	89.3	11.9	54	125
111-44-4	Bis(2-chloroethyl) ether	775	77.8	12.6	40	116
117-81-7	Bis(2-ethylhexyl) phthalate	275	114.1	19.6	55	173
85-68-7	Butyl benzyl phthalate	159	90.7	17.3	39	143
86-74-8	Carbazole	631	84	13.1	45	123
218-01-9	Chrysene	3215	88.3	10.4	57	120
84-74-2	Di-n-butyl phthalate	153	102.5	14.2	60	145
117-84-0	Di-n-octyl phthalate	157	103.3	19	46	160
53-70-3	Dibenzo(a,h)anthracene	3233	87.2	14.5	44	131
132-64-9	Dibenzofuran	864	77.5	14.1	35	120
84-66-2	Diethyl phthalate	142	94.5	13.5	54	135
206-44-0	Fluoranthene	3242	89.1	10.4	58	120
86-73-7	Fluorene	3232	84.1	11.3	50	118
118-74-1	Hexachlorobenzene	947	84.8	13	46	124

118-74-1	Hexachlorobenzene	847	84.8	13	46	124
87-68-3	Hexachlorobutadiene	187	84.5	14.7	40	129
193-39-5	Indeno(1,2,3-cd)pyrene	3244	88.7	13.7	48	130
62-75-9	N-Nitrosodimethylamine	162	62.5	10	33	92
91-20-3	Naphthalene	3277	78.8	11.9	43	114
4165-60-0	Nitrobenzene-d5	444	83.1	9.2	55	111
87-86-5	Pentachlorophenol	808	88.4	17.6	36	141
85-01-8	Phenanthrene	3240	83.6	10.3	53	115
129-00-0	Pyrene	3252	87.1	11.3	53	121
1718-51-0	Terphenyl-d14	642	95.1	12.4	58	132

Matrix **Unconsolidated Material**

Analyte	CAS Number	Screening Criterion [a] (mg/kg)	Project LOQ Goal (mg/kg)	Project LOD Goal (mg/kg)	Laboratory-Specifi	
					LOQ	LOI
TPH						
TPH-g (C5–C11)	-3547	100	33	10	TBD	TBI
TPH-d (C10–C24)	-3527	220	73	22	TBD	TBI
VOCs						
Benzene	71-43-2	0.30	0.10	0.030	TBD	TBI
Ethylbenzene	100-41-4	3.7	1.2	0.37	TBD	TBI
Toluene	108-88-3	3.2	1.1	0.32	TBD	TBI
Total Xylenes	1330-20-7	2.1	0.70	0.21	TBD	TBI
PAHs						
1-Methylnaphthalene	90-12-0	4.2	1.4	0.42	TBD	TBI
2-Methylnaphthalene	91-57-6	4.1	1.4	0.41	TBD	TBI
Naphthalene	91-20-3	4.4	1.5	0.44	TBD	TBI

Notes:

mg/kg milligrams per kilogram

[a] DOH Tier 1 EALs (Summer 2016, updated January 2017),

c Limits (mg/kg)	
D	DL
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD

Data Qualification Reason Codes

Reason Code	Reason Code Description
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds LinearCalibration Range
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank

Data Qualification Reason Codes

V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degreec C.
Y1	False Positive
Y2	Data rejected due to radiological anomolies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of ana
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or ope

a concentration less than 5X the concentration detected in

lyses for the analyte/compound by the stated method and

ning CCV.

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-112198-1
Analyses/Method:	Volatile Organic Compounds (BTEX) by EPA Method 8260D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM — Completed on: 09/28/2022
Reviewed by:	[redacted] (b) (6) / AECOM — File Name: 580-112198-1_BTEX_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 31, 2022 and April 1, 2022.

Sample ID	Lab ID	Matrix/Sample Type
PSCOOLING-WSN01-000.0	580-112198-1	Groundwater
PSCOOLING-WSFD01-000.0	580-112198-2	Field duplicate of PSCOOLING-WSN01-000.0
SUMPDRN-WSN01-000.0	580-112198-3	Groundwater
SUMP-WSN01-000.0	580-112198-4	Groundwater
A3015-SON01-002.0	580-112198-5	Soil
A3015-WGN01-002.0	580-112198-6	Groundwater

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✓	Holding times and sample preservation
✓	Instrument tuning
✗	Initial calibration/initial and continuing calibration verification
✓	Laboratory blanks/field blanks/equipment blanks
✓	Surrogate spike recoveries
NA	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
✓	Field duplicate results
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Selected data points were estimated due to nonconformances of certain QC criteria (see discussion below). Qualified sample results are presented in Table 1.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Samples listed on the COC but not included in this report were included separately as a part of SDG 580-112198-2.

LCS/LCSD Results

The following recoveries were outside control limits:

LCS/LCSD ID	Analyte	LCS/LCSD Recoveries	RPD	Recovery Limits/RPD
580-386906/6, 580-386906/7	Toluene	**123/123**	0	80-121/20

Recovery for toluene in the above LCS and LCSD was above criteria. Results were nondetect and did not require qualification.

Continuing Calibration Verification Results

An opening continuing calibration verification (CCV) percent difference (%D) for o-xylene (21%) was above criteria (≤20%D). Associated detections were qualified as estimated "J" as shown below in Table 1.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation.

The reporting limits for nondetect results were within the site screening criteria, and no sample results exceeded the site screening limits.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

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Memorandum

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-112198-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-112198-1	A3015-WGN01-002.0	580-112198-6	8260D	o-xylene	120	ug/L	120 J	V2

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-112198-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B (using Level IV data package)	**Date**: 09/28/22	
		Validator: (b) (6)	
Number of Samples/Matrix:	5 groundwater (including 1 FD), 1 Soil	**Reviewer and Date:** (b) (6)	9/29/22
Analysis (Include Method #):	BTEX SW846 8260D		

QAPP (QSM 5.4), DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	Yes	No	Samples listed on the COC but not included in this report were included separately in SDG 580-112198-2
Sample Preservation	Yes	No	1.6 º C, 2.3 º C, 4.4 º C.
Holding Time	Yes	No	Collected 3/31/22 and 4/1/22, analyzed within HT.
Quantitation Limits	Yes	No	Sample A3015-WGN01-002.0 was analyzed at a dilution and sample A3015-SON01-002.0 was analyzed at a reduced volume. Reporting limits were adjusted accordingly
Percent Solids (>30%)	NA	NA	
Method Blanks	No	No	MB 580-386906/5, All ND, MB 580-386962/1-A, m/p-xylene, o-xylene, and total xylenes were detected. Blank concentration was insignificant compared to the results of the associated soil sample. No qualification was required
Other Laboratory Blanks[1,2]	NA	NA	
Trip/Equipment Blanks	NA	NA	No trip blank colllected.
Initial Calibration	Yes	No	04/07/2022 SEA046, 03/30/2022 TAC036, criteria met
Initial Calibration Verification	Yes	No	ICV 580-385800/28 criteria met
Continuing Calibration Verification	No	Yes	CCVIS 580-386965/2, CCVC 580-386968/34, CCVIS 580-386906/3, CCVC 580-386906/49, 580-387050/3, 580-387050/34 A %D for o-xlyene (21%) was above criteria in CCVIS 580-386906/3 (Associated samples: 580-112198-1, 2, 3, and 4). Detections were qualified as estimated "J", nondetect results did not require qualification
Matrix Spike	NA	NA	An MS/MSD was not analyzed on a sample in this SDG.
Matrix Spike Duplicate RPD[2]	NA	NA	
Laboratory Duplicate[2]	NA	NA	Not applicable to these analyses.
Surrogate Standards[2]	Yes	No	
Laboratory Control Standards	No	No	LCS 580-386906/6, LCSD 580-386906/7, LCS 580-386962/2-A, 580-386962/3-A, 580-387050/6, 580-387050/7. Recovery for Toluene in 580-386906/6 and 580-386906/7 (associated samples: 580-112198-1, 2, 3, 4) was above criteria; associated results were nondetect and did not require qualificaiton
Internal Standards[2,3]	Yes	No	
Field Duplicate	Yes	No	PSCOOLING-WSN01-000.0 (580-112198-1) and PSCOOLING-WSFD01-000.0 (580-112198-2): precision criteria met
GC/MS Tunes[2]	Yes	No	
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.

[2]May not be applicable to all analyses.

[3]Level IV validation only. See full NFG worksheets for details.

Note: it may not be appropriate to make a direct quantitative comparison for aqueous field blanks (such as equipment blanks reported as µg/mL) to a solid parent sample (such as a soil sample reported as mg/kg). At best, only a qualitative comparison can be made.

Samples	Lab ID
PSCOOLING-WSN01-000.0	580-112198-1
PSCOOLING-WSFD01-000.0	580-112198-2
SUMPDRN-WSN01-000.0	580-112198-3
SUMP-WSN01-000.0	580-112198-4
A3015-SON01-002.0	580-112198-5
A3015-WGN01-002.0	580-112198-6

Compound	QL	5x QL	PSCOOLING-WSN01-000.0	PSCOOLING-WSFD01-000.0	RPD	Abs. Diff	Action
			580-112198-1	580-112198-2			
Benzene		0.00	ND	ND	#VALUE!	#VALUE!	None both ND
Toluene		0.00	ND	ND	#VALUE!	#VALUE!	None both ND
Ethylbenzene		0.00	ND	ND	#VALUE!	#VALUE!	None both ND
m-Xylene & p-Xylene		0.00	ND	ND	#VALUE!	#VALUE!	None both ND
o-Xylene		0.00	ND	ND	#VALUE!	#VALUE!	None both ND
total xylenes		0.00	ND	ND	#VALUE!	#VALUE!	None both ND

RPD limits: ≤ 30% (aqueous) and ≤50% (solid) (when both sample concentrations are > 5x the LOQ) or

absolute difference between concentrations are ≤2x LOQ (when the sample or field duplicate concentrations are ≤ 5x LOQ)

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-112198-1
Analyses/Method:	TPH-Gasoline Range Organics (TPH-g, C6-C10) by EPA Method 8260D TPH-Diesel Range Organics (TPH-d, C10-C24) by EPA Method 8015D TPH-Residual Range Organics (TPH-o, C24-C40) by EPA Method 8015D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM Completed on: 09/29/2022
Reviewed by:	[redacted] (b) (6) / AECOM File Name: 580-112198-1_GRO_DRO_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 31, 2022 and April 1, 2022.

Sample ID	Lab ID	Matrix/Sample Type
PSCOOLING-WSN01-000.0	580-112198-1	Groundwater
PSCOOLING-WSFD01-000.0	580-112198-2	Field duplicate of PSCOOLING-WSN01-000.0
SUMPDRN-WSN01-000.0	580-112198-3	Groundwater
SUMP-WSN01-000.0	580-112198-4	Groundwater
A3015-SON01-002.0	580-112198-5	Soil
A3015-WGN01-002.0	580-112198-6	Groundwater

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *SW--846 Method 8015D: Nonhalogenated Organics Using GC/FID* (June 2003)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC, Department of Defense*, Revision 1 (March 2021)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody [COC])/sample integrity
- ✗ Holding times and sample preservation
- ✓ Instrument tuning
- ✓ Initial calibration/initial and continuing calibration verification
- ✓ Laboratory blanks/field blanks/equipment blanks
- ✓ Surrogate spike recoveries
- ✓ Matrix spike (MS) and matrix spike duplicate (MSD) results
- ✓ Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
- ✓ Field duplicate results
- ✓ Internal standard results
- ✓ Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Selected data points were estimated due to nonconformances of certain QC criteria (see discussion below).

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Samples listed on the COC but not included in this report were included separately as a part of SDG 580-112198-2.

Holding Times

Sample A3015-WGN01-002.0 was extracted three days outside of holding time criteria. Associated results were qualified as estimated as shown below in Table 1.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This "J" qualifier is retained during data validation.

The following results exceeded the site screening criteria:

Sample Name	Analyte	Result	LOD	Screening Criteria	Units
A3015-SON01-002.0	C10-C24	3900	37	220	mg/kg
A3015-WGN01-002.0	C10-C24	390000	5600	400	ug/L
A3015-WGN01-002.0	C24-C40	430	340	400	ug/L

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-112198-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-112198-1	A3015-WGN01-002.0	580-112198-6	8015D	C10-C24	390000	ug/L	390000 J	H2
580-112198-1	A3015-WGN01-002.0	580-112198-6	8015D	C24-C40	430	ug/L	430 J	H2

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-112198-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B	**Date**: 09/29/22	
	(using Level IV data package)	**Validator**: (b) (6)	
Number of Samples/Matrix:	5 groundwater (including 1 FD), 1 Soil	**Reviewer and Date:** (b) (6)	9/30/22
Analysis (Include Method #):	GRO C6-C10 SW-846 8260D		

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	Yes	No	Samples listed on the COC but not included in this report were included separately in SDG 580-112198-2
Sample Preservation	Yes	No	1.6 º C, 2.3 º C, 4.4 º C.
Holding Time	Yes	No	Collected 3/31/22 and 4/1/22, analyzed within HT.
Quantitation Limits	Yes	No	No dilutions. Lab DLs for ND results meet PAL.
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-386909/5, MB 580-386962/1-A, All ND
Trip/Equipment Blanks	NA	NA	
Initial Calibration	Yes	No	TAC036 03/28/22, TAC036 03/30/22, SEA046 04/04/22, SEA046 04/07/22
Initial Calibration Verification	Yes	No	ICV 580-385488/14, ICV 580-385803/28, ICV 580-386230/13, ICV 580-386734/12
Continuing Calibration Verification	Yes	No	CCVIS 580-386909/4, CCV 580-386909/14, CCV 580-386909/25, CCV 580-386909/30, CCVIS 580-386968/3, CCV 580-386968/14, criteria met.
Matrix Spike	Yes	No	Sample A3015-SON01-002.0 was spiked and recoveries were within criteria.
Matrix Spike Duplicate RPD[2]	Yes	No	
Laboratory Duplicate[2]	NA	NA	
Surrogate Standards[2]	Yes	No	
Laboratory Control Standards	Yes	No	LCS 580-386909/8, LCSD 580-386909/9, LCS 580-386962/4-A, 580-386962/4-A
Field Duplicate	Yes	No	PSCOOLING-WSN01-000.0 (580-112198-1) and PSCOOLING-WSFD01-000.0 (580-112198-2): precision criteria met.
Internal Standards[2,3]	Yes	No	
GC/MS Tunes[2]	Yes	No	
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C10)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Samples	Lab ID
PSCOOLING-WSN01-000.0	580-112198-1
PSCOOLING-WSFD01-000.0	580-112198-2
SUMPDRN-WSN01-000.0	580-112198-3
SUMP-WSN01-000.0	580-112198-4
A3015-SON01-002.0	580-112198-5
A3015-WGN01-002.0	580-112198-6

*The relative abundance of specific ions is not applicable to the GRO method since the analysis performed on the GC/MS is based on the total ion chromatograph and not a selected quantitation ion. The qualitative identification of the presence or absence of GRO in the samples is based on defining the retention time window with the analysis of a retention time standard that includes compounds which mark the start and end of the C6-C12 window, and not as the result of comparison to a reference spectrum. Quantitation is based on the use of an initial calibration which is determined using the total ion chromatograph and not a selected quantitation ion. Therefore, nonconformances noted for the BFB tunes are not applicable and data validation actions are not required.

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-112198-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B (using Level IV data package)	**Date**: 09/29/22 **Validator**: (b) (6)	
Number of Samples/Matrix:	5 groundwater (including 1 FD), 1 Soil	**Reviewer and Date:**	
Analysis (Include Method #):	DRO/ORO SW-846 8015C		

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	Yes	No	Samples listed on the COC but not included in this report were included separately in SDG 580-112198-2
Sample Preservation	Yes	No	1.6 º C, 2.3 º C, 4.4 º C.
Holding Time	No	Yes	Collected 4/1/22, analyzed within HT. Sample A3015-WGN01-002.0 was extracted 3 days outside of hold time. Associated results were qualified as estimated "J".
Quantitation Limits	No	No	Sample A3015-WGN01-002.0 was analyzed at a 50x dilution. Results for DRO and/or ORO were above PALs in some samples - see below.
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-386480/1-A, MB 580-386518/1-A, 580-387017/1-A, All ND
Equipment Blanks	NA	NA	
Initial Calibration	Yes	No	TAC013 04/01/22, TAC013 04/01/22
Initial Calibration Verification	Yes	No	ICV 580-386091/14, 580-386092/14
Continuing Calibration Verification	Yes	No	CCV 580-386539/11, CCV 580-386539/21, CCVRT 580-386676/3, 580-386676/12, 580-386676/21, 580-387023/56, 580 387023/67, 580-387027/57, 580-387027/68, CCVRT 580-387209/2, CCV 580-387209/6
Matrix Spike	No	No	A3015-SON01-002.0 was spiked. The recovery for C10-C24 was above criteria in the MS and below criteria in the MSD. The associated sample result was greater than four times the spike amount and no qualification was needed.
Matrix Spike Duplicate RPD[2]	No	No	
Laboratory Duplicate[2]	NA	NA	
Surrogate Standards[2]	Yes	No	The case narrative mentioned that A3015-WGN01-002.0 had a high surrogate recovery. The recovery was within range and no qualification was needed.
Laboratory Control Standards	Yes	No	LCS 580-386480/2-A, LCSD 580-386480/3-A, LCS 580-386518/2-A, LCSD 580-386518/3-A, LCS 580-387017/2-A, LCSD 580-387017/3-A
Field Duplicate	Yes	No	PSCOOLING-WSN01-000.0 (580-112198-1) and PSCOOLING-WSFD01-000.0 (580-112198-2): precision criteria met.
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C10)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Samples	Lab ID
PSCOOLING-WSN01-000.0	580-112198-1
PSCOOLING-WSFD01-000.0	580-112198-2
SUMPDRN-WSN01-000.0	580-112198-3
SUMP-WSN01-000.0	580-112198-4
A3015-SON01-002.0	580-112198-5
A3015-WGN01-002.0	580-112198-6

Sample	Compound	Result (ug/L)	PAL (mg/kg or ug/L)
A3015-SON01-002.0	C10-C24	3900	220
A3015-WGN01-002.0	C10-C24	380000	400
A3015-WGN01-002.0	C24-C40	430	400

Compound	QL	5x QL	PSCOOLING-WSN01-000.0	PSCOOLING-WSFD01-000.0	RPD	Abs. Diff	Action
			580-112198-1	580-112198-2			
Gasoline Range Organics (C6-C10)	0.10	1	0	0	#DIV/0!	0.0	None both ND
C10-C24	120	600	0	100	200.0	100.0	None abs diff <2X QL
C24-C40	370	1850	0	380	200.0	380	None abs diff <2X QL

RPD limits: ≤ 30% (aqueous) and ≤50% (solid) (when both sample concentrations are > 5x the LOQ) or

absolute difference between concentrations are ≤2x LOQ (when the sample or field duplicate concentrations are ≤ 5x LOQ)

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-112198-1
Analyses/Method:	Semivolatile Organic Compounds by EPA Method 8270E-SIM (1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene)
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM — Completed on: 09/28/2022
Reviewed by:	[redacted] (b) (6) / AECOM — File Name: 580-112198-1_SVOC_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on March 31, 2022 and April 1, 2022.

Sample ID	Lab ID	Matrix/Sample Type
PSCOOLING-WSN01-000.0	580-112198-1	Groundwater
PSCOOLING-WSFD01-000.0	580-112198-2	Field duplicate of PSCOOLING-WSN01-000.0
SUMPDRN-WSN01-000.0	580-112198-3	Groundwater
SUMP-WSN01-000.0	580-112198-4	Groundwater
A3015-SON01-002.0	580-112198-5	Soil
A3015-WGN01-002.0	580-112198-6	Groundwater

Data validation activities were conducted with reference to:

- *SW-846 Method 8270E: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✓	Holding times and sample preservation
✓	Instrument tuning
✓	Initial calibration/initial and continuing calibration verification
✓	Laboratory blanks/field blanks/equipment blanks
✓	Surrogate spike recoveries
NA	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
✓	Field duplicate results
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. There were no data points qualified as a result of this data review.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Samples listed on the COC but not included in this report were included separately as a part of SDG 580-112198-2.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is

retained during data validation. Laboratory limits of detection (LOD) meet screening criteria for all samples.

The following analytes exceeded the project screening criteria:

Sample Name	Analyte	Result	LOD	Screening Criteria	Units
A3015-WGN01-002.0	1-Methylnaphthalene	660	1.9	17	ug/L

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-112198-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B	**Date**: 09/28/22	
	(using Level IV data package)	**Validator**: (b) (6)	
Number of Samples/Matrix:	5 groundwater (including 1 FD), 1 Soil	**Reviewer and Date:** (b) (6)	9/29/22
Analysis (Include Method #):	SVOCs, SW846 8270E-SIM (Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene)		

DoD QSM 5.4, DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	Yes	No	Samples listed on the COC but not included in this report were included separately in SDG 580-112198-2
Sample Preservation	Yes	No	1.6 º C, 2.3 º C, 4.4 º C.
Holding Time	Yes	No	Collected 3/31/22 and 4/1/22, analyzed within HT.
Quantitation Limits	No	No	Samples A3015-SON01-002.0 and A3015-WGN01-002.0 were analyzed at a 50x dilution. Reporting limits were raised accordingly.
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-386688/1-A, 580-386740/1-A, All ND.
Other Laboratory Blanks[1,2]	NA	NA	Not applicable to these analyses.
Trip/Equipment Blanks	NA	NA	
Initial Calibration	Yes	No	ICAL 03/24/2022 Inst SEA101, criteria met
Initial Calibration Verification	Yes	No	ICV 580-385060/21, 580-378263/18 criteria met
Continuing Calibration Verification	Yes	No	CCVIS 580-386818/3, CCVC 580-386818/23, CCVIS 580-386976/3, CCVC 580-386976/20, CCVIS 580-386820/3, CCVC 580-386820/24, CCVIS 580-386978/3, CCVC 580-386978/30, criteria met
Matrix Spike	NA	NA	An MS/MSD was not analyzed on a sample in this SDG.
Matrix Spike Duplicate RPD[2]	NA	NA	
Laboratory Duplicate[2]	NA	NA	Not applicable to these analyses.
Surrogate Standards[2]	No	No	The surrogate 2,4,6-tribromophenol recovered at 0% in sample A3015-SON01-002.0. Qualification was not required for surrogates that were diluted out (sample dilution factor = 50x).
Laboratory Control Standards	Yes	No	LCS 580-386688/2-A, LCS 580-386740/2, LCSD 580-386740/3-A, criteria met
Internal Standards[2,3]	Yes	No	
Field Duplicate	Yes	No	PSCOOLING-WSN01-000.0 (580-112198-1) and PSCOOLING-WSFD01-000.0 (580-112198-2): precision criteria met.
GC/MS Tunes[2]	Yes	No	
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Samples	Lab ID
PSCOOLING-WSN01-000.0	580-112198-1
PSCOOLING-WSFD01-000.0	580-112198-2
SUMPDRN-WSN01-000.0	580-112198-3
SUMP-WSN01-000.0	580-112198-4
A3015-SON01-002.0	580-112198-5
A3015-WGN01-002.0	580-112198-6

Sample	Compound	Result (ug/L)	PAL (ug/L)
A3015-WGN01-002.0	1-Methylnaphthalene	660	17

Compound	QL	5x QL	PSCOOLING-WSN01-000.0	PSCOOLING-WSFD01-000.0	RPD	Abs. Diff	Action
			580-112198-1	580-112198-2			
1-Methylnaphthalene	0.11	0.550	0.033	0.034	3.0	0.001	None
2-Methylnaphthalene	0.22	1.100	ND	ND	#VALUE!	#VALUE!	None, both ND
Naphthalene	0.11	0.550	0.048	0.075	43.9	0.027	None, difference less than 2x QL

RPD limits: ≤ 30% (aqueous) and ≤50% (solid) (when both sample concentrations are > 5x the LOQ) or

absolute difference between concentrations are ≤2x LOQ (when the sample or field duplicate concentrations are ≤ 5x LOQ)

Facility:	RHBFS Site Characterization
Event:	Site Characterization Tunnel Cutouts
SDG:	5801121981
Guidance Document:	Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP
Prime Contractor:	AECOM, Honolulu, HI
Project Manager:	
Contract Laboratory(ies):	Eurofins Environment Testing TestAmerica, Tacoma, WA
Data Review Contractor:	
Data Review Level:	
Primary Data Reviewer:	,
Date Submitted:	

Field Sample ID	Lab Sample ID	Matrix	Type/Type Code	BNASIM	SW8015D	SW8260	SW8260D
A3015-SON01-002.0	580-112198-5	Solid	Field Sample/N	X	X	X	X
A3015-WGN01-002.0	580-112198-6	Water	Field Sample/N	X	X	X	X
PSCOOLING-WSFD01-000.0	580-112198-2	Water	Field Duplicate/FD	X	X	X	X
PSCOOLING-WSN01-000.0	580-112198-1	Water	Field Sample/N	X	X	X	X
SUMPDRN-WSN01-000.0	580-112198-3	Water	Field Sample/N	X	X	X	X
SUMP-WSN01-000.0	580-112198-4	Water	Field Sample/N	X	X	X	X

This report assesses the analytical data quality associated with the analyses listed on the preceding cover page at data validation level. This assessment has been made through a combination of automated data review (ADR) and supplemental manual review, the details of which are described below. The approach taken in the review of this data set is consistent with the requirements contained in the Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP and the additional guidance documents incorporated by reference to the extent possible. Where definitive guidance is not provided, results have been evaluated in a conservative manner using professional judgment.

Sample collection was managed and directed by AECOM, Honolulu, HI; analyses were performed by Eurofins Environment Testing TestAmerica, Tacoma, WA and were reported under sample delivery group (SDG) 5801121981. Data have been evaluated electronically based on electronic data deliverables (EDDs) provided by the laboratory, and hard copy data summary forms have also been reviewed during this effort and compared to the automated review output by the reviewers whose signatures appear on the following page. Findings based on the automated data submission and manual data verification processes are detailed in the ADR narrative and throughout this report.

All quality control (QC) elements associated with this SDG have been reviewed by a project chemist in accordance with the requirements defined for the project. This review is documented in the attached Data Review Checklists. The QC elements listed below were supported by the electronic deliverable and were evaluated using ADR processes.

Continuing Calibration Verification

Field Duplicate RPD

Lab Blank

LCS Recovery

LCS RPD

MS Recovery

MS RPD

Prep Hold Time

Surrogate

Test Hold Time

Results of the ADR process were subsequently reviewed and updated as applicable by the data review chemists identified on the signature page. Quality control elements that were not included in the electronic deliverable were reviewed manually and findings are documented within this report. Summaries of findings and associated qualified results are documented throughout this report.

A total of 3 results (4.17%) out of the 72 results (sample and field QC samples) reported are qualified based on review and 0 results (0.00%) have been rejected or deemed a serious deficiency (X qualifier). Trace values, defined as results that are qualified as estimated because they fall between the detection limit and the reporting limit/limit of quantitation, are not counted as qualified results in the above count. The qualified results are detailed throughout this report and discussed in the narrative below, where appropriate.

Narrative Comments

Analytical Method	Data Reviewer Comment

Reviewed by , ,

As the First Reviewer, I certify that I have performed a data review process in accordance with the requirements of the project guidance document, and have compared the electronic data to the laboratory's hard copy report and have verified the consistency of the reported sample results and method quality control data between the two deliverables.

(b) (6) [redacted]

September 30, 2022

As the Second Reviewer, I certify that I have performed a quality assurance review of the report generated by the First Reviewer.

Quality Control Outliers for test method BNASIM, Lab Blank

The purpose of laboratory blanks is to determine the existence and magnitude of cross-contamination problems resulting from laboratory activities. Reported results were evaluated to determine compliance with the required acceptance criteria. Summary forms were evaluated and compared to electronic data deliverables. Findings of this review, and contaminants found in laboratory blanks are listed below along with any associated qualified results.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
MB5803868641A (LB)	1-Methylnaphthalene	0.02550	< 0.019	< 0.1	ug/l	U/None*	L	

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

*Blank flags displayed in the above table identify qualification of the sample result when it is less than or equal to the LOQ/RL. Sample results above the LOQ will be qualified based on the validation type such as J+ at the sample result.

No results associated with this QC element required qualification.

Quality Control Outliers for test method BNASIM, Prep Hold Time

Hold times are ascertained based on project requirements. Holding times were determined by comparing the chain of custody records with the dates of extraction found in the electronic data deliverable and laboratory summary forms. Findings of this review, and any associated qualified results, are listed below.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
PSCOOLING-WSFD01-000.0 (FD)		7.030	< 7	< 14	days	J/UJ	H2	Prep Exceeds UWL
PSCOOLING-WSN01-000.0 (N)		7.030	< 7	< 14	days	J/UJ	H2	Prep Exceeds UWL
SUMPDRN-WSN01-000.0 (N)		7.060	< 7	< 14	days	J/UJ	H2	Prep Exceeds UWL
SUMP-WSN01-000.0 (N)		7.140	< 7	< 14	days	J/UJ	H2	Prep Exceeds UWL

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

No results associated with this QC element required qualification.

Quality Control Outliers for test method SW8015D, MS Recovery

Data for matrix spikes/matrix spike duplicates (MS/MSD) are generated to determine long-term precision and accuracy of the analytical method on various matrices and to demonstrate acceptable compound recovery by the laboratory at the time of sample analysis. These data alone cannot be used to evaluate the precision and accuracy of individual samples. However, when exercising professional judgment, MS/MSD data can be used in conjunction with other available QC information. Reported results were evaluated to determine compliance with the required acceptance criteria, and summary forms were evaluated and compared to electronic data deliverables. Findings of this review, and any associated qualified results, are listed below.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
A3015-SON01-002.0 (MS)	C10-C24 Petroleum Hydrocarbons	170.0	38 - 132	20 - 132	percent	J/None	M	
A3015-SON01-002.0 (SD)	C10-C24 Petroleum Hydrocarbons	-24.00	38 - 132	20 - 132	percent	J/X	M	

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

No results associated with this QC element required qualification.

Quality Control Outliers for test method SW8015D, Prep Hold Time

Hold times are ascertained based on project requirements. Holding times were determined by comparing the chain of custody records with the dates of extraction found in the electronic data deliverable and laboratory summary forms. Findings of this review, and any associated qualified results, are listed below.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
A3015-WGN01-002.0 (N)		9.730	< 7	< 14	days	J/UJ	H2	Prep Exceeds UWL

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

Qualified Results associated with the Prep Hold Time for SW8015D

FieldSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3015-WGN01-002.0 580-112198-6	N	C10-C24 Petroleum Hydrocarbons	6200	390000 D H	390000 J		ug/l	H2
A3015-WGN01-002.0 580-112198-6	N	C24-C40 Petroleum Hydrocarbons	390	430 H	430 J		ug/l	H2

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.

Quality Control Outliers for test method SW8260, Surrogate

Method performance for individual samples is demonstrated through spiking activities. All samples are spiked with surrogate compounds prior to sample preparation. The sample itself may produce effects due to such factors as interferences and high concentrations of analytes. Summary forms were evaluated and compared to electronic data deliverables. Surrogate results that were outside of the acceptance criteria are listed below.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
PSCOOLING-WSFD01-000.0 (FD)	1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	82.00	85 - 114	85 - 114	percent	R/R	I	
PSCOOLING-WSN01-000.0 (N)	1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	81.00	85 - 114	85 - 114	percent	R/R	I	
SUMPDRN-WSN01-000.0 (N)	1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	81.00	85 - 114	85 - 114	percent	R/R	I	
SUMP-WSN01-000.0 (N)	1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	84.00	85 - 114	85 - 114	percent	R/R	I	

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

No results associated with this QC element required qualification.

Quality Control Outliers for test method SW8260D, Lab Blank

The purpose of laboratory blanks is to determine the existence and magnitude of cross-contamination problems resulting from laboratory activities. Reported results were evaluated to determine compliance with the required acceptance criteria. Summary forms were evaluated and compared to electronic data deliverables. Findings of this review, and contaminants found in laboratory blanks are listed below along with any associated qualified results.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
MB5803869621A (LB)	m,p-Xylene	0.009690	< 0.0071	< 0.04	mg/kg	RB/R	L	
MB5803869621A (LB)	o-Xylene	0.007200	< 0.005	< 0.04	mg/kg	RB/R	L	
MB5803869621A (LB)	Xylenes, Total	0.01690	< 0.0071	< 0.04	mg/kg	RB/R	L	

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

No results associated with this QC element required qualification.

Table of All Qualified Results

Test Method: SW8015D		**Extraction Method: SW3510**						
FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3015-WGN01-002.0 580-112198-6	N	C10-C24 Petroleum Hydrocarbons	6200	390000 D H	390000 J		ug/l	H2
A3015-WGN01-002.0 580-112198-6	N	C24-C40 Petroleum Hydrocarbons	390	430 H	430 J		ug/l	H2

Test Method: SW8260D		**Extraction Method: SW5030**						
FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3015-WGN01-002.0 580-112198-6	N	o-Xylene	10.0	120 D	120 J		ug/l	V2

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Table of Results with Modified Qualifiers

Modified Qualifiers for test method BNASIM

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
PSCOOLING-WSFD01-000.0 580-112198-2	FD	1-Methylnaphthalene	0.110	0.0330 J	0.0330 J	0.0330 J	TR
PSCOOLING-WSFD01-000.0 580-112198-2	FD	2-Methylnaphthalene	0.220	0.0870 U	0.0870 UJ	0.0870 U	
PSCOOLING-WSFD01-000.0 580-112198-2	FD	Naphthalene	0.110	0.0480 J	0.0480 J	0.0480 J	TR
PSCOOLING-WSN01-000.0 580-112198-1	N	1-Methylnaphthalene	0.110	0.0340 J	0.0340 J	0.0340 J	TR
PSCOOLING-WSN01-000.0 580-112198-1	N	2-Methylnaphthalene	0.220	0.0870 U	0.0870 UJ	0.0870 U	
PSCOOLING-WSN01-000.0 580-112198-1	N	Naphthalene	0.110	0.0750 J	0.0750 J	0.0750 J	TR
SUMPDRN-WSN01-000.0 580-112198-3	N	1-Methylnaphthalene	0.110	0.0560 J	0.0560 J	0.0560 J	TR
SUMPDRN-WSN01-000.0 580-112198-3	N	2-Methylnaphthalene	0.220	0.0570 J	0.0570 J	0.0570 J	TR
SUMPDRN-WSN01-000.0 580-112198-3	N	Naphthalene	0.110	0.0920 J	0.0920 J	0.0920 J	TR
SUMP-WSN01-000.0 580-112198-4	N	1-Methylnaphthalene	0.100	0.0780 J	0.0780 J	0.0780 J	TR
SUMP-WSN01-000.0 580-112198-4	N	2-Methylnaphthalene	0.210	0.0940 J	0.0940 J	0.0940 J	TR
SUMP-WSN01-000.0 580-112198-4	N	Naphthalene	0.100	0.170	0.170 J	0.170 J	

Modified Qualifiers for test method SW8015D

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3015-SON01-002.0 580-112198-5	N	C10-C24 Petroleum Hydrocarbons	61.0	3900 J1	3900 J	3900	

Modified Qualifiers for test method SW8260

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
PSCOOLING-WSFD01-000.0 580-112198-2	FD	C6-C10 Gasoline Range Organics	100	80.0 U	80.0 R	80.0 U	
PSCOOLING-WSN01-000.0 580-112198-1	N	C6-C10 Gasoline Range Organics	100	80.0 U	80.0 R	80.0 U	
SUMPDRN-WSN01-000.0 580-112198-3	N	C6-C10 Gasoline Range Organics	100	80.0 U	80.0 R	80.0 U	
SUMP-WSN01-000.0 580-112198-4	N	C6-C10 Gasoline Range Organics	100	80.0 U	80.0 R	80.0 U	

Data Validation Report for 5801121981

Table of Results with Modified Qualifiers

Modified Qualifiers for test method SW8260D

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3015-WGN01-002.0 580-112198-6	N	o-Xylene	10.0	120 D	120	120 J	V2

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Reason Code Definitions

Code	Definition
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
L	Lab Blank
M	MS Recovery
TR	Trace Level Detect
V2	CCV

Flag Code and Definitions

Flag	Definition
J	Estimated Value
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a tentative identification.
NJ	The analyte has been tentatively identified or presumptively as present and the associated numerical value was the estimated concentration in the sample.
R	The data are rejected due to deficiencies in meeting QC criteria and may not be used for decision making.
U	Undetected: The analyte was analyzed for, but not detected.
UJ	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
X	Result may require rejection; PDT attention required

Bias

-	The result may be biased low
+	The result may be biased high

Note - The bias field is a separate field; however, it is an integral part of the final flag (qualifier) on the sample result

Review Questions

AECOM
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Chelmsford, MA 01824
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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-115521-1
Analyses/Method:	Volatile Organic Compounds (BTEX) by EPA Method 8260D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM — Completed on: 05/25/2022
Reviewed by:	[redacted] (b) (6) / AECOM — File Name: 580-115521-1_BTEX_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on April 6, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3000MISH-SOFT01-003.0	580-115521-1	Soil
A3000MISH-SOFT02-003.0	580-115521-2	Soil
A3000MISH-SOFT03-003.0	580-115521-3	Soil
Trip Blank	580-115521-4	Trip Blank

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✓	Holding times and sample preservation
✓	Instrument tuning
✓	Initial calibration/initial and continuing calibration verification
✓	Laboratory blanks/field blanks/equipment blanks
✓	Surrogate spike recoveries
NA	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
NA	Field duplicate results
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. There were no data points qualified as a result of this data review.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation.

QUALIFICATION ACTIONS

There were no sample results qualified as a result of this data review.

Laboratory: Eurofins Seattle
Laboratory SDG/Job No: 580-115521-1
Validation Level: Stage 2B
(using Level IV data package)
Number of Samples/Matrix: 3 soils, 1 TB
Analysis (Include Method #): BTEX SW846 8260D

QAPP (QSM 5.4), DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)
Chain of Custody	Yes	No
Sample Preservation	Yes	No
Holding Time	Yes	No
Quantitation Limits	Yes	No
Percent Solids (>30%)	Yes	No
Method Blanks	Yes	No
Other Laboratory Blanks[1,2]	NA	NA
Trip/Equipment Blanks	Yes	No
Initial Calibration	Yes	No
Initial Calibration Verification	Yes	No
Continuing Calibration Verification	Yes	No
Matrix Spike	NA	NA
Matrix Spike Duplicate RPD[2]	NA	NA
Laboratory Duplicate[2]	NA	NA
Surrogate Standards[2]	Yes	No
Laboratory Control Standards	Yes	No
Internal Standards[2,3]	Yes	No
ISM Relative Standard Deviation	Yes	No
Field Duplicate	NA	NA
GC/MS Tunes[2]	Yes	No
Calculation Spot Checks[3]	NA	NA

[1]May include reagent blanks, calibration blanks, etc.

[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Samples	Lab ID
A3000MISH-SOFT01-003.0	580-115521-1
A3000MISH-SOFT02-003.0	580-115521-2
A3000MISH-SOFT03-003.0	580-115521-3
Trip Blank	580-115521-4

Client/Site Name: Red Hill Site Characterization
Project Number: 60674414.00.50.01
Date: 05/25/22
Validator: [redacted]
Reviewer and Date: [redacted] 5/31/22

Comments
0.8°C
Collected 4/6/22, analyzed within HT
No dilutions. ND results at LOD meet action limits.
MB 580-387661/1-A, xylenes were detected in the method blank; however, associated results were all ND and no qualification was required.
Trip Blank was ND for BTEX.
04/07/22 Inst SEA046, criteria met
ICV 580-386730/12 within %D ≤20%
CCVIS 580-387672/2, CCVC 580-387672/21, within criteria.
An MS/MSD was not analyzed on a sample in this SDG.
Not applicable to these analyses.
Surrogate %Rs within QSM limits
LCS 580-387661/2-A, LCSD 580-387661/3-A, RPDs within lab limits.
RSD below 50%.
Not a required validation element for this project.

Note: it may not be appropriate to make a direct quantitative comparison for aqueous field blanks (such as equipment blanks reported as µg/mL) to a solid parent sample (such as a soil sample reported as mg/kg). At best, only a qualitative comparison can be made.

5pt calibration, RSD ≤15% or r2 ≥ 0.99, min RF suggested per Method 8260D (see Cal Mod 1 tab)
ICV %D ≤20%
CCV %D ≤20%

see DoD QSM QC limits tab

see DoD QSM QC limits tab

see DoD QSM QC limits tab

see DoD QSM QC limits tab

Table B-3: Preparation and Analytical Requirements for Field and QC Samples

Matrix	Analytical Group	Preparation Reference/Method SOP Analytical Reference/Method SOP	Containers	Sample Volume	Preser Requir
Unconsolidated Material	TPH-g, VOCs	Preparation Method: EPA 5035C Preparation SOP: ANA8260 Analysis Method: EPA 8260C Analysis SOP: ANA8260	2 × 10mL water-preserved; 1 × 5mL methanol-preserved; Teflon-lined septum caps	40 mL	Cool t
	TPH-d, TPH-o	Preparation Method: EPA 3550C Preparation SOP: SON004 Analysis Method: EPA 8015C Analysis SOP: ANA8015	1 × 8-oz glass jar, Teflon-lined lid	30 g	Cool t
	TPH-d, TPH-o with Silica Gel Cleanup	Preparation Method: EPA 3550C/EPA 3630 Preparation SOP: SON004/CLN004 Analysis Method: EPA 8015C Analysis SOP: ANA8015		30 g	Cool t
	PAHs	Preparation Method: EPA 3550C Preparation SOP: SON009 Analysis Method: EPA 8270D SIM Analysis SOP: ANA8270SIM		30 g	Cool t

Notes:

g	gram
H_2SO_4	sulfuric acid
HCl	hydrogen chloride
L	liter
mL	milliliter
$NaHSO_4$	sodium bisulfate
oz	ounce

vation rement	Maximum Holding Time (preparation/analysis)
o ≤6°C	7 days (water-preserved); 14 days (methanol-preserved)
o ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
o ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
o ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.

Data validation activities were conducted with reference to:

SW-846 Method 8260D Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/M

Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Departme

General Data Validation Guidelines, Department of Defense, Revision 1 (November 2019)

USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data

DoD Module 1

Note DoD Module 1 criteria (below) are based on Method 8260B; lab analyzed samples using 8260D. QSM 5.4 Table B-4 criteria of RSD ≤15% or r2 ≥ 0.99 was used to evaluate the ICAL data. Per Method 8260D, minimum RFs on Table 4 are used as guidance.

SPCCs and CCCs should have been included in the calibration standards and reported, even if individual SPCCs and CCCs are not project target analytes.

Table VIII lists those VOCs that have poor sensitivity and are considered "poor performers". The minimum average RF for the "poor performers" is 0.01. The minimum average RF for all other volatile target analytes should be ≥ 0.05.

An additional criterion is that all volatile target analytes should have a percent Relative Standard Deviation (%RSD) of ≤ 15%.

Table VI: SPCCs average RFs should meet the following criteria (Method 8260B):

Analyte	Minimum Average RF (method uses the term "mean")
Chloromethane	0.1
1,1-Dichloroethane	0.1
Bromoform	0.1
Chlorobenzene	0.3
1,1,2,2-Tetrachloroethane	0.3

Table

Analy
1,1-D
Chlor
1,2-D

Table

Analy
Aceto
2-But
Carbo
Chlor
Cyclo
1,2-D
Dichl
1,2-D
cis-1,
1,4-D
1,2-D

VII: CCCs (Method 8260B)

yte	
ichloroethene	Toluene
oform	Ethylbenzene
ichloropropane	Vinyl Chloride

VIII: VOC Poor Performers (Method 8260B):

yte	
ne	1,2-Dibromo-3-chloropropane
anone	Isopropylbenzene
on disulfide	Methyl acetate
oethane	Methylene chloride
hexane	Methylcyclohexane
ibromoethane	Methyl-tert-butyl ether
orodifluoromethane	trans-1,2-Dichloroethene
ichloropropane	4-Methyl-2-pentanone
2-Dichloroethene	2-Hexanone
ioxane	Trichlorofluoroethane
ibromo-3-chloropropane	1,1,2-Trichloro-1,2,2-triflouroethane

Matrix Unconsolidated Material

Analyte	CAS Number	Screening Criterion [a] (mg/kg)	Project LOQ Goal (mg/kg)	Project LOD Goal (mg/kg)	Laboratory-Specific Limits (mg/kg)		
					LOQ	LOD	D
TPH							
TPH-g (C5–C11)	-3547	100	33	10	TBD	TBD	TE
TPH-d (C10–C24)	-3527	220	73	22	TBD	TBD	TE
VOCs							
Benzene	71-43-2	0.30	0.10	0.030	TBD	TBD	TE
Ethylbenzene	100-41-4	3.7	1.2	0.37	TBD	TBD	TE
Toluene	108-88-3	3.2	1.1	0.32	TBD	TBD	TE
Total Xylenes	1330-20-7	2.1	0.70	0.21	TBD	TBD	TE
PAHs							
1-Methylnaphthalene	90-12-0	4.2	1.4	0.42	TBD	TBD	TE
2-Methylnaphthalene	91-57-6	4.1	1.4	0.41	TBD	TBD	TE
Naphthalene	91-20-3	4.4	1.5	0.44	TBD	TBD	TE

Notes:

mg/kg milligrams per kilogram

[a] DOH Tier 1 EALs (Summer 2016, updated January 2017),

)L

BD
BD

BD
BD
BD
BD

BD
BD
BD

DoD QSM Criteria Table C-23 Method 8260 Solid Matrix

Table C-23. Method 8260 Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
630-20-6	1,1,1,2-Tetrachloroethane	11115	101.1	7.8	78	125
71-55-6	1,1,1-Trichloroethane	12156	101.6	9.4	73	130
79-34-5	1,1,2,2-Tetrachloroethane	11670	97	8.9	70	124
79-00-5	1,1,2-Trichloroethane	11772	99.7	7.2	78	121
76-13-1	1,1,2-Trifluoro-1,2,2-trichloroethane [Freon-113]	9760	100.8	11.7	66	136
75-34-3	1,1-Dichloroethane	11856	100.4	8.1	76	125
75-35-4	1,1-Dichloroethene	12352	100.3	10.1	70	131
563-58-6	1,1-Dichloropropene	10793	100.5	8.3	76	125
87-61-6	1,2,3-Trichlorobenzene	10572	97.8	10.6	66	130
96-18-4	1,2,3-Trichloropropane	10925	99.1	8.8	73	125
526-73-8	1,2,3-Trimethylbenzene	1948	99.8	6	82	118
120-82-1	1,2,4-Trichlorobenzene	10980	98	10.4	67	129
95-63-6	1,2,4-Trimethylbenzene	11085	98.7	7.9	75	123
96-12-8	1,2-Dibromo-3-chloropropane	11380	96.6	11.7	61	132
106-93-4	1,2-Dibromoethane	11408	100.1	7.3	78	122
95-50-1	1,2-Dichlorobenzene	11785	99.1	7.2	78	121
107-06-2	1,2-Dichloroethane	12328	100.5	9.2	73	128
17060-07-0	1,2-Dichloroethane-d4	5951	103.1	10.8	71	136
540-59-0	1,2-Dichloroethene	7748	99.9	7.3	78	122
78-87-5	1,2-Dichloropropane	12145	99.5	7.8	76	123
354-23-4	1,2-Dichlorotrifluoroethane [Freon 123a]	1269	97.8	11.3	64	132
108-70-3	1,3,5-Trichlorobenzene	4723	99.4	9.6	71	128
108-67-8	1,3,5-Trimethylbenzene	11080	98.4	8.4	73	124
541-73-1	1,3-Dichlorobenzene	11619	98.9	7.4	77	121
142-28-9	1,3-Dichloropropane	10713	99.1	7.3	77	121
542-75-6	1,3-Dichloropropene	3714	101.6	8.1	77	126
106-46-7	1,4-Dichlorobenzene	11848	97.5	7.6	75	120
105-05-5	1,4-Diethylbenzene	1896	96.6	5.9	79	114
123-91-1	1,4-Dioxane	7698	96.4	13.7	55	138
544-10-5	1-Chlorohexane	2543	100.4	9.8	71	130
594-20-7	2,2-Dichloropropane	10703	99.7	11.1	67	133

Table C-23. Method 8260 Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
78-93-3	2-Butanone [MEK]	11514	99.6	16.3	51	148
126-99-8	2-Chloro-1,3-butadiene	6667	99	11.3	65	133
110-75-8	2-Chloroethyl vinyl ether	6957	96.1	17.6	43	149
95-49-8	2-Chlorotoluene	10838	98.5	7.9	75	122
591-78-6	2-Hexanone	11004	99.1	15.4	53	145
79-46-9	2-Nitropropane	4969	98.3	17.1	47	150
67-63-0	2-Propanol [Isopropyl alcohol]	1696	99.8	13.4	60	140
460-00-4	4-Bromofluorobenzene	6267	98.9	6.8	79	119
106-43-4	4-Chlorotoluene	10785	98.3	8.6	72	124
108-10-1	4-Methyl-2-pentanone [MIBK]	11364	99.6	11.6	65	135
67-64-1	Acetone	11089	99.6	21.4	36	164
75-05-8	Acetonitrile	5697	98.5	14.8	54	143

107-02-8	Acrolein [Propenal]	7528	101.1	18	47	155
107-13-1	Acrylonitrile	8293	99.7	11.4	65	134
107-05-1	Allyl chloride	6908	101.1	11.2	68	135
71-43-2	Benzene	12853	99.2	7.4	77	121
100-44-7	Benzyl chloride	2743	92.1	9.4	64	120
108-86-1	Bromobenzene	10974	99.3	7.3	78	121
74-97-5	Bromochloromethane	11023	101.4	7.8	78	125
75-27-4	Bromodichloromethane	11850	101	8.5	75	127
75-25-2	Bromoform	11890	99.1	10.8	67	132
74-83-9	Bromomethane	11416	98.3	15	53	143
75-15-0	Carbon disulfide	11132	97.9	11.5	63	132
56-23-5	Carbon tetrachloride	12090	102.3	10.7	70	135
108-90-7	Chlorobenzene	12382	99.7	6.9	79	120
124-48-1	Chlorodibromomethane	11852	100.2	8.7	74	126
75-00-3	Chloroethane	11444	98.8	13.3	59	139
67-66-3	Chloroform	12344	100.3	7.6	78	123
74-87-3	Chloromethane	11876	93.3	14.3	50	136
156-59-2	cis-1,2-Dichloroethene	11645	99.9	7.6	77	123
10061-01-5	cis-1,3-Dichloropropene	11805	99.8	8.7	74	126
1476-11-5	cis-1,4-Dichloro-2-butene	977	106	12.4	69	143

Table C-23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
110-82-7	Cyclohexane	8827	98.9	10.6	67	131
108-94-1	Cyclohexanone	3764	93.2	20.9	30	156
1868-53-7	Dibromofluoromethane	2142	98.1	6.8	78	119
74-95-3	Dibromomethane	10913	101.1	7.9	78	125
75-71-8	Dichlorodifluoromethane [Freon-12]	11467	88.9	20.1	29	149
75-43-4	Dichlorofluoromethane	717	100.8	18	47	155
60-29-7	Diethyl ether	6283	99.6	9.6	71	129
108-20-3	Diisopropyl ether	8542	98.3	9.7	69	127
64-17-5	Ethanol	3958	102.2	18.9	45	159
141-78-6	Ethyl acetate	4516	95.4	14.5	52	139
97-63-2	Ethyl methacrylate	7075	98.9	9.9	69	129
637-92-3	Ethyl tert-butyl ether	7514	98.9	9.1	72	126
100-41-4	Ethylbenzene	12427	99.1	7.7	76	122
462-06-6	Fluorobenzene	689	97.3	5.4	81	114
142-82-5	Heptane	5420	93.4	14.9	49	138
87-68-3	Hexachlorobutadiene	10264	98.1	12.4	61	135
67-72-1	Hexachloroethane	3265	102.5	10.1	72	133
110-54-3	Hexane	7116	93.6	16.1	45	142
74-88-4	Iodomethane	9457	100.9	10.1	71	131
78-83-1	Isobutyl alcohol	6162	97.5	12.6	60	135
108-21-4	Isopropyl acetate [Acetic acid]	2885	94.2	12.2	58	131
98-82-8	Isopropylbenzene	11596	100.8	11.1	68	134
179601-23-1	m/p-Xylene [3/4-Xylene]	10612	100.4	7.7	77	124
126-98-7	Methacrylonitrile	6736	99.2	11.1	66	132
79-20-9	Methyl acetate	8320	98.7	15.2	53	144
80-62-6	Methyl methacrylate	7050	98.4	11.9	63	134
1634-04-4	Methyl tert-butyl ether [MTBE]	11253	98.9	8.7	73	125
108-87-2	Methylcyclohexane	8565	99.4	11.2	66	133
75-09-2	Methylene chloride	12024	98.9	9.7	70	128
123-86-4	n-Butyl acetate	2981	95.1	11	62	128

71-36-3	n-Butyl alcohol	4800	92.9	12.6	55	131

Table C-23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
104-51-8	n-Butylbenzene	10921	98.7	9.7	70	128
103-65-1	n-Propylbenzene	10947	98.9	8.8	73	125
91-20-3	Naphthalene	10602	95.6	11.2	62	129
95-47-6	o-Xylene	11940	100	7.7	77	123
99-87-6	p-Isopropyltoluene [p-Cymene]	10953	100.3	9	73	127
76-01-7	Pentachloroethane	5957	102	11.1	69	135
107-12-0	Propionitrile [Ethyl cyanide]	6734	101	11.1	68	134
135-98-8	sec-Butylbenzene	10960	99	8.8	73	126
100-42-5	Styrene	11809	100.2	8	76	124
994-05-8	tert-Amyl methyl ether [TAME]	7153	99.8	8.9	73	126
75-65-0	tert-Butyl alcohol	7492	100.5	10.7	68	133
98-06-6	tert-Butylbenzene	10974	98.8	8.6	73	125
127-18-4	Tetrachloroethene	12091	100.5	9.2	73	128
109-99-9	Tetrahydrofuran	8039	98	12.4	61	135
108-88-3	Toluene	12499	99.3	7.3	77	121
2037-26-5	Toluene-d8	6232	100.7	5.2	85	116
156-60-5	trans-1,2-Dichloroethene	11849	99.2	8.6	74	125
10061-02-6	trans-1,3-Dichloropropene	11805	100.9	9.8	71	130
110-57-6	trans-1,4-Dichloro-2-butene	8307	98.6	12.3	62	136
79-01-6	Trichloroethene	12440	100.2	7.6	77	123
75-69-4	Trichlorofluoromethane [Freon-11]	11530	101	13.1	62	140
108-05-4	Vinyl acetate	7260	100.3	16.9	50	151
75-01-4	Vinyl chloride	12129	95.6	13.2	56	135
1330-20-7	Xylenes [total]	8623	100.7	7.7	78	124

DoD QSM Criteria Table C-24 Method 8260 Aqueous Matrix

Table C-24. Method 8260 Aqueous Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
630-20-6	1,1,1,2-Tetrachloroethane	24511	101.1	7.6	78	124
71-55-6	1,1,1-Trichloroethane	28223	102.7	9.6	74	131
CAS ID	**Analyte**	**N Records**	**Mean**	**Standard Deviation**	**Lower Control Limit**	**Upper Control Limit**
79-34-5	1,1,2,2-Tetrachloroethane	27450	96.4	8.3	71	121
79-00-5	1,1,2-Trichloroethane	27338	99.5	6.5	80	119
76-13-1	1,1,2-Trifluoro-1,2,2-trichloroethane [Freon-113]	21122	103	11.1	70	136
75-34-3	1,1-Dichloroethane	28154	101.3	8	77	125

75-35-4	1,1-Dichloroethene	29436	101	10	71	131
563-58-6	1,1-Dichloropropene	23631	102	7.8	79	125
87-61-6	1,2,3-Trichlorobenzene	24271	98.7	10.1	69	129
96-18-4	1,2,3-Trichloropropane	24525	97.5	8	73	122
526-73-8	1,2,3-Trimethylbenzene	2965	100.9	6.2	82	120
120-82-1	1,2,4-Trichlorobenzene	25290	99.8	10.1	69	130
95-63-6	1,2,4-Trimethylbenzene	27917	99.6	8	76	124
96-12-8	1,2-Dibromo-3-chloropropane	24955	94.9	11.1	62	128
106-93-4	1,2-Dibromoethane	29096	99	7.2	77	121
95-50-1	1,2-Dichlorobenzene	27583	99.4	6.5	80	119
107-06-2	1,2-Dichloroethane	32965	100.3	9.2	73	128
17060-07-0	1,2-Dichloroethane-d4	8673	99.5	6.1	81	118
540-59-0	1,2-Dichloroethene	18667	100.2	7.1	79	121
78-87-5	1,2-Dichloropropane	27787	100.1	7.2	78	122
354-23-4	1,2-Dichlorotrifluoroethane [Freon 123a]	3144	103.1	10.9	70	136
108-70-3	1,3,5-Trichlorobenzene	10037	102.1	9.2	75	130
108-67-8	1,3,5-Trimethylbenzene	27820	99.5	8.1	75	124
106-99-0	1,3-Butadiene	1202	100.6	19.2	43	158
541-73-1	1,3-Dichlorobenzene	26951	99.7	6.5	80	119
142-28-9	1,3-Dichloropropane	23811	99.1	6.5	80	119
542-75-6	1,3-Dichloropropene	9784	99.9	7.6	77	123
106-46-7	1,4-Dichlorobenzene	27715	98.3	6.5	79	118
105-05-5	1,4-Diethylbenzene	1980	98.4	6.4	79	118
123-91-1	1,4-Dioxane	17866	99	13.4	59	139
544-10-5	1-Chlorohexane	5790	99.6	8	76	124
540-84-1	2,2,4-Trimethylpentane [Isooctane]	5432	95.2	12.3	58	132

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
594-20-7	2,2-Dichloropropane	23775	99.7	13.2	60	139
75-85-4	2-Butanol	4332	92.7	9.1	66	120
78-93-3	2-Butanone [MEK]	26659	99.6	14.6	56	143
126-99-8	2-Chloro-1,3-butadiene	15673	100	11.7	65	135
110-75-8	2-Chloroethyl vinyl ether	18225	94.7	14.7	51	139
95-49-8	2-Chlorotoluene	23750	100	7.2	79	122
591-78-6	2-Hexanone	25368	97.9	13.5	57	139
91-57-6	2-Methylnaphthalene	3754	79.4	20.9	17	142
79-46-9	2-Nitropropane	10213	92.6	14.5	49	136
67-63-0	2-Propanol [Isopropyl alcohol]	2034	98.8	14.4	56	142
624-95-3	3,3-Dimethyl-1-butanol	6491	90.9	13.9	49	133
460-00-4	4-Bromofluorobenzene	9971	99.7	4.9	85	114
106-43-4	4-Chlorotoluene	23616	99.9	7.4	78	122
108-10-1	4-Methyl-2-pentanone [MIBK]	25796	98.5	10.6	67	130
67-64-1	Acetone	25006	99.5	20.1	39	160
75-05-8	Acetonitrile	13308	95.8	15.2	50	142
107-02-8	Acrolein [Propenal]	16380	96.8	19.3	39	155

107-13-1	Acrylonitrile	20173	99	11.9	63	135
107-05-1	Allyl chloride	15758	99	10.4	68	130
71-43-2	Benzene	34376	99.4	6.9	79	120
100-44-7	Benzyl chloride	10675	90.1	15.9	42	138
108-86-1	Bromobenzene	23762	99.7	6.7	80	120
74-97-5	Bromochloromethane	24356	100.8	7.5	78	123
75-27-4	Bromodichloromethane	26888	101.8	7.8	79	125
75-25-2	Bromoform	27675	97.8	10.8	66	130
74-83-9	Bromomethane	26717	97	14.7	53	141
75-15-0	Carbon disulfide	25719	98.8	11.5	64	133
56-23-5	Carbon tetrachloride	28870	103.8	10.7	72	136
108-90-7	Chlorobenzene	29802	100	6.1	82	118
124-48-1	Chlorodibromomethane	27424	100	8.5	74	126
75-45-6	Chlorodifluoromethane	7197	84.4	14.9	40	129
75-00-3	Chloroethane	27069	99	13	60	138

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
67-66-3	Chloroform	29373	101.1	7.5	79	124
74-87-3	Chloromethane	27697	94.5	15	50	139
156-59-2	cis-1,2-Dichloroethene	27935	100.1	7.5	78	123
10061-01-5	cis-1,3-Dichloropropene	27197	99.5	8	75	124
1476-11-5	cis-1,4-Dichloro-2-butene	1524	101.5	14.9	57	146
110-82-7	Cyclohexane	20438	100.4	10	71	130
1868-53-7	Dibromofluoromethane	5702	99.1	6.5	80	119
74-95-3	Dibromomethane	24473	101.1	7.3	79	123
75-71-8	Dichlorodifluoromethane [Freon-12]	25410	92	20.1	32	152
75-43-4	Dichlorofluoromethane	1504	101.5	9.8	72	131
60-29-7	Diethyl ether	17189	98.6	10.2	68	129
108-20-3	Diisopropyl ether	22989	97.5	10.3	67	128
64-17-5	Ethanol	9543	99.2	17.1	48	151
141-78-6	Ethyl acetate	9208	96.8	13.9	55	138
97-63-2	Ethyl methacrylate	16674	98.7	9	72	126
637-92-3	Ethyl tert-butyl ether	19841	98.3	9.4	70	127
100-41-4	Ethylbenzene	33325	99.8	7	79	121
462-06-6	Fluorobenzene	1373	97.9	6.1	80	116
142-82-5	Heptane	11878	94.4	15	49	140
87-68-3	Hexachlorobutadiene	23535	100.1	11.3	66	134
67-72-1	Hexachloroethane	8718	102.9	10.3	72	134
110-54-3	Hexane	15545	95.5	15.9	48	143
74-88-4	Iodomethane	20229	100	10.4	69	131
78-83-1	Isobutyl alcohol	14123	97.7	11.7	63	133
108-21-4	Isopropyl acetate [Acetic acid]	7216	97.8	11.6	63	133
98-82-8	Isopropylbenzene	28636	101.5	9.9	72	131
179601-23-1	m/p-Xylene [3/4-Xylene]	28168	100.5	6.9	80	121
126-98-7	Methacrylonitrile	15982	97.9	11.6	63	133
79-20-9	Methyl acetate	19698	96	13.2	56	136

80-62-6	Methyl methacrylate	16524	97.7	10.2	67	128
1634-04-4	Methyl tert-butyl ether [MTBE]	29660	97.3	8.8	71	124

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
108-87-2	Methylcyclohexane	20025	101.8	10.1	72	132
75-09-2	Methylene chloride	27659	99.4	8.3	74	124
123-86-4	n-Butyl acetate	7247	96.8	9.4	69	125
71-36-3	n-Butyl alcohol	10122	95.1	12	59	131
104-51-8	n-Butylbenzene	24088	101.1	8.8	75	128
109-60-4	n-Propyl acetate	602	100.8	8.3	76	126
103-65-1	n-Propylbenzene	24419	101	8.5	76	126
91-20-3	Naphthalene	27847	94.6	11.3	61	128
95-47-6	o-Xylene	31776	100	7.2	78	122
99-87-6	p-Isopropyltoluene [p-Cymene]	24335	102	8.5	77	127
76-01-7	Pentachloroethane	11688	101.1	10.7	69	133
109-66-0	Pentane	3915	74.8	19.7	16	134
107-12-0	Propionitrile [Ethyl cyanide]	15701	99.9	12	64	136
135-98-8	sec-Butylbenzene	24191	101.1	8.1	77	126
100-42-5	Styrene	26985	100.5	7.6	78	123
994-05-8	tert-Amyl methyl ether [TAME]	19726	98.1	10.1	68	128
75-65-0	tert-Butyl alcohol	21112	98.6	10.1	68	129
762-75-4	tert-Butyl formate	6651	98.1	11.1	65	132
98-06-6	tert-Butylbenzene	23919	101	7.7	78	124
127-18-4	Tetrachloroethene	29017	101.3	9.3	74	129
109-99-9	Tetrahydrofuran	18021	95	12.8	57	133
108-88-3	Toluene	33510	100.1	6.8	80	121
2037-26-5	Toluene-d8	9809	100.4	3.8	89	112
156-60-5	trans-1,2-Dichloroethene	27663	99.5	8.2	75	124
10061-02-6	trans-1,3-Dichloropropene	27134	100	8.9	73	127
110-57-6	trans-1,4-Dichloro-2-butene	19320	91.5	16.1	43	140
79-01-6	Trichloroethene	30150	101.1	7.3	79	123
75-69-4	Trichlorofluoromethane [Freon-11]	26108	103	12.8	65	141
108-05-4	Vinyl acetate	18941	100.2	15.3	54	146
75-01-4	Vinyl chloride	29472	97.4	13.2	58	137
1330-20-7	Xylenes [total]	23426	100.1	7	79	121

Data Qualification Reason Codes

Reason Code	Reason Code Description
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds LinearCalibration Range
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank

Data Qualification Reason Codes

V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degreec C.
Y1	False Positive
Y2	Data rejected due to radiological anomolies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of ana
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or ope

a concentration less than 5X the concentration detected in

lyses for the analyte/compound by the stated method and

ning CCV.

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-115521-1
Analyses/Method:	TPH-Gasoline Range Organics (TPH-g, C6-C12) by EPA Method 8260D TPH-Diesel Range Organics (TPH-d, C10-C24) by EPA Method 8015D TPH-Residual Range Organics (TPH-o, C24-C40) by EPA Method 8015D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM — Completed on: 05/26/2022
Reviewed by:	[redacted] (b) (6) / AECOM — File Name: 580-115521-1_GRO_DRO_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on April 6, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3000MISH-SOFT01-003.0	580-115521-1	Soil
A3000MISH-SOFT02-003.0	580-115521-2	Soil
A3000MISH-SOFT03-003.0	580-115521-3	Soil
Trip Blank	580-115521-4	Trip Blank

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *SW--846 Method 8015D: Nonhalogenated Organics Using GC/FID* (June 2003)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC, Department of Defense*, Revision 1 (March 2021)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✓	Holding times and sample preservation
✓	Instrument tuning
✓	Initial calibration/initial and continuing calibration verification
✗	Laboratory blanks/field blanks/equipment blanks
✓	Surrogate spike recoveries
NA	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
NA	Field duplicate results
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Select data points were estimated due to nonconformances of certain QC criteria (see discussion below). Qualified sample results are presented in Table 1.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation.

The following positive results exceeded the site screening criteria:

Sample Name	Analyte	Result	LOD	Screening Criteria	Units
A3000MISH-SOFT01-003.0	TPH-d	360	25	220	mg/kg

Trip Blank Results

GRO was detected above the LOD but below the LOQ in the trip blank. The detected results for samples were qualified either as estimated "J" or nondetect “U”, as shown in Table 1, below based on if the detection exceeded the LOQ.

Relative Standard Deviation

RSD of GRO for the sample, duplicate, and triplicate was above criteria. Associated results were qualified as estimated "J/UJ" as shown in Table 1.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-112521-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-112521-1	A3000MISH-SOFT02-003.0	580-115521-1	8260D	TPH-g	5.1 U	mg/kg	5.1 UJ	D4
580-112521-1	A3000MISH-SOFT02-003.0	580-115521-2	8260D	TPH-g	35	mg/kg	35 J+	T/D4
580-112521-1	A3000MISH-SOFT03-003.0	580-115521-3	8260D	TPH-g	69	mg/kg	69 J+	T/D4

Laboratory: Eurofins Seattle
Laboratory SDG/Job No: 580-115521-1
Validation Level: Stage 2B
(using Level IV data package)
Number of Samples/Matrix: 3 soils, 1 TB
Analysis (Include Method #): GRO C6-C12 SW-846 8260D

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)
Chain of Custody	Yes	No
Sample Preservation	Yes	No
Holding Time	Yes	No
Quantitation Limits	Yes	No
Percent Solids (>30%)	Yes	No
Method Blanks	Yes	No
Trip/Equipment Blanks	Yes	No
Initial Calibration	Yes	No
Initial Calibration Verification	Yes	No
Continuing Calibration Verification	Yes	No
Matrix Spike	NA	NA
Matrix Spike Duplicate RPD[2]	NA	NA
Laboratory Duplicate[2]	NA	NA
Surrogate Standards[2]	Yes	No
Laboratory Control Standards	Yes	No
ISM Relative Standard Deviation	No	Yes
Field Duplicate	NA	NA
Internal Standards[2,3]	Yes	No
GC/MS Tunes[2]	Yes	No
Calculation Spot Checks[3]	NA	NA

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C12)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Samples	Lab ID	
A3000MISH-SOFT01-003.0	580-115521-1	Soil
A3000MISH-SOFT02-003.0	580-115521-2	Soil
A3000MISH-SOFT03-003.0	580-115521-3	Soil
Trip Blank	580-115521-4	Trip Blank

*The relative abundance of specific ions is not applicable to the GRO method since the analysis
qualitative identification of the presence or absence of GRO in the samples is based on defining
start and end of the C6-C12 window, and not as the result of comparison to a reference spectru
and not a selected quantitation ion. Therefore, nonconformances noted for the BFB tunes are r

Client/Site Name: Red Hill Site Characterization
Project Number: 60674414.00.50.01
Date: 05/26/22
Validator: [redacted]
Reviewer and Date: [redacted] 5/31/22

Comments
0.8°C
Collected 4/6/22, analyzed within HT
No dilutions. Results for GRO meet PAL (100 mg/kg).
MB 580-387661/1-A was ND.
GRO was detected in the Trip Blank. Associated sample results were qualified as nondetect "U" or estimated "J".
SEA046 04/04/22, SEA046 04/07/2022 meet criteria
ICV 580-386230/13, ICV 580-386734/12 meet criteria.
CCVIS 580-387675/3, CCV 580-387675/14, CCV 580-387675/20 meet criteria
An MS/MSD was not analyzed on a sample in this SDG.
Surrogate BFB within QSM limits
LCS 580-387661/4-A, LCSD 580-387661/5-A meet criteria
RSD of GRO for the sample, duplicate, and triplicate was above criteria. Associated results were qualified as estimated "J/UJ".
Not a required validation element for this project.

s performed on the GC/MS is based on the total ion chromatograph and not a selected quantitation ion. The
g the retention time window with the analysis of a retention time standard that includes compounds which mark the
ım. Quantitation is based on the use of an initial calibration which is determined using the total ion chromatograph
not applicable and data validation actions are not required.

Five-pt cal, RSD ≤ 15% or r2 ≥0.99

ICV %D ≤20%
CCV %D ≤20%

see DoD QSM QC limits tab

see DoD QSM QC limits tab
see DoD QSM QC limits tab

Laboratory: Eurofins Seattle
Laboratory SDG/Job No: 580-115521-1
Validation Level: Stage 2B
(using Level IV data package)
Number of Samples/Matrix: 3 soils
Analysis (Include Method #): DRO/ORO SW-846 8015C
DRO C10-C24, ORO C24-C40

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)
Chain of Custody	Yes	No
Sample Preservation	Yes	No
Holding Time	Yes	No
Quantitation Limits	No	No
Percent Solids (>30%)	Yes	No
Method Blanks	Yes	No
Equipment Blanks	NA	NA
Initial Calibration	Yes	No
Initial Calibration Verification	Yes	No
Continuing Calibration Verification	Yes	No
Matrix Spike	NA	NA
Matrix Spike Duplicate RPD[2]	NA	NA
Laboratory Duplicate[2]	NA	NA
Surrogate Standards[2]	Yes	No
Laboratory Control Standards	Yes	No
ISM Relative Standard Deviation	Yes	No
Field Duplicate	NA	NA
Calculation Spot Checks[3]	NA	NA

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C12)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Sample	Compound	Result (mg/kg)
A3000MISH-SOFT01-003.0	C10-C24	360

Samples	Lab ID	
A3000MISH-SOFT01-003.0	580-115521-1	Soil
A3000MISH-SOFT02-003.0	580-115521-2	Soil
A3000MISH-SOFT03-003.0	580-115521-3	Soil

Client/Site Name: Red Hill Site Characterization
Project Number: 60674414.00.50.01
Date: 05/26/22
Validator: [redacted]
Reviewer and Date: [redacted] 5/31/22

Comments
0.8°C
Collected 4/6/22, analyzed within HT
Results for DRO was above PAL (220 mg/kg) in a sample - see below.
MB 580-387509/1-A, All ND
TAC020 4/11/22 within criteria
ICV 580-387027/14,within criteria
CCVRT 580-387706/3, CCV 580-387706/14, CCV 580-387706/22 within criteria
An MS/MSD was not analyzed on a sample in this SDG.
LCS 580-387509/2-A, LCSD 580-387509/3-A, within limits
RSD under 50%
Not a required validation element for this project.

PAL (mg/kg)
220

Five-pt cal, RSD ≤ 20% or r2 ≥0.99
ICV %D ≤20%
CCV %D ≤20%

see DoD QSM QC limits tab

see DoD QSM QC limits tab
see DoD QSM QC limits tab

Data validation activities were conducted with reference to:

SW-846 Method 8260D Volatile Organic Compounds by Gas Chromatography/Mass Sp
SW-846 Method 8015C: Nonhalogenated Organics by Gas Chromatography (February

- Module 1 Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by
General Data Validation Guidelines, Department of Defense , Revision 1 (November 201
USEPA Contract Laboratory Program National Functional Guidelines for Organic Superf

Table B-3: Preparation and Analytical Requirements for Field and QC Samples

Matrix	Analytical Group	Preparation Reference/Method SOP Analytical Reference/Method SOP	Containers
Unconsolidated Material	TPH-g, VOCs	Preparation Method: EPA 5035C Preparation SOP: ANA8260 Analysis Method: EPA 8260C Analysis SOP: ANA8260	2 × 10mL water-preserved; 1 × 5mL methanol-preserved; Teflon-lined septum caps
	TPH-d, TPH-o	Preparation Method: EPA 3550C Preparation SOP: SON004 Analysis Method: EPA 8015C Analysis SOP: ANA8015	1 × 8-oz glass jar, Teflon-lined lid
	TPH-d, TPH-o with Silica Gel Cleanup	Preparation Method: EPA 3550C/EPA 3630 Preparation SOP: SON004/CLN004 Analysis Method: EPA 8015C Analysis SOP: ANA8015	
	PAHs	Preparation Method: EPA 3550C Preparation SOP: SON009 Analysis Method: EPA 8270D SIM Analysis SOP: ANA8270SIM	

Notes:

g	gram
H_2SO_4	sulfuric acid
HCl	hydrogen chloride
L	liter
mL	milliliter
$NaHSO_4$	sodium bisulfate
oz	ounce

Sample Volume	Preservation Requirement	Maximum Holding Time (preparation/analysis)
40 mL	Cool to ≤6°C	7 days (water-preserved); 14 days (methanol-preserved)
30 g	Cool to ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
30 g	Cool to ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
30 g	Cool to ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.

Table C-13. Method 8015 (MOD) Solid Matrix					
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit
460-00-4	4-Bromofluorobenzene	1263	100.7	11.1	67
303-04	Diesel Range Organics (DRO)	2184	85.2	15.7	38
307-27	Gasoline Range Organics (GRO)	1134	100.3	7.2	79
307-51	Motor Oil	658	72.2	11.2	39
84-15-1	o-Terphenyl	314	87.4	14.1	45

Table C-14. Method 8015 (MOD) Aqueous Matrix					
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit
460-00-4	4-Bromofluorobenzene	756	101	10.8	69
303-04	Diesel Range Organics (DRO)	1757	83.7	16	36
307-27	Gasoline Range Organics (GRO)	971	99.9	7.3	78
307-51	Motor Oil	573	76.9	12.1	41
84-15-1	o-Terphenyl	299	90.5	11.4	56
630-02-4	Octacosane	130	101.1	13.8	60

Upper Control Limit
134
132
122
106
130

Upper Control Limit
133
132
122
113
125
142

Matrix Unconsolidated Material

Analyte	CAS Number	Screening Criterion [a] (mg/kg)	Project LOQ Goal (mg/kg)	Project LOD Goal (mg/kg)	Laboratory-Specific Limits (mg/kg)		
					LOQ	LOD	D
TPH							
TPH-g (C5–C11)	-3547	100	33	10	TBD	TBD	TE
TPH-d (C10–C24)	-3527	220	73	22	TBD	TBD	TE
VOCs							
Benzene	71-43-2	0.30	0.10	0.030	TBD	TBD	TE
Ethylbenzene	100-41-4	3.7	1.2	0.37	TBD	TBD	TE
Toluene	108-88-3	3.2	1.1	0.32	TBD	TBD	TE
Total Xylenes	1330-20-7	2.1	0.70	0.21	TBD	TBD	TE
PAHs							
1-Methylnaphthalene	90-12-0	4.2	1.4	0.42	TBD	TBD	TE
2-Methylnaphthalene	91-57-6	4.1	1.4	0.41	TBD	TBD	TE
Naphthalene	91-20-3	4.4	1.5	0.44	TBD	TBD	TE

Notes:

mg/kg milligrams per kilogram

[a] DOH Tier 1 EALs (Summer 2016, updated January 2017),

)L

BD
BD

BD
BD
BD
BD

BD
BD
BD

Data Qualification Reason Codes

Reason Code	Reason Code Description
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds LinearCalibration Range
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank

Data Qualification Reason Codes

V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degreec C.
Y1	False Positive
Y2	Data rejected due to radiological anomolies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of ana
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or ope

a concentration less than 5X the concentration detected in

lyses for the analyte/compound by the stated method and

ning CCV.

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-115521-1
Analyses/Method:	Semivolatile Organic Compounds by EPA Method 8270E-SIM (1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene)
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM Completed on: 05/26/2022
Reviewed by:	[redacted] (b) (6) / AECOM File Name: 580-115521-1_SVOC SIM_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on April 6, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3000MISH-SOFT01-003.0	580-115521-1	Soil
A3000MISH-SOFT02-003.0	580-115521-2	Soil
A3000MISH-SOFT03-003.0	580-115521-3	Soil

Data validation activities were conducted with reference to:

- *SW-846 Method 8270E: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓ Data completeness (chain-of-custody [COC])/sample integrity
✓ Holding times and sample preservation
✓ Instrument tuning

✓	Initial calibration/initial and continuing calibration verification
✓	Laboratory blanks/field blanks/equipment blanks
✓	Surrogate spike recoveries
✓	Matrix spike (MS) and matrix spike duplicate (MSD) results
✓	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
NA	Field duplicate results
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. There were no data points qualified as a result of this data review.

RESULTS

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation. Laboratory limits of detection (LOD) meet screening criteria for all samples.

Relative Standard Deviation

Relative Standard Deviation (RSD) for naphthalene, 2-methylnaphthalene, and 1-methylnaphthalene of the sample, duplicate, and triplicate was above criteria. Associated results were qualified as estimated "J/UJ" as shown below in Table 1.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

AECOM
250 Apollo Drive
Chelmsford, MA 01824
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978 905 2100 tel
978 905 2101 fax

Memorandum

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-112521-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-112521-1	A3000MISH-SOFT01-003.0	580-115521-1	8270E SIM	1-Methylnaphthalene	ND	mg/kg	UJ	D4
580-112521-1	A3000MISH-SOFT01-003.0	580-115521-1	8270E SIM	2-Methylnaphthalene	ND	mg/kg	UJ	D4
580-112521-1	A3000MISH-SOFT01-003.0	580-115521-1	8270E SIM	Naphthalene	ND	mg/kg	UJ	D4
580-112521-1	A3000MISH-SOFT02-003.0	580-115521-2	8270E SIM	1-Methylnaphthalene	0.0063	mg/kg	J	D4
580-112521-1	A3000MISH-SOFT02-003.0	580-115521-2	8270E SIM	2-Methylnaphthalene	0.0063	mg/kg	J	D4
580-112521-1	A3000MISH-SOFT02-003.0	580-115521-2	8270E SIM	Naphthalene	0.011	mg/kg	J	D4
580-112521-1	A3000MISH-SOFT03-003.0	580-115521-3	8270E SIM	1-Methylnaphthalene	0.0060	mg/kg	J	D4
580-112521-1	A3000MISH-SOFT03-003.0	580-115521-3	8270E SIM	2-Methylnaphthalene	ND	mg/kg	UJ	D4
580-112521-1	A3000MISH-SOFT03-003.0	580-115521-3	8270E SIM	Naphthalene	0.017	mg/kg	J	D4

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-115521-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B	**Date**: 05/26/22	
	(using Level IV data package)	**Validator**: [redacted]	
Number of Samples/Matrix:	3 soils	**Reviewer and Date:** [redacted] 5/31/22	
Analysis (Include Method #):	SVOCs, SW846 8270E-SIM (Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene)		

DoD QSM 5.4, DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	Yes	No	
Sample Preservation	Yes	No	0.8°c
Holding Time	Yes	No	Collected 4/6/22, analyzed within HT
Quantitation Limits	Yes	No	No dilutions. ND results at LOD meet action limits.
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-387403/1-A, All ND
Other Laboratory Blanks[1,2]	NA	NA	Not applicable to these analyses.
Trip/Equipment Blanks	NA	NA	
Initial Calibration	Yes	No	ICAL 3/24/2022, Inst SEA101, criteria met
Initial Calibration Verification	Yes	No	ICV 580-385060/21, within criteria
Continuing Calibration Verification	Yes	No	CCVIS 580-387732/3, CCVC 580-387732/21, within criteria
Matrix Spike	Yes	No	Sample A3000MISH-SOFT02-003.0 spiked; within criteria
Matrix Spike Duplicate RPD[2]	Yes	No	
Laboratory Duplicate[2]	NA	NA	Not applicable to these analyses.
Surrogate Standards[2]	Yes	No	%Rs within lab limits (per QSM) for PAH surrogates fluoranthene-d10 and 2-methylnaphthalene-d10
Laboratory Control Standards	Yes	No	LCS 580-387403/2-A within criteria
Internal Standards[2,3]	Yes	No	
ISM Relative Standard Deviation	No	Yes	RSDs for naphthalene, 2-methylnaphthalene, and 1-methylnaphthalene of the sample, duplicate, and triplicate were above criteria. Associated results were qualified as estimated "J/UJ".
Field Duplicate	NA	NA	
GC/MS Tunes[2]	Yes	No	
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Data validation activities were conducted with reference to:

SW-846 Method 8270E Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS

Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of

General Data Validation Guidelines, Department of Defense, Revision 1 (November 2019)

USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Revi

f Defense, Revision 1 (May 2020)

iew (November 2020)

DoD Module 1

Note DoD Module 1 criteria (below) are based on Method 8270D; lab analyzed samples using 8270E-SIM. QSM 5.4 Table B-22 criteria of RSD ≤20% or r2 ≥ 0.99 was used to evaluate the ICAL data. Per Method 8270E, minimum RFs on Table 4 are used as guidance.

Table IX: SVOC RF (Method 8270D)

Analyte	Minimum Average RF (method uses the term "mean")
Acenaphthylene	0.9
Acenaphthene	0.9
Fluorene	0.9
Phenol	0.8
2-Chlorophenol	0.8
2-Chloronaphthalene	0.8
Dibenzofuran	0.8
Benzo(a)anthracene	0.8
bis(2-Chloroethyl)ether	0.7
2-Methylphenol	0.7
Naphthalene	0.7
Phenanthrene	0.7
Anthracene	0.7
Chrysene	0.7
Benzo(b)fluoranthene	0.7
Benzo(k)fluoranthene	0.7

Analyte	Minimum Average RF (method uses the term "mean")
Benzo(a)pyrene	0.7
4-Methylphenol	0.6
Fluoranthene	0.6
Pyrene	0.6
N-nitroso-di-n-propylamine	0.5
Indeno(1,2,3-cd)pyrene	0.5
Benzo(ghi)peylene	0.5
Isophorone	0.4
2-Methylnaphthalene	0.4
4-Chlorophenylphenylether	0.4
Dibenz(a,h)anthracene	0.4
Hexachloroethane	0.3
bis(2-Chloroethoxy)methane	0.3
Nitrobenzene	0.2

DoD Mod 1

If any SVOC
RF less thar

If the avera
and associa

A minimum
coefficients
instrument
value shoul

A minimum
correlation
Some instru
r2, the valu

2,4-Dimethylphenol	0.2
2,4-Dichlorophenol	0.2
4-Chloro-3-methylphenol	0.2
2,4,6-Trichlorophenol	0.2
2,4,5-Trichlorphenol	0.2
2,6-Dinitrotoluene	0.2
2,4-Dinitrotoluene	0.2
2-Nitrophenol	0.1
4-Bromophenylphenylether	0.1
Hexachlorobenzene	0.1
Hexachlorocyclopentadiene	0.05
Pentachlorophenol	0.05
Benzaldehyde	0.01
2,2'-Oxybis-(1-chloropropane)	0.01

Analyte	**Minimum Average RF (method uses the term "mean")**
Acetophenone	0.01
4-Chloroaniline	0.01
Hexachlorobutadiene	0.01
Caprolactam	0.01
1,1'-Biphenyl	0.01
2-Nitroaniline	0.01
Dimethyl phthalate	0.01
3-Nitroaniline	0.01
2,4-Dinitrophenol	0.01
4-Nitrophenol	0.01
Diethyl phthalate	0.01
1,2,4,5-Tetrachlorobenzene	0.01
4-Nitroaniline	0.01
4,6-Dinitro-2-methylphenol	0.01
N-Nitrosodiphenylamine	0.01
Atrazine	0.01
Carbazole	0.01
Di-n-butyl phthalate	0.01
Butyl benzyl phthalate	0.01
3,3'-Dichlorobenzidine	0.01
bis(2-ethylhexyl)phthalate	0.01
Di-n-octylphthalate	0.01
2,3,4,6-Tetrachlorophenol	0.01

. (8270D)

: analyte listed above (except those with an average RF of 0.01) has an average
ı that listed in the table, qualify detects J and non-detects UJ.

.ge RF for any target analyte is < 0.01, associated detects should be qualified J
ıted non-detects should be qualified X.

ı of five standards is required for a linear regression. Evaluate the correlation
; (r) for all applicable target analytes. The r value should be ≥ 0.995. Some
ation reports coefficient of determination (r2). If the instrument reports r2, the
d be ≥ 0.99.

ı of six standards is required for a second order (quadratic) curve. Evaluate the
coefficients(r) for all applicable target analytes. The r value should be ≥ 0.995.
ımentation reports coefficient of determination (r2). If the instrument reports
e should be ≥ 0.99.

Table C-27 8270 SIM SOLID

Table C-27. Method 8270 SIM Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
90-12-0	1-Methylnaphthalene	2267	76.6	11.3	43	111
95-95-4	2,4,5-Trichlorophenol	169	79.9	14.9	35	125
91-58-7	2-Chloronaphthalene	615	76.7	10.5	45	108
321-60-8	2-Fluorobiphenyl	1961	80.6	11.6	46	115
91-57-6	2-Methylnaphthalene	2535	76.8	12.5	39	114
83-32-9	Acenaphthene	2813	77.7	11.2	44	111
208-96-8	Acenaphthylene	2761	77.1	12.8	39	116
120-12-7	Anthracene	2812	82.1	10.7	50	114
56-55-3	Benz(a)anthracene	2827	88	11.4	54	122
50-32-8	Benzo(a)pyrene	2789	87.3	12.5	50	125
205-99-2	Benzo(b)fluoranthene	2790	90.3	12.6	53	128
191-24-2	Benzo(g,h,i)perylene	2739	87.8	13	49	127
207-08-9	Benzo(k)fluoranthene	2761	89.3	11.2	56	123
111-44-4	Bis(2-chloroethyl) ether	192	65.4	15.8	18	113
117-81-7	Bis(2-ethylhexyl) phthalate	181	108.9	13.9	67	150
85-68-7	Butyl benzyl phthalate	144	103.5	10.6	72	135
86-74-8	Carbazole	183	79.3	14.6	36	123

Table C-27. Method 8270 SIM Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
218-01-9	Chrysene	2812	87.5	10.2	57	118
84-74-2	Di-n-butyl phthalate	150	106.5	12.9	68	145
117-84-0	Di-n-octyl phthalate	144	105.5	16.8	55	156
53-70-3	Dibenzo(a,h)anthracene	2778	89.2	13.2	50	129
132-64-9	Dibenzofuran	282	71.9	12.2	35	108
84-66-2	Diethyl phthalate	147	99.3	10.9	67	132
131-11-3	Dimethyl phthalate	149	99.3	9.3	71	127
206-44-0	Fluoranthene	2782	87.3	10.7	55	119
86-73-7	Fluorene	2795	80.6	11.2	47	114
118-74-1	Hexachlorobenzene	201	81.9	14.2	39	125
193-39-5	Indeno(1,2,3-cd)pyrene	2812	89.6	13.5	49	130
62-75-9	n-Nitrosodimethylamine	117	90.7	10.9	58	124
91-20-3	Naphthalene	2823	74.7	12.2	38	111
87-86-5	Pentachlorophenol	259	82.4	15.5	36	129

85-01-8	Phenanthrene	2792	80.8	10.6	49	113
129-00-0	Pyrene	2792	85.8	10.2	55	117

Table C-28 8270 SIM AQUEOUS

Table C-28. Method 8270 SIM Aqueous Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
92-52-4	1,1-Biphenyl	106	77.3	7.3	56	99
90-12-0	1-Methylnaphthalene	2566	77.9	12.5	41	115
95-95-4	2,4,5-Trichlorophenol	488	84.1	13.4	44	124
118-79-6	2,4,6-Tribromophenol	164	83.7	12.7	46	122
606-20-2	2,6-Dinitrotoluene	118	67.2	15.8	20	115
91-58-7	2-Chloronaphthalene	717	72.4	12.7	34	111
321-60-8	2-Fluorobiphenyl	747	79.2	8.8	53	106
91-57-6	2-Methylnaphthalene	2984	76.5	12.6	39	114
83-32-9	Acenaphthene	3241	80.9	11.1	48	114
208-96-8	Acenaphthylene	3234	77.8	14.4	35	121
120-12-7	Anthracene	3224	85.8	11	53	119

Table C-28. Method 8270 SIM Aqueous Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
56-55-3	Benz(a)anthracene	3277	89.3	10.1	59	120
50-32-8	Benzo(a)pyrene	3284	86.4	11.2	53	120
205-99-2	Benzo(b)fluoranthene	3248	89.7	12.3	53	126
191-24-2	Benzo(g,h,i)perylene	3178	86	14.1	44	128
207-08-9	Benzo(k)fluoranthene	3167	89.3	11.9	54	125
111-44-4	Bis(2-chloroethyl) ether	775	77.8	12.6	40	116
117-81-7	Bis(2-ethylhexyl) phthalate	275	114.1	19.6	55	173
85-68-7	Butyl benzyl phthalate	159	90.7	17.3	39	143
86-74-8	Carbazole	631	84	13.1	45	123
218-01-9	Chrysene	3215	88.3	10.4	57	120
84-74-2	Di-n-butyl phthalate	153	102.5	14.2	60	145
117-84-0	Di-n-octyl phthalate	157	103.3	19	46	160
53-70-3	Dibenzo(a,h)anthracene	3233	87.2	14.5	44	131
132-64-9	Dibenzofuran	864	77.5	14.1	35	120
84-66-2	Diethyl phthalate	142	94.5	13.5	54	135
206-44-0	Fluoranthene	3242	89.1	10.4	58	120
86-73-7	Fluorene	3232	84.1	11.3	50	118
118-74-1	Hexachlorobenzene	947	84.8	13	46	124

118-74-1	Hexachlorobenzene	847	84.8	13	46	124
87-68-3	Hexachlorobutadiene	187	84.5	14.7	40	129
193-39-5	Indeno(1,2,3-cd)pyrene	3244	88.7	13.7	48	130
62-75-9	N-Nitrosodimethylamine	162	62.5	10	33	92
91-20-3	Naphthalene	3277	78.8	11.9	43	114
4165-60-0	Nitrobenzene-d5	444	83.1	9.2	55	111
87-86-5	Pentachlorophenol	808	88.4	17.6	36	141
85-01-8	Phenanthrene	3240	83.6	10.3	53	115
129-00-0	Pyrene	3252	87.1	11.3	53	121
1718-51-0	Terphenyl-d14	642	95.1	12.4	58	132

Matrix **Unconsolidated Material**

Analyte	CAS Number	Screening Criterion [a] (mg/kg)	Project LOQ Goal (mg/kg)	Project LOD Goal (mg/kg)	Laboratory-Specifi	
					LOQ	LOI
TPH						
TPH-g (C5–C11)	-3547	100	33	10	TBD	TBI
TPH-d (C10–C24)	-3527	220	73	22	TBD	TBI
VOCs						
Benzene	71-43-2	0.30	0.10	0.030	TBD	TBI
Ethylbenzene	100-41-4	3.7	1.2	0.37	TBD	TBI
Toluene	108-88-3	3.2	1.1	0.32	TBD	TBI
Total Xylenes	1330-20-7	2.1	0.70	0.21	TBD	TBI
PAHs						
1-Methylnaphthalene	90-12-0	4.2	1.4	0.42	TBD	TBI
2-Methylnaphthalene	91-57-6	4.1	1.4	0.41	TBD	TBI
Naphthalene	91-20-3	4.4	1.5	0.44	TBD	TBI

Notes:

mg/kg milligrams per kilogram

[a] DOH Tier 1 EALs (Summer 2016, updated January 2017),

c Limits (mg/kg)	
D	DL
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD

Data Qualification Reason Codes

Reason Code	Reason Code Description
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds LinearCalibration Range
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank

Data Qualification Reason Codes

V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degreec C.
Y1	False Positive
Y2	Data rejected due to radiological anomolies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of ana
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or ope

a concentration less than 5X the concentration detected in

lyses for the analyte/compound by the stated method and

ning CCV.

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-112657-1
Analyses/Method:	Volatile Organic Compounds (BTEX) by EPA Method 8260D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM — Completed on: 05/27/2022
Reviewed by:	[redacted] (b) (6) / AECOM — File Name: 580-112657-1_BTEX_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on April 12, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3000MISH-SOFT01-003.2	580-112657-1	Soil
A3000MISH-SOFT02-003.2	580-112657-2	Soil
A3000MISH-SOFT03-003.2	580-112657-3	Soil
Trip Blank	580-112657-4	Trip Blank

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody [COC])/sample integrity
- ✓ Holding times and sample preservation
- ✓ Instrument tuning
- ✓ Initial calibration/initial and continuing calibration verification
- ✗ Laboratory blanks/field blanks/equipment blanks
- ✓ Surrogate spike recoveries
- ✗ Matrix spike (MS) and matrix spike duplicate (MSD) results
- ✓ Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
- ✓ Field duplicate/triplicate results
- ✓ Internal standard results
- ✓ Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Select data points were estimated due to nonconformances of certain QC criteria (see discussion below).

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Method Blank Results

The following recoveries were outside control limits:

Method Blank ID	Analyte	Result	LOD	Units
580-387999/1-A	m,p-xylene	0.0101 J	0.015	mg/kg
580-387999/1-A	o-xylene	0.00695 J	0.015	mg/kg
580-387999/1-A	Total xylenes	17.1	15	ug/kg

Associated results detected below the LOD were qualified as nondetect "U" as shown in Table 1, below.

MS/MSD Results

The following recoveries were outside control limits:

MS/MSD ID	Analyte	MS/MSD Recoveries	RPD	Recovery Limits/RPD
A3000MISH-SOFT02-003.2	Benzene	**21/40**	**61**	77-121/20
A3000MISH-SOFT02-003.2	Toluene	**23/39**	**52**	77-121/20
A3000MISH-SOFT02-003.2	Ethylbenzene	**25/38**	**39**	76-122/20
A3000MISH-SOFT02-003.2	m,p-xylene	**27/42**	**44**	77-124/20
A3000MISH-SOFT02-003.2	o-xylene	**23/40**	**53**	77-123/20
A3000MISH-SOFT02-003.2	Total xylene	**25/41**	**48**	78-124/20

Associated results were qualified as estimated “UJ” as shown in Table 1, below. Nondetect results did not require qualification due to RPDs above criteria.

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation.

The reporting limits for nondetect results were within the site screening criteria, and no sample results exceeded the site screening limits.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

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Memorandum

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-112657-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-112657-1	A3000MISH-SOFT01-003.2	580-112567-1	8260D	m,p-xylene	0.020 J	mg/kg	0.022 U	L
580-112657-1	A3000MISH-SOFT01-003.2	580-112567-1	8260D	o-xylene	0.013 J	mg/kg	0.022 U	L
580-112657-1	A3000MISH-SOFT02-003.2	580-112657-2	8260D	Benzene	0.0044 U	mg/kg	0.0044 UJ	M
580-112657-1	A3000MISH-SOFT02-003.2	580-112657-2	8260D	Toluene	0.0088 U	mg/kg	0.0088 UJ	M
580-112657-1	A3000MISH-SOFT02-003.2	580-112657-2	8260D	Ethylbenzene	0.0088 U	mg/kg	0.0088 UJ	M
580-112657-1	A3000MISH-SOFT02-003.2	580-112657-2	8260D	m,p-xylene	0.0044 U	mg/kg	0.0044 UJ	M
580-112657-1	A3000MISH-SOFT02-003.2	580-112657-2	8260D	o-xylene	0.0044 U	mg/kg	0.0044 UJ	M
580-112657-1	A3000MISH-SOFT02-003.2	580-112657-2	8260D	Total xylene	0.0044U	mg/kg	0.0044 UJ	M

Laboratory: Eurofins Seattle
Laboratory SDG/Job No: 580-112657-1
Validation Level: Stage 2B
(using Level IV data package)
Number of Samples/Matrix: 3 soils, 1 TB
Analysis (Include Method #): BTEX SW846 8260D

QAPP (QSM 5.4), DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)
Chain of Custody	Yes	No
Sample Preservation	Yes	No
Holding Time	Yes	No
Quantitation Limits	Yes	No
Percent Solids (>30%)	Yes	No
Method Blanks	No	Yes
Other Laboratory Blanks[1,2]	Yes	No
Trip/Equipment Blanks	Yes	No
Initial Calibration	Yes	No
Initial Calibration Verification	Yes	No
Continuing Calibration Verification	Yes	No
Matrix Spike	No	Yes
Matrix Spike Duplicate RPD[2]	No	No
Laboratory Duplicate[2]	NA	NA
Surrogate Standards[2]	Yes	No
Laboratory Control Standards	Yes	No
Internal Standards[2,3]	Yes	No
ISM Relative Standard Deviation	Yes	No
Field Duplicate	NA	NA
GC/MS Tunes[2]	Yes	No
Calculation Spot Checks[3]	NA	NA

[1]May include reagent blanks, calibration blanks, etc.

[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Samples	Lab ID
A3000MISH-SOFT01-003.2	580-112657-1
A3000MISH-SOFT02-003.2	580-112657-2
A3000MISH-SOFT03-003.2	580-112657-3
Trip Blank	580-112657-4

Client/Site Name: Red Hill Site Characterization
Project Number: 60674414.00.50.01
Date: 05/26/22
Validator: [redacted]
Reviewer and Date: [redacted] **7/25/22**

Comments
0.0°C
Collected 4/12/22, analyzed within HT
No dilutions. ND results at LOD meet action limits.
MB 580-387999/1-A, m,p-xylene, o-xylene, and total xylenes were detected in the method blank. Associated detections below the LOD were qualified as nondetect "U". Since total xylenes were determined by summing the individual xylene results, those results are ND where applicable.
Trip Blank-1 was ND for BTEX.
04/07/22 Inst SEA046, criteria met
ICV 580-386730/12 within %D ≤20%
CCVIS 580-388033/2, CCVC 580-388033/33, within criteria.
Sample A3000MISH-SOFT02-003.2 was spiked. All results recovered below criteria and were qualified as estimated "UJ". RPDs were above criteria; however, results were nondetect and did not require qualification.
Not applicable to these analyses.
Surrogate %Rs within QSM limits
LCS 580-387999/2-A, LCSD 580-387999/3-A, RPDs within lab limits.
All ND. RSD below 50%.
Not a required validation element for this project.

Note: it may not be appropriate to make a direct quantitative comparison for aqueous field blanks (such as equipment blanks reported as µg/mL) to a solid parent sample (such as a soil sample reported as mg/kg). At best, only a qualitative comparison can be made.

5pt calibration, RSD ≤15% or r2 ≥ 0.99, min RF suggested per Method 8260D (see Cal Mod 1 tab)
ICV %D ≤20%
CCV %D ≤20%

see DoD QSM QC limits tab

see DoD QSM QC limits tab

see DoD QSM QC limits tab

see DoD QSM QC limits tab

Table B-3: Preparation and Analytical Requirements for Field and QC Samples

Matrix	Analytical Group	Preparation Reference/Method SOP Analytical Reference/Method SOP	Containers	Sample Volume	Preser Requir
Unconsolidated Material	TPH-g, VOCs	Preparation Method: EPA 5035C Preparation SOP: ANA8260 Analysis Method: EPA 8260C Analysis SOP: ANA8260	2 × 10mL water-preserved; 1 × 5mL methanol-preserved; Teflon-lined septum caps	40 mL	Cool t
	TPH-d, TPH-o	Preparation Method: EPA 3550C Preparation SOP: SON004 Analysis Method: EPA 8015C Analysis SOP: ANA8015	1 × 8-oz glass jar, Teflon-lined lid	30 g	Cool t
	TPH-d, TPH-o with Silica Gel Cleanup	Preparation Method: EPA 3550C/EPA 3630 Preparation SOP: SON004/CLN004 Analysis Method: EPA 8015C Analysis SOP: ANA8015		30 g	Cool t
	PAHs	Preparation Method: EPA 3550C Preparation SOP: SON009 Analysis Method: EPA 8270D SIM Analysis SOP: ANA8270SIM		30 g	Cool t

Notes:

g	gram
H_2SO_4	sulfuric acid
HCl	hydrogen chloride
L	liter
mL	milliliter
$NaHSO_4$	sodium bisulfate
oz	ounce

vation rement	Maximum Holding Time (preparation/analysis)
o ≤6°C	7 days (water-preserved); 14 days (methanol-preserved)
o ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
o ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
o ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.

Data validation activities were conducted with reference to:

SW-846 Method 8260D Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/M

Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Departme

General Data Validation Guidelines, Department of Defense, Revision 1 (November 2019)

USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data

DoD Module 1

Note DoD Module 1 criteria (below) are based on Method 8260B; lab analyzed samples using 8260D. QSM 5.4 Table B-4 criteria of RSD ≤15% or r2 ≥ 0.99 was used to evaluate the ICAL data. Per Method 8260D, minimum RFs on Table 4 are used as guidance.

SPCCs and CCCs should have been included in the calibration standards and reported, even if individual SPCCs and CCCs are not project target analytes.

Table VIII lists those VOCs that have poor sensitivity and are considered "poor performers". The minimum average RF for the "poor performers" is 0.01. The minimum average RF for all other volatile target analytes should be ≥ 0.05.

An additional criterion is that all volatile target analytes should have a percent Relative Standard Deviation (%RSD) of ≤ 15%.

Table VI: SPCCs average RFs should meet the following criteria (Method 8260B):

Analyte	Minimum Average RF (method uses the term "mean")
Chloromethane	0.1
1,1-Dichloroethane	0.1
Bromoform	0.1
Chlorobenzene	0.3
1,1,2,2-Tetrachloroethane	0.3

Table

Analy
1,1-D
Chlor
1,2-D

Table

Analy
Aceto
2-But
Carbo
Chlor
Cyclo
1,2-D
Dichl
1,2-D
cis-1,
1,4-D
1,2-D

VII: CCCs (Method 8260B)

yte	
ichloroethene	Toluene
oform	Ethylbenzene
ichloropropane	Vinyl Chloride

VIII: VOC Poor Performers (Method 8260B):

yte	
ne	1,2-Dibromo-3-chloropropane
anone	Isopropylbenzene
on disulfide	Methyl acetate
oethane	Methylene chloride
hexane	Methylcyclohexane
ibromoethane	Methyl-tert-butyl ether
orodifluoromethane	trans-1,2-Dichloroethene
ichloropropane	4-Methyl-2-pentanone
2-Dichloroethene	2-Hexanone
ioxane	Trichlorofluoroethane
ibromo-3-chloropropane	1,1,2-Trichloro-1,2,2-triflouroethane

Matrix Unconsolidated Material

Analyte	CAS Number	Screening Criterion [a] (mg/kg)	Project LOQ Goal (mg/kg)	Project LOD Goal (mg/kg)	Laboratory-Specific Limits (mg/kg)		
					LOQ	LOD	D
TPH							
TPH-g (C5–C11)	-3547	100	33	10	TBD	TBD	TE
TPH-d (C10–C24)	-3527	220	73	22	TBD	TBD	TE
VOCs							
Benzene	71-43-2	0.30	0.10	0.030	TBD	TBD	TE
Ethylbenzene	100-41-4	3.7	1.2	0.37	TBD	TBD	TE
Toluene	108-88-3	3.2	1.1	0.32	TBD	TBD	TE
Total Xylenes	1330-20-7	2.1	0.70	0.21	TBD	TBD	TE
PAHs							
1-Methylnaphthalene	90-12-0	4.2	1.4	0.42	TBD	TBD	TE
2-Methylnaphthalene	91-57-6	4.1	1.4	0.41	TBD	TBD	TE
Naphthalene	91-20-3	4.4	1.5	0.44	TBD	TBD	TE

Notes:

mg/kg milligrams per kilogram

[a] DOH Tier 1 EALs (Summer 2016, updated January 2017),

)L

BD
BD

BD
BD
BD
BD

BD
BD
BD

DoD QSM Criteria Table C-23 Method 8260 Solid Matrix

Table C-23. Method 8260 Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
630-20-6	1,1,1,2-Tetrachloroethane	11115	101.1	7.8	78	125
71-55-6	1,1,1-Trichloroethane	12156	101.6	9.4	73	130
79-34-5	1,1,2,2-Tetrachloroethane	11670	97	8.9	70	124
79-00-5	1,1,2-Trichloroethane	11772	99.7	7.2	78	121
76-13-1	1,1,2-Trifluoro-1,2,2-trichloroethane [Freon-113]	9760	100.8	11.7	66	136
75-34-3	1,1-Dichloroethane	11856	100.4	8.1	76	125
75-35-4	1,1-Dichloroethene	12352	100.3	10.1	70	131
563-58-6	1,1-Dichloropropene	10793	100.5	8.3	76	125
87-61-6	1,2,3-Trichlorobenzene	10572	97.8	10.6	66	130
96-18-4	1,2,3-Trichloropropane	10925	99.1	8.8	73	125
526-73-8	1,2,3-Trimethylbenzene	1948	99.8	6	82	118
120-82-1	1,2,4-Trichlorobenzene	10980	98	10.4	67	129
95-63-6	1,2,4-Trimethylbenzene	11085	98.7	7.9	75	123
96-12-8	1,2-Dibromo-3-chloropropane	11380	96.6	11.7	61	132
106-93-4	1,2-Dibromoethane	11408	100.1	7.3	78	122
95-50-1	1,2-Dichlorobenzene	11785	99.1	7.2	78	121
107-06-2	1,2-Dichloroethane	12328	100.5	9.2	73	128
17060-07-0	1,2-Dichloroethane-d4	5951	103.1	10.8	71	136
540-59-0	1,2-Dichloroethene	7748	99.9	7.3	78	122
78-87-5	1,2-Dichloropropane	12145	99.5	7.8	76	123
354-23-4	1,2-Dichlorotrifluoroethane [Freon 123a]	1269	97.8	11.3	64	132
108-70-3	1,3,5-Trichlorobenzene	4723	99.4	9.6	71	128
108-67-8	1,3,5-Trimethylbenzene	11080	98.4	8.4	73	124
541-73-1	1,3-Dichlorobenzene	11619	98.9	7.4	77	121
142-28-9	1,3-Dichloropropane	10713	99.1	7.3	77	121
542-75-6	1,3-Dichloropropene	3714	101.6	8.1	77	126
106-46-7	1,4-Dichlorobenzene	11848	97.5	7.6	75	120
105-05-5	1,4-Diethylbenzene	1896	96.6	5.9	79	114
123-91-1	1,4-Dioxane	7698	96.4	13.7	55	138
544-10-5	1-Chlorohexane	2543	100.4	9.8	71	130
594-20-7	2,2-Dichloropropane	10703	99.7	11.1	67	133

Table C-23. Method 8260 Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
78-93-3	2-Butanone [MEK]	11514	99.6	16.3	51	148
126-99-8	2-Chloro-1,3-butadiene	6667	99	11.3	65	133
110-75-8	2-Chloroethyl vinyl ether	6957	96.1	17.6	43	149
95-49-8	2-Chlorotoluene	10838	98.5	7.9	75	122
591-78-6	2-Hexanone	11004	99.1	15.4	53	145
79-46-9	2-Nitropropane	4969	98.3	17.1	47	150
67-63-0	2-Propanol [Isopropyl alcohol]	1696	99.8	13.4	60	140
460-00-4	4-Bromofluorobenzene	6267	98.9	6.8	79	119
106-43-4	4-Chlorotoluene	10785	98.3	8.6	72	124
108-10-1	4-Methyl-2-pentanone [MIBK]	11364	99.6	11.6	65	135
67-64-1	Acetone	11089	99.6	21.4	36	164
75-05-8	Acetonitrile	5697	98.5	14.8	54	143

107-02-8	Acrolein [Propenal]	7528	101.1	18	47	155
107-13-1	Acrylonitrile	8293	99.7	11.4	65	134
107-05-1	Allyl chloride	6908	101.1	11.2	68	135
71-43-2	Benzene	12853	99.2	7.4	77	121
100-44-7	Benzyl chloride	2743	92.1	9.4	64	120
108-86-1	Bromobenzene	10974	99.3	7.3	78	121
74-97-5	Bromochloromethane	11023	101.4	7.8	78	125
75-27-4	Bromodichloromethane	11850	101	8.5	75	127
75-25-2	Bromoform	11890	99.1	10.8	67	132
74-83-9	Bromomethane	11416	98.3	15	53	143
75-15-0	Carbon disulfide	11132	97.9	11.5	63	132
56-23-5	Carbon tetrachloride	12090	102.3	10.7	70	135
108-90-7	Chlorobenzene	12382	99.7	6.9	79	120
124-48-1	Chlorodibromomethane	11852	100.2	8.7	74	126
75-00-3	Chloroethane	11444	98.8	13.3	59	139
67-66-3	Chloroform	12344	100.3	7.6	78	123
74-87-3	Chloromethane	11876	93.3	14.3	50	136
156-59-2	cis-1,2-Dichloroethene	11645	99.9	7.6	77	123
10061-01-5	cis-1,3-Dichloropropene	11805	99.8	8.7	74	126
1476-11-5	cis-1,4-Dichloro-2-butene	977	106	12.4	69	143

Table C-23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
110-82-7	Cyclohexane	8827	98.9	10.6	67	131
108-94-1	Cyclohexanone	3764	93.2	20.9	30	156
1868-53-7	Dibromofluoromethane	2142	98.1	6.8	78	119
74-95-3	Dibromomethane	10913	101.1	7.9	78	125
75-71-8	Dichlorodifluoromethane [Freon-12]	11467	88.9	20.1	29	149
75-43-4	Dichlorofluoromethane	717	100.8	18	47	155
60-29-7	Diethyl ether	6283	99.6	9.6	71	129
108-20-3	Diisopropyl ether	8542	98.3	9.7	69	127
64-17-5	Ethanol	3958	102.2	18.9	45	159
141-78-6	Ethyl acetate	4516	95.4	14.5	52	139
97-63-2	Ethyl methacrylate	7075	98.9	9.9	69	129
637-92-3	Ethyl tert-butyl ether	7514	98.9	9.1	72	126
100-41-4	Ethylbenzene	12427	99.1	7.7	76	122
462-06-6	Fluorobenzene	689	97.3	5.4	81	114
142-82-5	Heptane	5420	93.4	14.9	49	138
87-68-3	Hexachlorobutadiene	10264	98.1	12.4	61	135
67-72-1	Hexachloroethane	3265	102.5	10.1	72	133
110-54-3	Hexane	7116	93.6	16.1	45	142
74-88-4	Iodomethane	9457	100.9	10.1	71	131
78-83-1	Isobutyl alcohol	6162	97.5	12.6	60	135
108-21-4	Isopropyl acetate [Acetic acid]	2885	94.2	12.2	58	131
98-82-8	Isopropylbenzene	11596	100.8	11.1	68	134
179601-23-1	m/p-Xylene [3/4-Xylene]	10612	100.4	7.7	77	124
126-98-7	Methacrylonitrile	6736	99.2	11.1	66	132
79-20-9	Methyl acetate	8320	98.7	15.2	53	144
80-62-6	Methyl methacrylate	7050	98.4	11.9	63	134
1634-04-4	Methyl tert-butyl ether [MTBE]	11253	98.9	8.7	73	125
108-87-2	Methylcyclohexane	8565	99.4	11.2	66	133
75-09-2	Methylene chloride	12024	98.9	9.7	70	128
123-86-4	n-Butyl acetate	2981	95.1	11	62	128

71-36-3	n-Butyl alcohol	4800	92.9	12.6	55	131

Table C-23. Method 8260 Solid Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
104-51-8	n-Butylbenzene	10921	98.7	9.7	70	128
103-65-1	n-Propylbenzene	10947	98.9	8.8	73	125
91-20-3	Naphthalene	10602	95.6	11.2	62	129
95-47-6	o-Xylene	11940	100	7.7	77	123
99-87-6	p-Isopropyltoluene [p-Cymene]	10953	100.3	9	73	127
76-01-7	Pentachloroethane	5957	102	11.1	69	135
107-12-0	Propionitrile [Ethyl cyanide]	6734	101	11.1	68	134
135-98-8	sec-Butylbenzene	10960	99	8.8	73	126
100-42-5	Styrene	11809	100.2	8	76	124
994-05-8	tert-Amyl methyl ether [TAME]	7153	99.8	8.9	73	126
75-65-0	tert-Butyl alcohol	7492	100.5	10.7	68	133
98-06-6	tert-Butylbenzene	10974	98.8	8.6	73	125
127-18-4	Tetrachloroethene	12091	100.5	9.2	73	128
109-99-9	Tetrahydrofuran	8039	98	12.4	61	135
108-88-3	Toluene	12499	99.3	7.3	77	121
2037-26-5	Toluene-d8	6232	100.7	5.2	85	116
156-60-5	trans-1,2-Dichloroethene	11849	99.2	8.6	74	125
10061-02-6	trans-1,3-Dichloropropene	11805	100.9	9.8	71	130
110-57-6	trans-1,4-Dichloro-2-butene	8307	98.6	12.3	62	136
79-01-6	Trichloroethene	12440	100.2	7.6	77	123
75-69-4	Trichlorofluoromethane [Freon-11]	11530	101	13.1	62	140
108-05-4	Vinyl acetate	7260	100.3	16.9	50	151
75-01-4	Vinyl chloride	12129	95.6	13.2	56	135
1330-20-7	Xylenes [total]	8623	100.7	7.7	78	124

DoD QSM Criteria Table C-24 Method 8260 Aqueous Matrix

Table C-24. Method 8260 Aqueous Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
630-20-6	1,1,1,2-Tetrachloroethane	24511	101.1	7.6	78	124
71-55-6	1,1,1-Trichloroethane	28223	102.7	9.6	74	131
CAS ID	**Analyte**	**N Records**	**Mean**	**Standard Deviation**	**Lower Control Limit**	**Upper Control Limit**
79-34-5	1,1,2,2-Tetrachloroethane	27450	96.4	8.3	71	121
79-00-5	1,1,2-Trichloroethane	27338	99.5	6.5	80	119
76-13-1	1,1,2-Trifluoro-1,2,2-trichloroethane [Freon-113]	21122	103	11.1	70	136
75-34-3	1,1-Dichloroethane	28154	101.3	8	77	125

75-35-4	1,1-Dichloroethene	29436	101	10	71	131
563-58-6	1,1-Dichloropropene	23631	102	7.8	79	125
87-61-6	1,2,3-Trichlorobenzene	24271	98.7	10.1	69	129
96-18-4	1,2,3-Trichloropropane	24525	97.5	8	73	122
526-73-8	1,2,3-Trimethylbenzene	2965	100.9	6.2	82	120
120-82-1	1,2,4-Trichlorobenzene	25290	99.8	10.1	69	130
95-63-6	1,2,4-Trimethylbenzene	27917	99.6	8	76	124
96-12-8	1,2-Dibromo-3-chloropropane	24955	94.9	11.1	62	128
106-93-4	1,2-Dibromoethane	29096	99	7.2	77	121
95-50-1	1,2-Dichlorobenzene	27583	99.4	6.5	80	119
107-06-2	1,2-Dichloroethane	32965	100.3	9.2	73	128
17060-07-0	1,2-Dichloroethane-d4	8673	99.5	6.1	81	118
540-59-0	1,2-Dichloroethene	18667	100.2	7.1	79	121
78-87-5	1,2-Dichloropropane	27787	100.1	7.2	78	122
354-23-4	1,2-Dichlorotrifluoroethane [Freon 123a]	3144	103.1	10.9	70	136
108-70-3	1,3,5-Trichlorobenzene	10037	102.1	9.2	75	130
108-67-8	1,3,5-Trimethylbenzene	27820	99.5	8.1	75	124
106-99-0	1,3-Butadiene	1202	100.6	19.2	43	158
541-73-1	1,3-Dichlorobenzene	26951	99.7	6.5	80	119
142-28-9	1,3-Dichloropropane	23811	99.1	6.5	80	119
542-75-6	1,3-Dichloropropene	9784	99.9	7.6	77	123
106-46-7	1,4-Dichlorobenzene	27715	98.3	6.5	79	118
105-05-5	1,4-Diethylbenzene	1980	98.4	6.4	79	118
123-91-1	1,4-Dioxane	17866	99	13.4	59	139
544-10-5	1-Chlorohexane	5790	99.6	8	76	124
540-84-1	2,2,4-Trimethylpentane [Isooctane]	5432	95.2	12.3	58	132

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
594-20-7	2,2-Dichloropropane	23775	99.7	13.2	60	139
75-85-4	2-Butanol	4332	92.7	9.1	66	120
78-93-3	2-Butanone [MEK]	26659	99.6	14.6	56	143
126-99-8	2-Chloro-1,3-butadiene	15673	100	11.7	65	135
110-75-8	2-Chloroethyl vinyl ether	18225	94.7	14.7	51	139
95-49-8	2-Chlorotoluene	23750	100	7.2	79	122
591-78-6	2-Hexanone	25368	97.9	13.5	57	139
91-57-6	2-Methylnaphthalene	3754	79.4	20.9	17	142
79-46-9	2-Nitropropane	10213	92.6	14.5	49	136
67-63-0	2-Propanol [Isopropyl alcohol]	2034	98.8	14.4	56	142
624-95-3	3,3-Dimethyl-1-butanol	6491	90.9	13.9	49	133
460-00-4	4-Bromofluorobenzene	9971	99.7	4.9	85	114
106-43-4	4-Chlorotoluene	23616	99.9	7.4	78	122
108-10-1	4-Methyl-2-pentanone [MIBK]	25796	98.5	10.6	67	130
67-64-1	Acetone	25006	99.5	20.1	39	160
75-05-8	Acetonitrile	13308	95.8	15.2	50	142
107-02-8	Acrolein [Propenal]	16380	96.8	19.3	39	155

107-13-1	Acrylonitrile	20173	99	11.9	63	135
107-05-1	Allyl chloride	15758	99	10.4	68	130
71-43-2	Benzene	34376	99.4	6.9	79	120
100-44-7	Benzyl chloride	10675	90.1	15.9	42	138
108-86-1	Bromobenzene	23762	99.7	6.7	80	120
74-97-5	Bromochloromethane	24356	100.8	7.5	78	123
75-27-4	Bromodichloromethane	26888	101.8	7.8	79	125
75-25-2	Bromoform	27675	97.8	10.8	66	130
74-83-9	Bromomethane	26717	97	14.7	53	141
75-15-0	Carbon disulfide	25719	98.8	11.5	64	133
56-23-5	Carbon tetrachloride	28870	103.8	10.7	72	136
108-90-7	Chlorobenzene	29802	100	6.1	82	118
124-48-1	Chlorodibromomethane	27424	100	8.5	74	126
75-45-6	Chlorodifluoromethane	7197	84.4	14.9	40	129
75-00-3	Chloroethane	27069	99	13	60	138

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
67-66-3	Chloroform	29373	101.1	7.5	79	124
74-87-3	Chloromethane	27697	94.5	15	50	139
156-59-2	cis-1,2-Dichloroethene	27935	100.1	7.5	78	123
10061-01-5	cis-1,3-Dichloropropene	27197	99.5	8	75	124
1476-11-5	cis-1,4-Dichloro-2-butene	1524	101.5	14.9	57	146
110-82-7	Cyclohexane	20438	100.4	10	71	130
1868-53-7	Dibromofluoromethane	5702	99.1	6.5	80	119
74-95-3	Dibromomethane	24473	101.1	7.3	79	123
75-71-8	Dichlorodifluoromethane [Freon-12]	25410	92	20.1	32	152
75-43-4	Dichlorofluoromethane	1504	101.5	9.8	72	131
60-29-7	Diethyl ether	17189	98.6	10.2	68	129
108-20-3	Diisopropyl ether	22989	97.5	10.3	67	128
64-17-5	Ethanol	9543	99.2	17.1	48	151
141-78-6	Ethyl acetate	9208	96.8	13.9	55	138
97-63-2	Ethyl methacrylate	16674	98.7	9	72	126
637-92-3	Ethyl tert-butyl ether	19841	98.3	9.4	70	127
100-41-4	Ethylbenzene	33325	99.8	7	79	121
462-06-6	Fluorobenzene	1373	97.9	6.1	80	116
142-82-5	Heptane	11878	94.4	15	49	140
87-68-3	Hexachlorobutadiene	23535	100.1	11.3	66	134
67-72-1	Hexachloroethane	8718	102.9	10.3	72	134
110-54-3	Hexane	15545	95.5	15.9	48	143
74-88-4	Iodomethane	20229	100	10.4	69	131
78-83-1	Isobutyl alcohol	14123	97.7	11.7	63	133
108-21-4	Isopropyl acetate [Acetic acid]	7216	97.8	11.6	63	133
98-82-8	Isopropylbenzene	28636	101.5	9.9	72	131
179601-23-1	m/p-Xylene [3/4-Xylene]	28168	100.5	6.9	80	121
126-98-7	Methacrylonitrile	15982	97.9	11.6	63	133
79-20-9	Methyl acetate	19698	96	13.2	56	136

80-62-6	Methyl methacrylate	16524	97.7	10.2	67	128
1634-04-4	Methyl tert-butyl ether [MTBE]	29660	97.3	8.8	71	124

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
108-87-2	Methylcyclohexane	20025	101.8	10.1	72	132
75-09-2	Methylene chloride	27659	99.4	8.3	74	124
123-86-4	n-Butyl acetate	7247	96.8	9.4	69	125
71-36-3	n-Butyl alcohol	10122	95.1	12	59	131
104-51-8	n-Butylbenzene	24088	101.1	8.8	75	128
109-60-4	n-Propyl acetate	602	100.8	8.3	76	126
103-65-1	n-Propylbenzene	24419	101	8.5	76	126
91-20-3	Naphthalene	27847	94.6	11.3	61	128
95-47-6	o-Xylene	31776	100	7.2	78	122
99-87-6	p-Isopropyltoluene [p-Cymene]	24335	102	8.5	77	127
76-01-7	Pentachloroethane	11688	101.1	10.7	69	133
109-66-0	Pentane	3915	74.8	19.7	16	134
107-12-0	Propionitrile [Ethyl cyanide]	15701	99.9	12	64	136
135-98-8	sec-Butylbenzene	24191	101.1	8.1	77	126
100-42-5	Styrene	26985	100.5	7.6	78	123
994-05-8	tert-Amyl methyl ether [TAME]	19726	98.1	10.1	68	128
75-65-0	tert-Butyl alcohol	21112	98.6	10.1	68	129
762-75-4	tert-Butyl formate	6651	98.1	11.1	65	132
98-06-6	tert-Butylbenzene	23919	101	7.7	78	124
127-18-4	Tetrachloroethene	29017	101.3	9.3	74	129
109-99-9	Tetrahydrofuran	18021	95	12.8	57	133
108-88-3	Toluene	33510	100.1	6.8	80	121
2037-26-5	Toluene-d8	9809	100.4	3.8	89	112
156-60-5	trans-1,2-Dichloroethene	27663	99.5	8.2	75	124
10061-02-6	trans-1,3-Dichloropropene	27134	100	8.9	73	127
110-57-6	trans-1,4-Dichloro-2-butene	19320	91.5	16.1	43	140
79-01-6	Trichloroethene	30150	101.1	7.3	79	123
75-69-4	Trichlorofluoromethane [Freon-11]	26108	103	12.8	65	141
108-05-4	Vinyl acetate	18941	100.2	15.3	54	146
75-01-4	Vinyl chloride	29472	97.4	13.2	58	137
1330-20-7	Xylenes [total]	23426	100.1	7	79	121

Data Qualification Reason Codes

Reason Code	Reason Code Description
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds LinearCalibration Range
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank

Data Qualification Reason Codes

V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degreec C.
Y1	False Positive
Y2	Data rejected due to radiological anomolies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of ana
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or ope

: a concentration less than 5X the concentration detected in

lyses for the analyte/compound by the stated method and

ning CCV.

AECOM

Summary Data Quality Review
Joint Base Pearl Harbor-Hickam, Hawaii
Red Hill Bulk Fuel Storage Facility

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-112657-1
Analyses/Method:	TPH-Gasoline Range Organics (TPH-g, C6-C10) by EPA Method 8260D TPH-Diesel Range Organics (TPH-d, C10-C24) by EPA Method 8015D TPH-Residual Range Organics (TPH-o, C24-C40) by EPA Method 8015D
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	(b) (6) / AECOM Completed on: 05/27/2022
Reviewed by:	(b) (6) / AECOM File Name: 580-112657-1_GRO_DRO_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on April 12, 2022.

Sample ID	Lab ID	Matrix/Sample Type	Analysis/Method
A3000MISH-SOFT01-003.2	580-112657-1	Soil	TPH-g EPA 8260D, TPH-d EPA 8015D
A3000MISH-SOFT02-003.2	580-112657-2	Soil	TPH-g EPA 8260D, TPH-d EPA 8015D
A3000MISH-SOFT03-003.2	580-112657-3	Soil	TPH-g EPA 8260D, TPH-d EPA 8015D
Trip Blank	580-112657-4	Trip Blank	TPH-g EPA 8260D
A3000MISH-SOFT01-003.2-1	580-112657-5	Soil	TPH-o EPA 8015d
A3000MISH-SOFT02-003.2-1	580-112657-6	Soil	TPH-o EPA 8015d
A3000MISH-SOFT03-003.2-1	580-112657-7	Soil	TPH-o EPA 8015d

Original sample IDs were listed on the COC as A3000MISH-SOFT01-003.2, A3000MISH-SOFT02-003.2, and A3000MISH-SOFT03-003.2. The laboratory revised the sample IDs to make ORO a separate fraction in order to report the incremental sampling methodology (ISM) results in the EDMS database. The sample IDs containing only the ORO fraction were renamed to add -1 to the end of the client ID.

Data validation activities were conducted with reference to:

- *SW-846 Method 8260D: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *SW-846 Method 8015D: Nonhalogenated Organics Using GC/FID* (June 2003)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC, Department of Defense*, Revision 1 (March 2021)

- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody [COC])/sample integrity
✓	Holding times and sample preservation
✓	Instrument tuning
✗	Initial calibration/initial and continuing calibration verification (ICV/CCV)
✓	Laboratory blanks/field blanks/equipment blanks
✓	Surrogate spike recoveries
✗	Matrix spike (MS) and matrix spike duplicate (MSD) results
✗	Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
✗	Field duplicate/triplicate results
✓	Internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. Select data points were estimated due to nonconformances of certain QC criteria (see discussion below). Qualified sample results are presented in Table 1.

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Trip Blank Contamination

GRO was detected in the trip blank. Associated results were detected greater than the LOD and less than or equal to 5x blank and qualified as estimated "J+" as shown below in Table 1.

Continuing Calibration Verification

The following percent difference (%D) was outside of control limits due to carry over from a previous client sample:

CCV ID	Analyte	%D	%D Limit
CCV 580-388036/14	TPH-g	123.1	20

Associated results were qualified as estimated "J+" as shown in Table 1, below.

MS/MSD Results

The following recoveries were outside control limits:

MS/MSD ID	Analyte	MS/MSD Recoveries	RPD	Recovery Limits/RPD
A3000MISH-SOFT01-003.2	TPH-d	111**/155**	15	75-125/20
A3000MISH-SOFT03-003.2	TPH-g	**53/127**	24	79-122/30

Associated results were qualified as estimated "J" as shown in Table 1, below.

LCS/LCSD Results

The following recoveries were outside control limits:

LCS/LCSD ID	Analyte	LCS/LCSD Recoveries	RPD	Recovery Limits/RPD
580-388061/2-A, 580-388061/3-A	TPH-o	106**/108**	1	39-106/20

Associated results were qualified as estimated "J" as shown in Table 1, below.

Field Duplicate/Triplicate Results

The relative standard deviation of the GRO results for the field triplicate samples exceeded 50%. The three associated GRO results were qualified as estimated "J".

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This "J" qualifier is retained during data validation.

The following positive results exceeded the site screening criteria:

Sample Name	Analyte	Result	LOD	Screening Criteria	Units
A3000MISH-SOFT01-003.2	TPH-d	810	34	220	mg/kg
A3000MISH-SOFT02-003.2	TPH-d	730	35	220	mg/kg
A3000MISH-SOFT03-003.2	TPH-d	650	34	220	mg/kg
A3000MISH-SOFT03-003.2	TPH-g	140	4.8	100	mg/kg

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

Table 1
QA/QC Data Summary Review
Red Hill Site Characterization
Laboratory Group: 580-112657-1

Laboratory Group	Sample ID	Laboratory ID	Method	Analyte	Laboratory Result	Units	Final Result	Reason Code
580-112657-1	A3000MISH-SOFT01-003.2-1	580-112657-5	8015D	TPH-o	110	mg/kg	110 J	C
580-112657-1	A3000MISH-SOFT02-003.2-1	580-112657-6	8015D	TPH-o	110	mg/kg	110 J	C
580-112657-1	A3000MISH-SOFT03-003.2-1	580-112657-7	8015D	TPH-o	150	mg/kg	150 J	C
580-112657-1	A3000MISH-SOFT01-003.2	580-112657-1	8015D	TPH-d	810	mg/kg	810 J	M
580-112657-1	A3000MISH-SOFT01-003.2	580-112657-1	8260	TPH-g	31	mg/kg	31 J+	T/V2/D4
580-112657-1	A3000MISH-SOFT02-003.2	580-112657-2	8260	TPH-g	19	mg/kg	19 J+	T/V2/D4
580-112657-1	A3000MISH-SOFT03-003.2	580-112657-3	8260	TPH-g	140	mg/kg	140 J	T/V2/M/D4

Laboratory:	Eurofins Seattle
Laboratory SDG/Job No:	580-112657-1
Validation Level:	Stage 2B (using Level IV data package)
Number of Samples/Matrix:	3 soils, 1 TB
Analysis (Include Method #):	GRO C6-C10 SW-846 8260D

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)
Chain of Custody	Yes	No
Sample Preservation	Yes	No
Holding Time	Yes	No
Quantitation Limits	No	No
Percent Solids (>30%)	Yes	No
Method Blanks	Yes	No
Trip/Equipment Blanks	No	Yes
Initial Calibration	Yes	No
Initial Calibration Verification	Yes	No
Continuing Calibration Verification	No	Yes
Matrix Spike	No	Yes
Matrix Spike Duplicate RPD[2]	Yes	No
Laboratory Duplicate[2]	NA	NA
Surrogate Standards[2]	Yes	No
Laboratory Control Standards	Yes	No
ISM Relative Standard Deviation	No	Yes
Field Duplicate	NA	NA
Internal Standards[2,3]	Yes	No
GC/MS Tunes[2]	Yes	No
Calculation Spot Checks[3]	NA	NA

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C10)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Samples	Lab ID	
A3000MISH-SOFT01-003.2	580-112657-1	Soil
A3000MISH-SOFT02-003.2	580-112657-2	Soil
A3000MISH-SOFT03-003.2	580-112657-3	Soil
Trip Blank	580-112657-4	Trip Blank

*The relative abundance of specific ions is not applicable to the GRO method since the analysis
qualitative identification of the presence or absence of GRO in the samples is based on defining
start and end of the C6-C12 window, and not as the result of comparison to a reference spectru
and not a selected quantitation ion. Therefore, nonconformances noted for the BFB tunes are r

Sample	Concentration	PAL
A3000MISH-SOFT03-003.2	140 mg/kg	100 mg/kg

Client/Site Name: Red Hill Site Characterization
Project Number: 60674414.00.50.01
Date: 05/27/22
Validator: [redacted]
Reviewer and Date: [redacted] **10/3/22**

Comments
0.0°C
Collected 4/12/22, analyzed within HT
No dilutions. Results for GRO meet PAL (100 mg/kg), except for sample A3000MISH-SOFT03-003.2 as shown
MB 580-387999/1-A were ND.
Trip Blank-1, GRO was detected (50 mg/Kg). All sample results were detected > LOD and ≤ 5x blank and qualified as estimated J+
SEA046 04/04/22, SEA046 04/07/2022
ICV 580-386230/13, ICV 580-386734/12 meet criteria.
CCVIS 580-388036/3, CCV 580-388036/14, CCV 580-388036/25, 580-388036/32. The %D for GRO was above criteria for CCV 580-388036/14 (123.1%) due to carry over from previous client sample. All samples were qualified
Sample A3000MISH-SOFT03-003.2 was spiked. The MS %R for GRO (53%) was below criteria and the MSD %R for GRO (127%) was above criteria. The parent sample would be qualified J as estimated since bias cannot be determined.
Surrogate BFB within QSM limits
LCS 580-387999/4-A, LCSD 580-387999/5-A
The relative standard deviation of the triplicate samples exceeded 50%. The three associated GRO results were qualified as estimated "J".
A field duplicate was not submitted with the samples in this SDG.
Not a required validation element for this project.

s performed on the GC/MS is based on the total ion chromatograph and not a selected quantitation ion. The
g the retention time window with the analysis of a retention time standard that includes compounds which mark the
um. Quantitation is based on the use of an initial calibration which is determined using the total ion chromatograph
not applicable and data validation actions are not required.

Five-pt cal, RSD ≤ 15% or r2 ≥0.99
ICV %D ≤20%

CCV %D ≤20%

see DoD QSM QC limits tab

see DoD QSM QC limits tab
see DoD QSM QC limits tab

Laboratory:	Eurofins Seattle
Laboratory SDG/Job No:	580-112657-1
Validation Level:	Stage 2B (using Level IV data package)
Number of Samples/Matrix:	3 soils
Analysis (Include Method #):	DRO/ORO SW-846 8015C DRO C10-C24, ORO C24-C40

QSM 5.4, DoD Module 4, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)
Chain of Custody	Yes	No
Sample Preservation	Yes	No
Holding Time	Yes	No
Quantitation Limits	No	No
Percent Solids (>30%)	Yes	No
Method Blanks	Yes	No
Equipment Blanks	NA	NA
Initial Calibration	Yes	No
Initial Calibration Verification	Yes	No
Continuing Calibration Verification	Yes	No
Matrix Spike	No	Yes
Matrix Spike Duplicate RPD[2]	Yes	No
Laboratory Duplicate[2]	NA	NA
Surrogate Standards[2]	Yes	No
Laboratory Control Standards	Yes	No
ISM Relative Standard Deviation	Yes	No
Field Duplicate	NA	NA
Calculation Spot Checks[3]	NA	NA

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Gasoline Range Organics (C6-C10)
Diesel Range Organics (C10-C24)
Oil Range Organics (C24-C40)

Sample	Compound	Result (mg/kg)
A3000MISH-SOFT01-003.2	C10-C24	810
A3000MISH-SOFT02-003.2	C10-C24	730
A3000MISH-SOFT03-003.2	C10-C24	650

Samples	Lab ID	
A3000MISH-SOFT01-003.2	580-112657-1	Soil
A3000MISH-SOFT02-003.2	580-112657-2	Soil
A3000MISH-SOFT03-003.2	580-112657-3	Soil
A3000MISH-SOFT01-003.2-1	580-112657-5	
A3000MISH-SOFT02-003.2-1	580-112657-6	
A3000MISH-SOFT03-003.2-1	580-112657-7	

Client/Site Name: Red Hill Site Characterization
Project Number: 60674414.00.50.01
Date: 05/27/22
Validator: [redacted]
Reviewer and Date: [redacted] 7/25/22

Comments
0.0°C
Collected 4/12/22, analyzed within HT
Results for DRO was above PAL (220 mg/kg) for the samples - see below.
MB 580-387925/1-A, All ND
TAC013 580-376805/14, TAC013 580-386092/14
ICV 580-376805/14, 580-386092/14, within criteria
CCVRT 580-388003/3, CCVRT 580-388003/19, CCV 580-388003/28, CCVRT 580-388299/3, CCV 580-388299/14, CCV 580-388299/25
A3000MISH-SOFT01-003.2, Recovery for DRO in the MSD was above criteria in the spiked sample. The associated result was qualified as estimated "J".
LCS 580-387925/2-A, LCSD 580-387925/3-A, LCS 580-388061/2-A, LCSD 580-388061/3-A.
RSDs were below 50%
Not a required validation element for this project.

PAL (mg/kg)
220
220
220

Five-pt cal, RSD ≤ 20% or r2 ≥0.99
ICV %D ≤20%

CCV %D ≤20%

see DoD QSM QC limits tab

see DoD QSM QC limits tab
see DoD QSM QC limits tab

Data validation activities were conducted with reference to:

SW-846 Method 8260D Volatile Organic Compounds by Gas Chromatography/Mass Sp
SW-846 Method 8015C: Nonhalogenated Organics by Gas Chromatography (February

- Module 1 Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by
General Data Validation Guidelines, Department of Defense , Revision 1 (November 201
USEPA Contract Laboratory Program National Functional Guidelines for Organic Superf

Table B-3: Preparation and Analytical Requirements for Field and QC Samples

Matrix	Analytical Group	Preparation Reference/Method SOP Analytical Reference/Method SOP	Containers
Unconsolidated Material	TPH-g, VOCs	Preparation Method: EPA 5035C Preparation SOP: ANA8260 Analysis Method: EPA 8260C Analysis SOP: ANA8260	2 × 10mL water-preserved; 1 × 5mL methanol-preserved; Teflon-lined septum caps
	TPH-d, TPH-o	Preparation Method: EPA 3550C Preparation SOP: SON004 Analysis Method: EPA 8015C Analysis SOP: ANA8015	1 × 8-oz glass jar, Teflon-lined lid
	TPH-d, TPH-o with Silica Gel Cleanup	Preparation Method: EPA 3550C/EPA 3630 Preparation SOP: SON004/CLN004 Analysis Method: EPA 8015C Analysis SOP: ANA8015	
	PAHs	Preparation Method: EPA 3550C Preparation SOP: SON009 Analysis Method: EPA 8270D SIM Analysis SOP: ANA8270SIM	

Notes:

g	gram
H_2SO_4	sulfuric acid
HCl	hydrogen chloride
L	liter
mL	milliliter
$NaHSO_4$	sodium bisulfate
oz	ounce

Sample Volume	Preservation Requirement	Maximum Holding Time (preparation/analysis)
40 mL	Cool to ≤6°C	7 days (water-preserved); 14 days (methanol-preserved)
30 g	Cool to ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
30 g	Cool to ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.
30 g	Cool to ≤6°C	Samples extracted within 14 days and analyzed within 40 days following extraction.

Table C-13. Method 8015 (MOD) Solid Matrix					
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit
460-00-4	4-Bromofluorobenzene	1263	100.7	11.1	67
303-04	Diesel Range Organics (DRO)	2184	85.2	15.7	38
307-27	Gasoline Range Organics (GRO)	1134	100.3	7.2	79
307-51	Motor Oil	658	72.2	11.2	39
84-15-1	o-Terphenyl	314	87.4	14.1	45

Table C-14. Method 8015 (MOD) Aqueous Matrix					
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit
460-00-4	4-Bromofluorobenzene	756	101	10.8	69
303-04	Diesel Range Organics (DRO)	1757	83.7	16	36
307-27	Gasoline Range Organics (GRO)	971	99.9	7.3	78
307-51	Motor Oil	573	76.9	12.1	41
84-15-1	o-Terphenyl	299	90.5	11.4	56
630-02-4	Octacosane	130	101.1	13.8	60

Upper Control Limit
134
132
122
106
130

Upper Control Limit
133
132
122
113
125
142

Matrix Unconsolidated Material

Analyte	CAS Number	Screening Criterion [a] (mg/kg)	Project LOQ Goal (mg/kg)	Project LOD Goal (mg/kg)	Laboratory-Specific Limits (mg/kg)		
					LOQ	LOD	D
TPH							
TPH-g (C5–C11)	-3547	100	33	10	TBD	TBD	TE
TPH-d (C10–C24)	-3527	220	73	22	TBD	TBD	TE
VOCs							
Benzene	71-43-2	0.30	0.10	0.030	TBD	TBD	TE
Ethylbenzene	100-41-4	3.7	1.2	0.37	TBD	TBD	TE
Toluene	108-88-3	3.2	1.1	0.32	TBD	TBD	TE
Total Xylenes	1330-20-7	2.1	0.70	0.21	TBD	TBD	TE
PAHs							
1-Methylnaphthalene	90-12-0	4.2	1.4	0.42	TBD	TBD	TE
2-Methylnaphthalene	91-57-6	4.1	1.4	0.41	TBD	TBD	TE
Naphthalene	91-20-3	4.4	1.5	0.44	TBD	TBD	TE

Notes:

mg/kg milligrams per kilogram

[a] DOH Tier 1 EALs (Summer 2016, updated January 2017),

)L

BD
BD

BD
BD
BD
BD

BD
BD
BD

Data Qualification Reason Codes

Reason Code	Reason Code Description
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds LinearCalibration Range
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank

Data Qualification Reason Codes

V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degreec C.
Y1	False Positive
Y2	Data rejected due to radiological anomolies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of ana
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or ope

: a concentration less than 5X the concentration detected in

lyses for the analyte/compound by the stated method and

ning CCV.

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Memorandum

Project:	Joint Base Pearl Harbor-Hickam, Hawaii Red Hill Bulk Fuel Storage Facility
	Site Characterization Study
Laboratory:	Eurofins, Seattle, WA
Laboratory Number:	580-112657-1
Analyses/Method:	Semivolatile Organic Compounds by EPA Method 8270E-SIM (1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene)
Validation Level:	Stage 2B
Project Number:	60674414.00.50.01
Prepared by:	[redacted] (b) (6) / AECOM — Completed on: 05/27/2022
Reviewed by:	[redacted] (b) (6) / AECOM — File Name: 580-112657-1_SVOC SIM_memo

SUMMARY

The samples listed below were collected by AECOM from the Joint Base Pearl Harbor-Hickam, Hawaii site on April 12, 2022.

Sample ID	Lab ID	Matrix/Sample Type
A3000MISH-SOFT01-003.2	580-112657-1	Soil
A3000MISH-SOFT02-003.2	580-112657-2	Soil
A3000MISH-SOFT03-003.2	580-112657-3	Soil

Data validation activities were conducted with reference to:

- *SW-846 Method 8270E: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)* (June 2018)
- *Preliminary Site Characterization Plan, Joint Base Pearl Harbor-Hickam, Hawaii* (January 2022)
- *Site Characterization Plan Addendum – Holding Tank-Leach Tank Phase 2, Joint Base Pearl Harbor-Hickam, Hawaii* (March 2022)
- *Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of Defense*, Revision 1 (May 2020)
- *General Data Validation Guidelines, Department of Defense*, Revision 1 (November 2019)
- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review* (November 2020).

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓ Data completeness (chain-of-custody [COC])/sample integrity
✓ Holding times and sample preservation

- ✓ Instrument tuning
- ✓ Initial calibration/initial and continuing calibration verification
- ✓ Laboratory blanks/field blanks/equipment blanks
- ✓ Surrogate spike recoveries
- ✓ Matrix spike (MS) and matrix spike duplicate (MSD) results
- ✓ Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
- ✓ Field duplicate/triplicate results
- ✓ Internal standard results
- ✓ Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. An NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as qualified and may be used for decision making purposes. There were no data points qualified as a result of this data review.

RESULTS

Sample Results/Reporting Issues

If applicable, the sample results detected at concentrations less than the Limit of Quantitation (LOQ) but greater than the Detection Limit (DL) are qualified by the laboratory as estimated (J). This “J” qualifier is retained during data validation. Laboratory limits of detection (LOD) meet screening criteria for all samples.

QUALIFICATION ACTIONS

There were no sample results qualified as a result of this data review.

Laboratory:	Eurofins Seattle	**Client/Site Name**: Red Hill Site Characterization	
Laboratory SDG/Job No:	580-112657-1	**Project Number**: 60674414.00.50.01	
Validation Level:	Stage 2B	**Date**: 05/27/22	
	(using Level IV data package)	**Validator**: [redacted]	
Number of Samples/Matrix:	3 soils	**Reviewer and Date:** [redacted] **7/25/22**	
Analysis (Include Method #):	SVOCs, SW846 8270E-SIM (Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene)		

DoD QSM 5.4, DoD Module 1, NFG

Review Item	Criteria Met? (Yes/No)	Qualification? (Yes/No)	Comments
Chain of Custody	Yes	No	
Sample Preservation	Yes	No	0.0°c
Holding Time	Yes	No	Collected 4/12/22, analyzed within HT
Quantitation Limits	Yes	No	No dilutions. ND results at LOD meet action limits.
Percent Solids (>30%)	Yes	No	
Method Blanks	Yes	No	MB 580-387916/1-A, All ND
Other Laboratory Blanks[1,2]	NA	NA	Not applicable to these analyses.
Trip/Equipment Blanks	NA	NA	
Initial Calibration	Yes	No	ICAL 3/24/2022, Inst SEA101, criteria met
Initial Calibration Verification	Yes	No	ICV 580-385060/21, within criteria
Continuing Calibration Verification	Yes	No	CCVIS 580-387965/2, CCVC 580-387965/15, within criteria
Matrix Spike	Yes	No	Sample A3000MISH-SOFT02-003.2 spiked; within criteria
Matrix Spike Duplicate RPD[2]	Yes	No	
Laboratory Duplicate[2]	NA	NA	Not applicable to these analyses.
Surrogate Standards[2]	Yes	No	%Rs within lab limits (per QSM) for PAH surrogates fluoranthene-d10 and 2-methylnaphthalene-d10
Laboratory Control Standards	Yes	No	LCS 580-387916/2-A
Internal Standards[2,3]	Yes	No	
ISM Relative Standard Deviation	Yes	No	All ND. RSD under 50%.
Field Duplicate	NA	NA	
GC/MS Tunes[2]	Yes	No	
Calculation Spot Checks[3]	NA	NA	Not a required validation element for this project.

[1]May include reagent blanks, calibration blanks, etc.
[2]May not be applicable to all analyses.
[3]Level IV validation only. See full NFG worksheets for details.

Data validation activities were conducted with reference to:

SW-846 Method 8270E Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS

Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS, Department of

General Data Validation Guidelines, Department of Defense, Revision 1 (November 2019)

USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Revi

f Defense, Revision 1 (May 2020)

iew (November 2020)

DoD Module 1

Note DoD Module 1 criteria (below) are based on Method 8270D; lab analyzed samples using 8270E-SIM. QSM 5.4 Table B-22 criteria of RSD ≤20% or r2 ≥ 0.99 was used to evaluate the ICAL data. Per Method 8270E, minimum RFs on Table 4 are used as guidance.

Table IX: SVOC RF (Method 8270D)

Analyte	Minimum Average RF (method uses the term "mean")
Acenaphthylene	0.9
Acenaphthene	0.9
Fluorene	0.9
Phenol	0.8
2-Chlorophenol	0.8
2-Chloronaphthalene	0.8
Dibenzofuran	0.8
Benzo(a)anthracene	0.8
bis(2-Chloroethyl)ether	0.7
2-Methylphenol	0.7
Naphthalene	0.7
Phenanthrene	0.7
Anthracene	0.7
Chrysene	0.7
Benzo(b)fluoranthene	0.7
Benzo(k)fluoranthene	0.7

Analyte	Minimum Average RF (method uses the term "mean")
Benzo(a)pyrene	0.7
4-Methylphenol	0.6
Fluoranthene	0.6
Pyrene	0.6
N-nitroso-di-n-propylamine	0.5
Indeno(1,2,3-cd)pyrene	0.5
Benzo(ghi)peylene	0.5
Isophorone	0.4
2-Methylnaphthalene	0.4
4-Chlorophenylphenylether	0.4
Dibenz(a,h)anthracene	0.4
Hexachloroethane	0.3
bis(2-Chloroethoxy)methane	0.3
Nitrobenzene	0.2

DoD Mod 1

If any SVOC
RF less thar

If the avera
and associa

A minimum
coefficients
instrument
value shoul

A minimum
correlation
Some instru
r2, the valu

2,4-Dimethylphenol	0.2
2,4-Dichlorophenol	0.2
4-Chloro-3-methylphenol	0.2
2,4,6-Trichlorophenol	0.2
2,4,5-Trichlorphenol	0.2
2,6-Dinitrotoluene	0.2
2,4-Dinitrotoluene	0.2
2-Nitrophenol	0.1
4-Bromophenylphenylether	0.1
Hexachlorobenzene	0.1
Hexachlorocyclopentadiene	0.05
Pentachlorophenol	0.05
Benzaldehyde	0.01
2,2'-Oxybis-(1-chloropropane)	0.01

Analyte	**Minimum Average RF (method uses the term "mean")**
Acetophenone	0.01
4-Chloroaniline	0.01
Hexachlorobutadiene	0.01
Caprolactam	0.01
1,1'-Biphenyl	0.01
2-Nitroaniline	0.01
Dimethyl phthalate	0.01
3-Nitroaniline	0.01
2,4-Dinitrophenol	0.01
4-Nitrophenol	0.01
Diethyl phthalate	0.01
1,2,4,5-Tetrachlorobenzene	0.01
4-Nitroaniline	0.01
4,6-Dinitro-2-methylphenol	0.01
N-Nitrosodiphenylamine	0.01
Atrazine	0.01
Carbazole	0.01
Di-n-butyl phthalate	0.01
Butyl benzyl phthalate	0.01
3,3'-Dichlorobenzidine	0.01
bis(2-ethylhexyl)phthalate	0.01
Di-n-octylphthalate	0.01
2,3,4,6-Tetrachlorophenol	0.01

. (8270D)

: analyte listed above (except those with an average RF of 0.01) has an average
ı that listed in the table, qualify detects J and non-detects UJ.

.ge RF for any target analyte is < 0.01, associated detects should be qualified J
ıted non-detects should be qualified X.

ı of five standards is required for a linear regression. Evaluate the correlation
; (r) for all applicable target analytes. The r value should be ≥ 0.995. Some
ation reports coefficient of determination (r2). If the instrument reports r2, the
d be ≥ 0.99.

ı of six standards is required for a second order (quadratic) curve. Evaluate the
coefficients(r) for all applicable target analytes. The r value should be ≥ 0.995.
ımentation reports coefficient of determination (r2). If the instrument reports
e should be ≥ 0.99.

Table C-27 8270 SIM SOLID

Table C-27. Method 8270 SIM Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
90-12-0	1-Methylnaphthalene	2267	76.6	11.3	43	111
95-95-4	2,4,5-Trichlorophenol	169	79.9	14.9	35	125
91-58-7	2-Chloronaphthalene	615	76.7	10.5	45	108
321-60-8	2-Fluorobiphenyl	1961	80.6	11.6	46	115
91-57-6	2-Methylnaphthalene	2535	76.8	12.5	39	114
83-32-9	Acenaphthene	2813	77.7	11.2	44	111
208-96-8	Acenaphthylene	2761	77.1	12.8	39	116
120-12-7	Anthracene	2812	82.1	10.7	50	114
56-55-3	Benz(a)anthracene	2827	88	11.4	54	122
50-32-8	Benzo(a)pyrene	2789	87.3	12.5	50	125
205-99-2	Benzo(b)fluoranthene	2790	90.3	12.6	53	128
191-24-2	Benzo(g,h,i)perylene	2739	87.8	13	49	127
207-08-9	Benzo(k)fluoranthene	2761	89.3	11.2	56	123
111-44-4	Bis(2-chloroethyl) ether	192	65.4	15.8	18	113
117-81-7	Bis(2-ethylhexyl) phthalate	181	108.9	13.9	67	150
85-68-7	Butyl benzyl phthalate	144	103.5	10.6	72	135
86-74-8	Carbazole	183	79.3	14.6	36	123

Table C-27. Method 8270 SIM Solid Matrix						
CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
218-01-9	Chrysene	2812	87.5	10.2	57	118
84-74-2	Di-n-butyl phthalate	150	106.5	12.9	68	145
117-84-0	Di-n-octyl phthalate	144	105.5	16.8	55	156
53-70-3	Dibenzo(a,h)anthracene	2778	89.2	13.2	50	129
132-64-9	Dibenzofuran	282	71.9	12.2	35	108
84-66-2	Diethyl phthalate	147	99.3	10.9	67	132
131-11-3	Dimethyl phthalate	149	99.3	9.3	71	127
206-44-0	Fluoranthene	2782	87.3	10.7	55	119
86-73-7	Fluorene	2795	80.6	11.2	47	114
118-74-1	Hexachlorobenzene	201	81.9	14.2	39	125
193-39-5	Indeno(1,2,3-cd)pyrene	2812	89.6	13.5	49	130
62-75-9	n-Nitrosodimethylamine	117	90.7	10.9	58	124
91-20-3	Naphthalene	2823	74.7	12.2	38	111
87-86-5	Pentachlorophenol	259	82.4	15.5	36	129

85-01-8	Phenanthrene	2792	80.8	10.6	49	113
129-00-0	Pyrene	2792	85.8	10.2	55	117

Table C-28 8270 SIM AQUEOUS

Table C-28. Method 8270 SIM Aqueous Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
92-52-4	1,1-Biphenyl	106	77.3	7.3	56	99
90-12-0	1-Methylnaphthalene	2566	77.9	12.5	41	115
95-95-4	2,4,5-Trichlorophenol	488	84.1	13.4	44	124
118-79-6	2,4,6-Tribromophenol	164	83.7	12.7	46	122
606-20-2	2,6-Dinitrotoluene	118	67.2	15.8	20	115
91-58-7	2-Chloronaphthalene	717	72.4	12.7	34	111
321-60-8	2-Fluorobiphenyl	747	79.2	8.8	53	106
91-57-6	2-Methylnaphthalene	2984	76.5	12.6	39	114
83-32-9	Acenaphthene	3241	80.9	11.1	48	114
208-96-8	Acenaphthylene	3234	77.8	14.4	35	121
120-12-7	Anthracene	3224	85.8	11	53	119

Table C-28. Method 8270 SIM Aqueous Matrix

CAS ID	Analyte	N Records	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
56-55-3	Benz(a)anthracene	3277	89.3	10.1	59	120
50-32-8	Benzo(a)pyrene	3284	86.4	11.2	53	120
205-99-2	Benzo(b)fluoranthene	3248	89.7	12.3	53	126
191-24-2	Benzo(g,h,i)perylene	3178	86	14.1	44	128
207-08-9	Benzo(k)fluoranthene	3167	89.3	11.9	54	125
111-44-4	Bis(2-chloroethyl) ether	775	77.8	12.6	40	116
117-81-7	Bis(2-ethylhexyl) phthalate	275	114.1	19.6	55	173
85-68-7	Butyl benzyl phthalate	159	90.7	17.3	39	143
86-74-8	Carbazole	631	84	13.1	45	123
218-01-9	Chrysene	3215	88.3	10.4	57	120
84-74-2	Di-n-butyl phthalate	153	102.5	14.2	60	145
117-84-0	Di-n-octyl phthalate	157	103.3	19	46	160
53-70-3	Dibenzo(a,h)anthracene	3233	87.2	14.5	44	131
132-64-9	Dibenzofuran	864	77.5	14.1	35	120
84-66-2	Diethyl phthalate	142	94.5	13.5	54	135
206-44-0	Fluoranthene	3242	89.1	10.4	58	120
86-73-7	Fluorene	3232	84.1	11.3	50	118
118-74-1	Hexachlorobenzene	947	84.8	13	46	124

118-74-1	Hexachlorobenzene	847	84.8	13	46	124
87-68-3	Hexachlorobutadiene	187	84.5	14.7	40	129
193-39-5	Indeno(1,2,3-cd)pyrene	3244	88.7	13.7	48	130
62-75-9	N-Nitrosodimethylamine	162	62.5	10	33	92
91-20-3	Naphthalene	3277	78.8	11.9	43	114
4165-60-0	Nitrobenzene-d5	444	83.1	9.2	55	111
87-86-5	Pentachlorophenol	808	88.4	17.6	36	141
85-01-8	Phenanthrene	3240	83.6	10.3	53	115
129-00-0	Pyrene	3252	87.1	11.3	53	121
1718-51-0	Terphenyl-d14	642	95.1	12.4	58	132

Matrix **Unconsolidated Material**

Analyte	CAS Number	Screening Criterion [a] (mg/kg)	Project LOQ Goal (mg/kg)	Project LOD Goal (mg/kg)	Laboratory-Specifi	
					LOQ	LOI
TPH						
TPH-g (C5–C11)	-3547	100	33	10	TBD	TBI
TPH-d (C10–C24)	-3527	220	73	22	TBD	TBI
VOCs						
Benzene	71-43-2	0.30	0.10	0.030	TBD	TBI
Ethylbenzene	100-41-4	3.7	1.2	0.37	TBD	TBI
Toluene	108-88-3	3.2	1.1	0.32	TBD	TBI
Total Xylenes	1330-20-7	2.1	0.70	0.21	TBD	TBI
PAHs						
1-Methylnaphthalene	90-12-0	4.2	1.4	0.42	TBD	TBI
2-Methylnaphthalene	91-57-6	4.1	1.4	0.41	TBD	TBI
Naphthalene	91-20-3	4.4	1.5	0.44	TBD	TBI

Notes:

mg/kg milligrams per kilogram

[a] DOH Tier 1 EALs (Summer 2016, updated January 2017),

c Limits (mg/kg)	
D	DL
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD
D	TBD

Data Qualification Reason Codes

Reason Code	Reason Code Description
A	Serial dilution
A1	Ambient Blank
B	The analyte was found in an associated blank as well as in the sample.
B2	CCB
B3	CCB - Neg
B4	Grinding Blank
C	LCS Recovery
C1	Reference Recovery
C2	Reference Recovery RPD
D	MS RPD
D1	Lab Replicate RPD
D2	No precision available
D3	Field Duplicate RPD
D4	Field Triplicate RSD
D5	Laboratory Triplicate RSD
F	Field Blank
F1	Hydrocarbon pattern does not match standard
G1	Initial Calibration RRF
G2	Initial Calibration RSD/r^2/r
G3	ICV RRF
H1	Test Hold Time
H2	Prep Hold Time
I	Surrogate recovery outside project limits.
J	CRA/CRI Recovery
K	An analyte (non-common laboratory artifact) was detected in the sample at
L	Lab Blank
L1	Lab Blank - Neg
M	MS Recovery
M2	Post Spike
N	Blank - No Action
O	ICS
P	Sample preservation/collection requirement not met.
P1	Column RPD
P2	Improper preparation/extraction
Q	Encore sample holding time exceeded by more than 2X.
Q1	Material Blank
Q2	Encore sample holding time exceeded by less than 2X.
R	Exceeds LinearCalibration Range
S	Internal standard
T	Trip Blank
TI	Tentatively Identified Compound
TR	Trace Level Detect
U	Receipt Temperature
V	Equipment Blank

Data Qualification Reason Codes

V1	ICV
V2	CCV
V3	CCV RRF
V4	Sample Receipt Condition
V5	Ending Continuing Calibration Verification
V6	Low Level Calibration Verification
V7	Interference Check Sample A
V8	Interference Check Sample AB
V9	Interference Check Sample A - Negative
W	Column breakdown (pesticides/8270)
X	Raised reporting limit
Y	Cooler temperature greater than 10 degreec C.
Y1	False Positive
Y2	Data rejected due to radiological anomolies
Y3	Non-accredited analyte/compound. Accreditation not offered at time of ana
Y4	Performance Check - Degradation of DDT
Y5	Extracted Internal Standard
Y6	Analyte not confirmed on second column.
Y7	Signal to Noise Ratio not met
Z	LCS RPD
Z1	Non-accredited analyte/compound
Z1	Data rejected, more valid data available.
Z2	Detection Level not met uncertainty greater than DL
Z4	MDA Greater than RDL.
Z5	Ion Ratio
Z6	Samples were analyzed past the 12 hour time period from the Tune or ope

: a concentration less than 5X the concentration detected in

lyses for the analyte/compound by the stated method and

ning CCV.

Facility:	RHBFS Site Characterization
Event:	Site Characterization Tunnel Cutouts
SDG:	5801141141
Guidance Document:	Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP
Prime Contractor:	AECOM, Honolulu, HI
Project Manager:	[redacted] (b) (6)
Contract Laboratory(ies):	Eurofins Environment Testing TestAmerica, Tacoma, WA | Eurofins Environment Testing TestAmerica, West Sacramento, CA
Data Review Contractor:	AECOM
Data Review Level:	S2BVEM
Primary Data Reviewer:	[redacted] (b) (6), Chemist
Second Reviewer:	[redacted] (b) (6), Chemist
Date Submitted:	October 04, 2022

Field Sample ID	Lab Sample ID	Matrix	Type/Type Code	BNASIM	SW8015D	SW8260	SW8260D
A3015-TN01-052322	580-114114-2	Water	Trip Blank/TB			X	X
A3015-WGN01-052322	580-114114-1	Water	Field Sample/N	X	X	X	X

This report assesses the analytical data quality associated with the analyses listed on the preceding cover page at S2BVEM data validation level. This assessment has been made through a combination of automated data review (ADR) and supplemental manual review, the details of which are described below. The approach taken in the review of this data set is consistent with the requirements contained in the Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP and the additional guidance documents incorporated by reference to the extent possible. Where definitive guidance is not provided, results have been evaluated in a conservative manner using professional judgment.

Sample collection was managed and directed by AECOM, Honolulu, HI; analyses were performed by Eurofins Environment Testing TestAmerica, Tacoma, WA | Eurofins Environment Testing TestAmerica, West Sacramento, CA and were reported under sample delivery group (SDG) 5801141141. Data have been evaluated electronically based on electronic data deliverables (EDDs) provided by the laboratory, and hard copy data summary forms have also been reviewed during this effort and compared to the automated review output by the reviewers whose signatures appear on the following page. Findings based on the automated data submission and manual data verification processes are detailed in the ADR narrative and throughout this report.

All quality control (QC) elements associated with this SDG have been reviewed by a project chemist in accordance with the requirements defined for the project. This review is documented in the attached Data Review Checklists. The QC elements listed below were supported by the electronic deliverable and were evaluated using ADR processes.

Continuing Calibration Verification

Lab Blank

LCS Recovery

LCS RPD

Prep Hold Time

Surrogate

Test Hold Time

Trip Blank

Results of the ADR process were subsequently reviewed and updated as applicable by the data review chemists identified on the signature page. Quality control elements that were not included in the electronic deliverable were reviewed manually and findings are documented within this report. Summaries of findings and associated qualified results are documented throughout this report.

A total of 1 results (5.26%) out of the 19 results (sample and field QC samples) reported are qualified based on review and 0 results (0.00%) have been rejected or deemed a serious deficiency (X qualifier). Trace values, defined as results that are qualified as estimated because they fall between the detection limit and the reporting limit/limit of quantitation, are not counted as qualified results in the above count. The qualified results are detailed throughout this report and discussed in the narrative below, where appropriate.

Narrative Comments

Analytical Method	Data Reviewer Comment
BNASIM	No additional comments; see Checklist for detail.
SW8015D	No additional comments; see Checklist for detail.
SW8260	No additional comments; see Checklist for detail.
SW8260D	No additional comments; see Checklist for detail.

[redacted] October 03, 2022

Chemist, AECOM

As the First Reviewer, I certify that I have performed a data review process in accordance with the requirements of the project guidance document, and have compared the electronic data to the laboratory's hard copy report and have verified the consistency of the reported sample results and method quality control data between the two deliverables.

[redacted]

hemist, AECOM October 04, 2022

As the Second Reviewer, I certify that I have performed a quality assurance review of the report generated by the First Reviewer.

No Outliers were associated with this sample delivery group.

Table of All Qualified Results

Test Method: SW8260		**Extraction Method: SW5030**						
FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3015-TN01-052322 580-114114-2	TB	C6-C10 Gasoline Range Organics	50.0	30.0 U	30.0 UJ		ug/l	P

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Table of Results with Modified Qualifiers

Modified Qualifiers for test method SW8260

FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	ADR Result	Modified Result	Reason
A3015-TN01-052322 580-114114-2	TB	C6-C10 Gasoline Range Organics	50.0	30.0 U	30.0 U	30.0 UJ	P

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Reason Code Definitions

Code	Definition
P	Sample preservation/collection requirement not met.

Flag Code and Definitions

Flag	Definition
J	Estimated Value
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a tentative identification.
NJ	The analyte has been tentatively identified or presumptively as present and the associated numerical value was the estimated concentration in the sample.
R	The data are rejected due to deficiencies in meeting QC criteria and may not be used for decision making.
U	Undetected: The analyte was analyzed for, but not detected.
UJ	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
X	Result may require rejection; PDT attention required

Bias

-	The result may be biased low
+	The result may be biased high

Note - The bias field is a separate field; however, it is an integral part of the final flag (qualifier) on the sample result

Review Questions

Method: BNASIM (GC/MS-SIM Analysis of 1,4-Dioxane by SW8270)				
Review Questions	Yes	No	NA	Comment
Were all samples documented correctly on the chain-of-custody (COC)?	•			
Did samples listed on the COCs match the sample labels?		•		The container labels for the following samples did not match the information listed on the Chain-of-Custody (COC): A3015-WGN01-052322 (580-114114-1) and A3015-TN01-052322 (580-114114-2). The container labels list the suffix for both samples as -44704, while the COC lists -52322. The -44704 suffix appears to be crossed out on the COC for sample -1. The COC was used for login. Collection time for sample -2 changed per case narrative.
Were samples relinquished properly on the COC?	•			
Were all samples properly preserved?	•			0.6C
Were sampling dates/times, date and time of laboratory receipt of samples, and sample conditions upon receipt at the laboratory (including preservation, pH, and temperature) documented?	•			Collected 5/23/22
Were sample results reported with percent moisture correction if required?			•	NA for aqueous samples
Were analytical methods performed and analysis dates present?	•			
Were all requested target analytes reported?	•			
Were QAPP specified Project Quantitation Limit Goals achieved? (The laboratory LOQ is compared to the QAPP Project Quantitation Goal)	•			
Were holding times met?	•			
Were trip blanks analyzed at the proper frequency and in control?			•	TB not applicable to this analysis.
Were field blanks analyzed at the proper frequency and in control?			•	FB not submitted with the samples in this data set.
Were equipment blanks analyzed at the proper frequency and in control?			•	EB not submitted with the samples in this data set.
Was a method blank prepared and analyzed with each batch?	•			MB 580-392094/1-A
Were target analytes in the method blank less than DL?	•			MB 580-392094/1-A ND
Was an LCS/LCSD pair prepared and analyzed with each batch?	•			LCS 580-392094/2-A, LCSD 580-392094/3-A
Were LCS/LCSD recoveries within project acceptance limits?	•			
Was the LCS/LCSD RPD within project acceptance limits?	•			
Was a MS/MSD pair prepared with each batch?		•		MS/MSD not analyzed or requested on a sample in this data set.
Were MS/MSD recoveries within project acceptance limits?			•	
Was the MS/MSD RPD within project acceptance limits?			•	
If ISM was used for sample collection, were laboratory triplicates analyzed and within project acceptance limits?			•	
Were surrogate recoveries within project acceptance limits?	•			
Were field replicates (duplicates, triplicates, etc.) analyzed at the proper frequency and in control?			•	FDs were not submitted in this data set.

Review Questions

Method: BNASIM (GC/MS-SIM Analysis of 1,4-Dioxane by SW8270)				
Review Questions	Yes	No	NA	Comment
Were reported sample concentrations within calibration range?	•			Sample 580-114114-1 results reported within calibration range from 10X dilution. Reporting limits were adjusted accordingly.
Was the GC/MS system properly tuned based on method criteria?	•			
Was instrument tuning completed every 12 hours during sample analysis?	•			An acceptable DFTPP tune was analyzed before ICV 580-385060/21 on 3/25/22 11:58.
Was the Calibration within project acceptance criteria?	•			SEA101 3/24/22
Was a ICV performed after each ICAL prior to sample analysis and within project acceptance criteria?	•			ICV 580-385060/21
Were CCVs run at the required frequency and within project acceptance criteria?	•			CCVIS 580-392254/3, CCVC 580-392254/30
Were internal standard retention times and area criteria within project acceptance criteria?	•			
Were internal standards spiked for every sample, standard, and QC sample?	•			
Were instrument run logs present and filled out appropriately?	•			
Were sample preparation sheets present and filled out appropriately?	•			
Have all Laboratory Case Narrative comments/findings been addressed in the data review process?	•			Case narrative notes that sample A3015-WGN01 -052322 (580-114114-1) formed emulsions during the extraction procedure. The emulsions were broken up using additional sodium sulfate filtrations and DCM rinsing as needed.
Were DoD QSM corrective actions followed if deviations were noted?	•			
Were any data recommended for exclusion in the data validation process?		•		

Data Validation Report for 5801141141

Review Questions

Method: SW8015D (Nonhalogenated Organics using GC/FID)				
Review Questions	Yes	No	NA	Comment
Were all samples documented correctly on the chain-of-custody (COC)?	•			
Did samples listed on the COCs match the sample labels?		•		The container labels for the following samples did not match the information listed on the Chain-of-Custody (COC): A3015-WGN01-052322 (580-114114-1) and A3015-TN01-052322 (580-114114-2). The container labels list the suffix for both samples as -44704, while the COC lists -52322. The -44704 suffix appears to be crossed out on the COC for sample -1. The COC was used for login. Collection time for sample -2 changed per case narrative.
Were samples relinquished properly on the COC?	•			
Were all samples properly preserved?	•			0.6C
Were sampling dates/times, date and time of laboratory receipt of samples, and sample conditions upon receipt at the laboratory (including preservation, pH, and temperature) documented?	•			Collected 5/23/22
Were sample results reported with percent moisture correction if required?			•	NA for aqueous samples
Were analytical methods performed and analysis dates present?	•			
Were all requested target analytes reported?	•			
Were QAPP specified Project Quantitation Limit Goals achieved? (The laboratory LOQ is compared to the QAPP Project Quantitation Goal)	•			
Were holding times met?	•			
Were trip blanks analyzed at the proper frequency and in control?			•	TB not applicable to this analysis.
Were field blanks analyzed at the proper frequency and in control?			•	FB not submitted with the samples in this data set.
Were equipment blanks analyzed at the proper frequency and in control?			•	EB not submitted with the samples in this data set.
Was a method blank prepared and analyzed with each batch?	•			MB 580-392093/1-A
Were target analytes in the method blank less than DL?	•			
Was an LCS/LCSD pair prepared and analyzed with each batch?	•			LCS 580-392093/2-A, LCSD 580-392093/3-A
Were LCS/LCSD recoveries within project acceptance limits?	•			
Was the LCS/LCSD RPD within project acceptance limits?	•			
Was a MS/MSD pair prepared with each batch?		•		MS/MSD not analyzed or requested on a sample in this data set.
Were MS/MSD recoveries within project acceptance limits?			•	
Was the MS/MSD RPD within project acceptance limits?			•	
If ISM was used for sample collection, were laboratory triplicates analyzed and within project acceptance limits?			•	
Were surrogate recoveries within project acceptance limits?	•			
Were field replicates (duplicates, triplicates, etc.) analyzed at the proper frequency and in control?			•	FDs not submitted with the sample in this data set.

Data Validation Report for 5801141141

Review Questions

Method: SW8015D (Nonhalogenated Organics using GC/FID)				
Review Questions	Yes	No	NA	Comment
Were reported sample concentrations within calibration range?	•			Sample A3015-WGN01-052322 (580-114114-1) analyzed at a 2X dilution to bring concentration of target analytes within calibration range. Elevated RLs reported.
Were Instrument Performace Checks (Degradation Checks) performed and within acceptace criteria?			•	
Was the Calibration within project acceptance criteria?	•			TAC020 5/26/22
Was a ICV performed after each ICAL prior to sample analysis and within project acceptance criteria?	•			ICV 580-392043/14
Were CCVs run at the required frequency and within project acceptance criteria?	•			CCVRT 580-392287/3, CCV 580-392287/25, CCV 580-392287/34
Were internal standard retention times and area criteria within method requirements?			•	
Were internal standards spiked for every sample, standard, and QC sample?			•	
Were instrument run logs present and filled out appropriately?	•			
Were sample preparation sheets present and filled out appropriately?	•			
Was a Cleanup Procedure required (Cleanup Recovery Checks) verified and within acceptance limits?			•	
Was a Second Column/Detector used and the column difference within acceptance limits?			•	
Have all Laboratory Case Narrative comments/findings been addressed in the data review process?	•			
Were DoD QSM corrective actions followed if deviations were noted?	•			
Were any data recommended for exclusion in the data validation process?		•		

Review Questions

Method: SW8260 (Volatile Organic Compounds by Capillary GC/MS)				
Review Questions	Yes	No	NA	Comment
Were all samples documented correctly on the chain-of-custody (COC)?	•			
Did samples listed on the COCs match the sample labels?		•		The container labels for the following samples did not match the information listed on the Chain-of-Custody (COC): A3015-WGN01-052322 (580-114114-1) and A3015-TN01-052322 (580-114114-2). The container labels list the suffix for both samples as -44704, while the COC lists -52322. The -44704 suffix appears to be crossed out on the COC for sample -1. The COC was used for login. Collection time for sample -2 changed per case narrative.
Were samples relinquished properly on the COC?	•			
Were all samples properly preserved?		•		0.6C, pH<2. Sample A3015-TN01-052322 (580-114114-2) sample container was received with headspace (bubble >6mm) for the GRO analysis. Based on professional judgment, the result was qualified(UJ, reason code P) as estimated.
Were sampling dates/times, date and time of laboratory receipt of samples, and sample conditions upon receipt at the laboratory (including preservation, pH, and temperature) documented?	•			Collected 5/23/22
Were sample results reported with percent moisture correction if required?			•	NA for aqueous samples
Were analytical methods performed and analysis dates present?	•			
Were all requested target analytes reported?	•			
Were QAPP specified Project Quantitation Limit Goals achieved? (The laboratory LOQ is compared to the QAPP Project Quantitation Goal)	•			
Were holding times met?	•			
Were trip blanks analyzed at the proper frequency and in control?	•			A3015-TN01-052322 ND
Were field blanks analyzed at the proper frequency and in control?			•	FB not submitted with the samples in this data
Were equipment blanks analyzed at the proper frequency and in control?			•	EB not submitted with the samples in this data
Was a method blank prepared and analyzed with each batch?	•			MB 320-591344/10
Were target analytes in the method blank less than DL?	•			MB ND
Was an LCS/LCSD pair prepared and analyzed with each batch?	•			LCS 320-591344/7, LCSD 320-591344/8
Were LCS/LCSD recoveries within project acceptance limits?	•			
Was the LCS/LCSD RPD within project acceptance limits?	•			
Was a MS/MSD pair prepared with each batch?		•		MS/MSD not requested or analyzed on a sample in this data set.
Were MS/MSD recoveries within project acceptance limits?			•	
Was the MS/MSD RPD within project acceptance limits?			•	
If ISM was used for sample collection, were laboratory triplicates analyzed and within project acceptance limits?			•	
Were surrogate recoveries within project acceptance limits?	•			

Review Questions

Method: SW8260 (Volatile Organic Compounds by Capillary GC/MS)				
Review Questions	Yes	No	NA	Comment
Were field replicates (duplicates, triplicates, etc.) analyzed at the proper frequency and in control?		•		FDs not submitted in this data set.
Were reported sample concentrations within calibration range?	•			No sample dilutions.
Was the GC/MS system properly tuned based on method criteria?			•	
Was instrument tuning completed every 12 hours during sample analysis?			•	
Was the Calibration within project acceptance criteria?	•			HP12 5/10/22
Was a ICV performed after each ICAL prior to sample analysis and within project acceptance criteria?	•			ICV 320-586817/15
Were CCVs run at the required frequency and within project acceptance criteria?	•			CCV 320-591344/3, CCV 320-591344/21, CCV 320-591344/32
Were internal standard retention times and area criteria within project acceptance criteria?			•	NA for GRO
Were internal standards spiked for every sample, standard, and QC sample?			•	NA for GRO
Were instrument run logs present and filled out appropriately?	•			
Were sample preparation sheets present and filled out appropriately?	•			
Have all Laboratory Case Narrative comments/findings been addressed in the data review process?	•			
Were DoD QSM corrective actions followed if deviations were noted?	•			
Were any data recommended for exclusion in the data validation process?		•		

Data Validation Report for 5801141141

Review Questions

Method: SW8260D (Volatile Organic Compounds by GC/MS)				
Review Questions	Yes	No	NA	Comment
Were all samples documented correctly on the chain-of-custody (COC)?	•			
Did samples listed on the COCs match the sample labels?		•		The container labels for the following samples did not match the information listed on the Chain-of-Custody (COC): A3015-WGN01-052322 (580-114114-1) and A3015-TN01-052322 (580-114114-2). The container labels list the suffix for both samples as -44704, while the COC lists -52322. The -44704 suffix appears to be crossed out on the COC for sample -1. The COC was used for login. Collection time for sample -2 changed per case narrative.
Were samples relinquished properly on the COC?	•			
Were all samples properly preserved?	•			0.6C, pH<2
Were sampling dates/times, date and time of laboratory receipt of samples, and sample conditions upon receipt at the laboratory (including preservation, pH, and temperature) documented?	•			Collected 5/23/22
Were sample results reported with percent moisture correction if required?			•	NA for aqueous samples.
Were analytical methods performed and analysis dates present?	•			
Were all requested target analytes reported?	•			BTEX only
Were QAPP specified Project Quantitation Limit Goals achieved? (The laboratory LOQ is compared to the QAPP Project Quantitation Goal)	•			
Were holding times met?	•			
Were trip blanks analyzed at the proper frequency and in control?	•			A3015-TN01-052322 ND
Were field blanks analyzed at the proper frequency and in control?			•	FB not submitted with the samples in this data. See trip blank.
Were equipment blanks analyzed at the proper frequency and in control?			•	EB not submitted with the samples in this data
Was a method blank prepared and analyzed with each batch?	•			MB 580-392136/6
Were target analytes in the method blank less than DL?	•			MB 580-392136/6 ND
Was an LCS/LCSD pair prepared and analyzed with each batch?	•			LCS 580-392136/3, LCSD 580-392136/4
Were LCS/LCSD recoveries within project acceptance limits?	•			
Was the LCS/LCSD RPD within project acceptance limits?	•			
Was a MS/MSD pair prepared with each batch?		•		MS not requested or analyzed on a sample in this data set.
Were MS/MSD recoveries within project acceptance limits?			•	
Was the MS/MSD RPD within project acceptance limits?			•	
If ISM was used for sample collection, were laboratory triplicates analyzed and within project acceptance limits?			•	
Were surrogate recoveries within project acceptance limits?	•			
Were field replicates (duplicates, triplicates, etc.) analyzed at the proper frequency and in control?		•		FDs not submitted with these samples.

Data Validation Report for 5801141141

Review Questions

Method: SW8260D (Volatile Organic Compounds by GC/MS)				
Review Questions	Yes	No	NA	Comment
Were reported sample concentrations within calibration range?	•			No dilutions
Was the GC/MS system properly tuned based on method criteria?	•			Tune 5/27/22 ion abundance (94.7%) for mass 176 rounds to 95% (criteria 95-105%). No actions taken.
Was instrument tuning completed every 12 hours during sample analysis?	•			
Was the Calibration within project acceptance criteria?	•			TAC048 5/3/22
Was a ICV performed after each ICAL prior to sample analysis and within project acceptance criteria?	•			ICV 580-389295/15
Were CCVs run at the required frequency and within project acceptance criteria?	•			CCVIS 580-392136/2, CCVC 580-392136/25
Were internal standard retention times and area criteria within project acceptance criteria?	•			
Were internal standards spiked for every sample, standard, and QC sample?	•			
Were instrument run logs present and filled out appropriately?	•			
Were sample preparation sheets present and filled out appropriately?	•			
Have all Laboratory Case Narrative comments/findings been addressed in the data review process?	•			
Were DoD QSM corrective actions followed if deviations were noted?	•			
Were any data recommended for exclusion in the data validation process?		•		

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-115329-1
Eurofins, Seattle

Prepared by
ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for
AECOM Environmental

Released: 9/28/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

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ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-115329-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 06/24/2022
Number of Samples: 2
Test Method: SW-846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3210BH-SON01-002.0-003.0	580-115329-1	solid	S4VEM
A3200-WQEB01-2206WK3	580-115329-2	equipment blank	S4VEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

Sample A3200-WQEB01-2206WK3 was submitted for the equipment blank in association with the samples in this sample delivery group (SDG). No problems were found for this criterion.

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were reviewed at the Stage 4 level. No anomalies were identified.

Compound Quantification

Target compound results quantitation were reviewed at the Stage 4 level. No anomalies were identified.

Manual integrations were reviewed for samples at the Stage 4 level. No problems were found for this criterion.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

Sample A3210BH-SON01-002.0-003.0 was submitted for MS/MSD evaluation in association with this SDG. Upon evaluation all precision and accuracy indicators were favorable.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. No problems were found for this criterion.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	x			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	x			
Matrix Spike/Matrix Spike Duplicate	x			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-115329-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 06/24/2022
Number of Samples: 2
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3210BH-SON01-002.0-003.0	580-115329-1	solid	S4VEM
A3200-WQEB01-2206WK3	580-115329-2	equipment blank	S4VEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

Sample A3200-WQEB01-2206WK3 was submitted as an equipment blank in association with the samples in this sample delivery group (SDG). No problems were found for this criterion.

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No samples were submitted for MS/MSD analyses in association with this SDG.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were reviewed at the Stage 4 level. No anomalies were identified.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were reviewed at the Stage 4 level, and no anomalies were identified in sample quantitation.

Manual integrations were reviewed for samples at the Stage 4 level. No problems were found for this criterion.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems requiring results qualification were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	x			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Compound Identification and Quantitation	x			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Calculation Documentation

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: DRO
Instrument: TAC013
Curve Date: 6/28/2022
Compound: C10-C24
Internal Standard: none

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
2.19E+06	1	5	1	2191460	5	25	438292.000
3.04E+06	1	10	1	3038042	10	100	303804.200
5.14E+06	1	20	1	5137013	20	400	256850.650
1.30E+07	1	50	1	13015455	50	2500	260309.100
2.57E+07	1	100	1	25735157	100	10000	257351.570
4.89E+07	1	200	1	48921723	200	40000	244608.615
1.28E+08	1	500	1	128365790	500	250000	256731.580
2.52E+08	1	1000	1	251832782	1000	1000000	251832.782
5.10E+08	1	2000	1	510188793	2000	4000000	255094.397
1.29E+09	1	5000	1	1290421290	5000	25000000	258084.258
2.62E+09	1	10000	1	2619386952	10000	100000000	261938.695
SUM OF EACH COLUMN :				**4898234457.0000**	**18885**	**130303025**	**3044897.8467**

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

Average RF	276808.895	**AVERAGE(RF)**
RSD	20.1%	**STDEV(RF)/(AveRF)**

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	**Equal**	**1/X**	**$1/X^2$**	**Equation**	reported
Slope (m)	261400.74728	259079.52496	246912.20812	**SLOPE(RatioY,RatioX)**	2.47E+05
Intercept (b)	-3483514.13359	501602.55171	845842.482833	**INTERCEPT(RatioY,RatioX)**	8.46E+05
CC (R)	0.99997	0.99988	0.99714	**CORREL(RatioY,RatioX)**	
COD (R^2)	0.99993	0.99976	0.99429	**POWER(R,2)**	0.994

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	**Equal**	**1/X**	**$1/X^2$**	**Equation**
x^2 Coefficient (a)	0.81955	0.85019	1.18400	**LINEST(RatioY,RatioX:RatioX^2,1,1)**
x Coefficient (b)	253777.83494	253492.81554	96080.00000	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)**
Intercept (c)	-104484.87116	21856.45947	8195000.00000	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)**
COD (R^2)	1.00000			**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)**

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					**Ax*Cis/Ais/RF**	**((Ax/Ais-b)/m)*Cis**			**(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis**			**Reported**
ICV	062822_014B.D	116736099	1	1	421.721	459.905	448.644	469.358	459.722	459.715	1114.391	469.4
CCV	070222_025B.D	123237272	1	1	445.207	484.776	473.737	495.688	485.262	485.281	1180.195	495.7
MB	070222_028B.D	531405	1	1	1.920	15.359	0.115	-1.273	2.506	2.010	-79.841	-1.27
LCS	070222_029B.D	112499336	1	1	406.415	443.697	432.291	452.199	443.076	443.052	1071.452	452.2
LCSD	070222_030B.D	115835648	1	1	418.468	456.461	445.169	465.711	456.185	456.174	1105.269	465.7
580-115329-1	070222_031B.D	1305584	1	1	4.717	18.321	3.103	1.862	5.556	5.064	-71.768	1.86

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: DRO
Instrument: TAC013
Curve Date: 6/28/2022
Compound: o-Terphenyl
Internal Standard: none

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
40799	1	0.1005	1	40799	0.1005	0.01010025	405960.199
87225	1	0.201	1	87225	0.201	0.040401	433955.224
173651	1	0.402	1	173651	0.402	0.161604	431967.662
428564	1	1.005	1	428564	1.005	1.010025	426431.841
829080	1	2.01	1	829080	2.01	4.0401	412477.612
1673485	1	4.02	1	1673485	4.02	16.1604	416289.801
4218909	1	10.05	1	4218909	10.05	101.0025	419791.940
8105811	1	20.1	1	8105811	20.1	404.01	403274.179
15626277	1	40.2	1	15626277	40.2	1616.04	388713.358
36773497	1	101.5	1	36773497	101.5	10302.25	362300.463
71062311	1	201	1	71062311	201	40401	353543.836
SUM OF EACH COLUMN :				**139019609.0000**	**380.5885**	**52845.72513**	**4454706.1148**

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

Average RF	404973.283	**AVERAGE(RF)**
RSD	6.6%	**STDEV(RF)/(AveRF)**

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	reported
Slope (m)	354065.35495	364611.99342	4.05E+05	**SLOPE(RatioY,RatioX)**	4.05E+05
Intercept (b)	387855.15057	22952.48557	0.000000	**INTERCEPT(RatioY,RatioX)**	0
CC (R)	0.99975	0.99879	0.99751	**CORREL(RatioY,RatioX)**	
COD (R^2)	0.99950	0.99757	0.99503	**POWER(R,2)**	0.995

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-130.50289	-223.59826	-380.15471	**LINEST(RatioY,RatioX:RatioX^2,1,1)**
x Coefficient (b)	378444.08955	395834.87146	418059.77970	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)**
Intercept (c)	171332.78595	16874.67790	37.79358	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)**
COD (R^2)	0.99985			**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)**

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
		Equations:			**Ax*Cis/Ais/RF**	**((Ax/Ais-b)/m)*Cis**			**(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis**			**Reported**
ICV	062822_014B.D	3832764	1	1	9.464	9.730	10.449	9.457	9.707	9.693	9.246	9.46
CCV	070222_025B.D	3977695	1	1	9.822	10.139	10.846	9.814	10.093	10.063	9.598	9.81
MB	070222_028B.D	2582301	1	1	6.376	6.198	7.019	6.371	6.385	6.505	6.212	6.37
LCS	070222_029B.D	3671319	1	1	9.066	9.274	10.006	9.058	9.278	9.281	8.853	9.06
LCSD	070222_030B.D	3734948	1	1	9.223	9.453	10.181	9.215	9.447	9.443	9.008	9.22
580-115329-1	070222_031B.D	2387672	1	1	5.896	5.648	6.486	5.891	5.868	6.010	5.741	5.89

Internal Standard Initial Calibration and Calculation Worksheet

Lab:	Eurofins Seattle
Method:	8270 SIM
Instrument:	SEA101
Curve Date:	3/24/2022
Compound:	Napthalene
Internal Standard:	Naphthalene-d8

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
676	61165	1	100	0.011052072	0.01	0.0001	1.1052072
1315	63638	2	100	0.020663754	0.02	0.0004	1.0331877
2888	57477	5	100	0.050246185	0.05	0.0025	1.0049237
6855	60890	10	100	0.112580062	0.1	0.01	1.1258006
13252	61637	20	100	0.21500073	0.2	0.04	1.0750037
33763	63228	50	100	0.533988107	0.5	0.25	1.0679762
68550	64709	100	100	1.059358049	1	1	1.0593580
140438	66606	200	100	2.108488725	2	4	1.0542444
376666	72529	500	100	5.193315777	5	25	1.0386632
732424	70581	1000	100	10.37707032	10	100	1.0377070
1451849	70105	2000	100	20.70963555	20	400	1.0354818
3732877	74649	5000	100	50.0057201	50	2500	1.0001144
6804306	78466	10000	100	86.71661611	100	10000	0.8671662
SUM OF EACH COLUMN :				177.1137	188.88	13030.303	13.5048

CALIBRATION MODELS:

Average Response Factor:

Cx = Ax*Cis/Ais/RF

			Reported
Average RF	1.0388	AVERAGE(RF)	1.0388000
RSD	6.0211%	STDEV(RF)/(AveRF)	6

Linear Regression:

y = mx + b

Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	
Slope (m)	0.88938	0.93722	1.02921	SLOPE(RatioY,RatioX)	slope (m1)
Intercept (b)	0.70217	0.00699	0.000662	INTERCEPT(RatioY,RatioX)	y-intercept
CC (R)	0.99751	0.99673	0.99805	CORREL(RatioY,RatioX)	reported CC
COD (R^2)	0.99503	0.99348	0.99611	POWER(R,2)	reported COD

Quadratic Regression:

$y = ax^2 + bx + c$

Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-0.00246	-0.00217	-0.00199	LINEST(RatioY,RatioX:RatioX^2,1,1)
x Coefficient (b)	1.11543	1.08854	1.07507	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)
Intercept (c)	-0.11548	-0.01820	-0.00050	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)
COD (R^2)	0.99990			INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)

Sample Concentration Calculations

Sample ID	File ID	Compound Response Ax	ISTD Response Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					Ax*Cis/Ais/RF	((Ax/Ais-b)/m)*Cis			(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis			reported on column
ICV 580-385060/21	032522a005.D	674588	71701	100	905.665	978.908	1003.107	914.066	870.545	881.459	889.850	905.7
CCVIS 580-395779/3	070122a030.D	590535	126918	100	447.895	444.212	495.708	452.018	431.600	432.848	436.373	447.9
MB 580-395417/1-A	070122a031.D	ND	87013	100	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	NA
LCS 580-395417/2-A	070122a032.D	828954	86747	100	919.878	995.509	1018.861	928.412	884.315	895.521	904.056	919.9
580-115329-1	070122a048.D	1398	87440	100	1.539	-77.153	0.960	1.489	11.789	3.141	1.534	1.54
				100	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Internal Standard Initial Calibration and Calculation Worksheet

Lab:	Eurofins Seattle
Method:	8270 SIM
Instrument:	SEA101
Curve Date:	3/24/2022
Compound:	2-methylnaphthalene-d10
Internal Standard:	Naphthalene-d8

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
335	61165	1	100	0.005476988	0.01	0.0001	0.5476988
647	63638	2	100	0.010166881	0.02	0.0004	0.5083441
1436	57477	5	100	0.024983907	0.05	0.0025	0.4996781
3236	60890	10	100	0.053145016	0.1	0.01	0.5314502
6555	61637	20	100	0.10634846	0.2	0.04	0.5317423
17172	63228	50	100	0.271588537	0.5	0.25	0.5431771
35592	64709	100	100	0.55003168	1	1	0.5500317
74088	66606	200	100	1.112332222	2	4	0.5561661
207280	72529	500	100	2.857891326	5	25	0.5715783
406827	70581	1000	100	5.763973307	10	100	0.5763973
824303	70105	2000	100	11.75811996	20	400	0.5879060
2134398	74649	5000	100	28.59245268	50	2500	0.5718491
4291990	78466	10000	100	54.69872301	100	10000	0.5469872
	1000			105.8052	188.88	13030.303	7.1230

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

			Reported
Average RF	0.5479	AVERAGE(RF)	0.5479000
RSD	4.7313%	STDEV(RF)/(AveRF)	4.7

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	
Slope (m)	0.55145	0.56023	0.55245	SLOPE(RatioY,RatioX)	slope (m1)
Intercept (b)	0.12668	-0.00085	-0.000312	INTERCEPT(RatioY,RatioX)	y-intercept
CC (R)	0.99974	0.99963	0.99887	CORREL(RatioY,RatioX)	reported CC
COD (R^2)	0.99948	0.99926	0.99775	POWER(R,2)	reported COD

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-0.00049	-0.00051	0.00042	LINEST(RatioY,RatioX:RatioX^2,1,1)
x Coefficient (b)	0.59682	0.59837	0.53087	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)
Intercept (c)	-0.03743	-0.04303	0.00075	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)
COD (R^2)	0.99999			INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)

Sample Concentration Calculations

Sample ID	File ID	Compound Response Ax	ISTD Response Ais	ISTD Conc Cis	Ave RF On-column Conc Equal Weighting	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					Ax*Cis/Ais/RF	((Ax/Ais-b)/m)*Cis			(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis			reported on column
ICV 580-385060/21	032522a005.D	370126	71701	100	942.116	913.115	921.572	934.452	877.570	876.436	964.800	942.1
CCVIS 580-395779/3	070122a030.D	311590	126918	100	448.064	422.225	438.373	444.449	419.078	418.978	460.619	448.1
MB 580-395417/1-A	070122a031.D	418981	87013	100	878.800	850.204	859.647	871.655	818.614	817.607	900.410	878.8
LCS 580-395417/2-A	070122a032.D	565406	86747	100	1189.559	1158.974	1163.579	1179.867	1108.535	1106.920	1215.819	1189.6
580-115329-1	070122a048.D	376547	87440	100	785.939	757.938	768.826	779.555	732.253	731.436	805.855	785.9
				100	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, 22F
Laboratory:	Eurofins, Seattle
SDG:	580-115329-1
Data Validator:	(b) (6)
Validation Date:	9/26/2022
Reviewer:	(b) (6)
Review Date:	9/28/2022

Analyzed for:
- ☐ GRO
- ☑ DRO
- ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded? ☐ Yes ☑ No

NOTE: Water and Soil sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	6/24/22	
Prepped	DRO/ORO: 6/30	ok
Analyzed	DRO/ORO: 7/2	ok

Surrogate Recovery

Are surrogate recoveries summarized within the report? ☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C23/24 4-Bromofluorobenzene aqueous 85-114%, solid 79-119)
(QSM 5.4 Table C14 o-Terphenyl aqueous 56-125%, solid 45-130%).

Were outliers marked as such? ☐ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☑ Yes ☐ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water?	☐ Yes	☐ No	☑ NA
b. low soil?	☑ Yes	☐ No	☐ NA
c. medium soil?	☐ Yes	☐ No	☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range? ☑ Yes ☐ No ☐ NA

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples.

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag
GRO				
NA				
DRO/ORO				
A3210BH-SON01-002.0-003.0	ok	ok	ok	
580-115329-1				

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD	Flag	Associated samples:
GRO		
NA		
DRO /ORO		
LCS 580-395462/2-A	ok	
LCSD 580-395462/3-A	ok	
LCS 580-395492/2-A	ok	
LCSD 580-395492/3-A	ok	

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022 ☐ Yes ☑ No

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			
DRO/ORO			
All ND			

Trip Blanks GRO
NA

Equipment Blank:
A3200-WQEB01-2206WK3 ND

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			
DRO/ORO			
ICAL on 6/28 TAC013			ok
ICV 580-395294/14			ok
CCV 580-395783/25 07/02/2022 07:17 1 070222_025B.D			ok
CCV 580-395783/36 07/02/2022 10:52 1 070222_036B.D			ok
CCV 580-395945/25 07/05/2022 15:27 1 070522_099B.D			ok
CCV 580-395945/26 07/05/2022 16:45 1 070522_097B.D			ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

☐ Yes ☑ No ☐ NA

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:

sample 1 used for calc

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value (JH).

Table 3-2: DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m³) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6

Notes:

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/22/22

Reviewer: (b) (6)

Review Date: 9/28/22

Project: JBPHH Site Characterization

SDG: 580-115329-1

LAB: Eurofins Seattle

Samples Collected: 6/24/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 6/24
  Samples extracted on 6/29 and 6/30
  Samples analyzed on 7/1 and 7/2

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: SEA101

Tune: 03/24/2022 ok

ICAL: 3/24/2022 ok

ICB 580-385060/20 032522a004.D 03/25/2022 12:26

ICV 580-385060/21 032522a005.D 03/25/2022 12:50 ok

Tune: 07/01/2022 10:59 ok

CCVIS 580-395622/3 070122a004.D 07/01/2022 11:26 ok

Sample 2 (EB all ND)

CCVC 580-395622/16 07/01/2022 20:34 - ok

Tune: 07/01/2022 21:48 ok

CCVIS 580-395779/3 070122a030.D 07/01/2022 22:16 ok

Sample 1

CCVC 580-395779/22 070122a049.D 07/02/2022 6:03 ok

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-395417/2-A

Water
LCS 580-395472/2-A and LCSD 580-395472/3-A
All %Rs acceptable; %RPD >20% for all analytes all results ND; no action
required
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

None

Blanks (Form IV/Form1)

✓ method blank – analyzed one per prep batch

✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

Solid

MB 580-395417/1-A ND

Aqueous

MB 580-395472/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

A3200-WQEB01-2206WK3 ND

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Ok

FIELD DUPLICATES

✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.

✓ See field duplicate worksheet

none

Automated Data Review Detail Report for 5801153291
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
A3210BH	A3210BH-SON01-002.0-003.0	06-24-2022	1510	MS	SO	0.00	0.00		X
A3210BH	A3210BH-SON01-002.0-003.0	06-24-2022	1510	N	SO	0.00	0.00	X	X
A3210BH	A3210BH-SON01-002.0-003.0	06-24-2022	1510	SD	SO	0.00	0.00		X
FIELDQC	A3200-WQEB01-2206WK3	06-24-2022	1040	EB	WQ	0.00	0.00	X	X
							Total	**2**	**4**

Automated Data Review Detail Report for 5801153291
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 395779

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5803957793		1/1	7/1/2022 22:16	7/1/2022 22:16	7/1/2022 22:16	395417/	CV
LABQC	SQ	LABQC	MB5803954171A		1/1	6/29/2022 15:18	6/29/2022 15:18	7/1/2022 22:41	395417/	LB
LABQC	SQ	LABQC	LCS5803954172A		1/1	6/29/2022 15:18	6/29/2022 15:18	7/1/2022 23:06	395417/	BS
A3210BH	SO	A3210BH-SON01-002.0-003.0	580-115329-1		1/1	6/24/2022 15:10	6/29/2022 15:18	7/2/2022 05:38	395417/	N
LABQC	SQ	LABQC	CCVC58039577922		1/1	7/2/2022 06:03	7/2/2022 06:03	7/2/2022 06:03	395417/	CV

Test Method: BNASIM Analysis Batch: 396262

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	MB5803954171A		2/1	6/29/2022 15:18	6/29/2022 15:18	7/7/2022 19:19	395417/	LB

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RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 395622

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVIS5803956223		1/1	7/1/2022 11:26	7/1/2022 11:26	7/1/2022 11:26	395472/	CV
LABQC	WQ	LABQC	MB5803954721A		1/1	6/30/2022 09:15	6/30/2022 09:15	7/1/2022 17:15	395472/	LB
LABQC	WQ	LABQC	LCS5803954722A		1/1	6/30/2022 09:15	6/30/2022 09:15	7/1/2022 17:40	395472/	BS
LABQC	WQ	LABQC	LCSD5803954723A		1/1	6/30/2022 09:15	6/30/2022 09:15	7/1/2022 18:05	395472/	BD
FIELDQC	WQ	A3200-WQEB01-2206WK3	580-115329-2		1/1	6/24/2022 10:40	6/30/2022 09:15	7/1/2022 18:54	395472/	EB

Test Method: SW8015D Analysis Batch: 395630

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVRT5803956303		1/1	6/30/2022 19:35	6/30/2022 19:35	6/30/2022 19:35	395630/	CV
LABQC	WQ	LABQC	CCV58039563050		1/1	7/1/2022 11:39	7/1/2022 11:39	7/1/2022 11:39	395630/	CV
LABQC	WQ	LABQC	MB5803954621A		1/1	6/30/2022 09:06	6/30/2022 09:06	7/1/2022 12:18	395462/	LB
LABQC	WQ	LABQC	LCS5803954622A		1/1	6/30/2022 09:06	6/30/2022 09:06	7/1/2022 12:38	395462/	BS
LABQC	WQ	LABQC	LCSD5803954623A		1/1	6/30/2022 09:06	6/30/2022 09:06	7/1/2022 12:57	395462/	BD
LABQC	WQ	LABQC	CCV58039563061		1/1	7/1/2022 15:22	7/1/2022 15:22	7/1/2022 15:22	395630/	CV

Test Method: SW8015D Analysis Batch: 395945

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVRT5803959453		1/1	7/5/2022 12:59	7/5/2022 12:59	7/5/2022 12:59	395462/	CV

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Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 395945

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCV5803959455		1/1	7/5/2022 14:08	7/5/2022 14:08	7/5/2022 14:08	395462/	CV
LABQC	WQ	LABQC	CCV58039594525		1/1	7/5/2022 15:27	7/5/2022 15:27	7/5/2022 15:27	395462/	CV
FIELDQC	WQ	A3200-WQEB01-2206WK3	580-115329-2		1/1	6/24/2022 10:40	6/30/2022 09:06	7/5/2022 16:26	395462/	EB
LABQC	WQ	LABQC	CCV58039594526		1/1	7/5/2022 16:45	7/5/2022 16:45	7/5/2022 16:45	395462/	CV

Test Method: SW8015D Analysis Batch: 395783

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5803957833		1/1	7/2/2022 00:08	7/2/2022 00:08	7/2/2022 00:08	395492/	CV
LABQC	SQ	LABQC	CCV58039578325		1/1	7/2/2022 07:17	7/2/2022 07:17	7/2/2022 07:17	395492/	CV
LABQC	SQ	LABQC	MB5803954921A		1/1	6/30/2022 11:53	6/30/2022 11:53	7/2/2022 08:15	395492/	LB
LABQC	SQ	LABQC	LCS5803954922A		1/1	6/30/2022 11:53	6/30/2022 11:53	7/2/2022 08:35	395492/	BS
LABQC	SQ	LABQC	LCSD5803954923A		1/1	6/30/2022 11:53	6/30/2022 11:53	7/2/2022 08:54	395492/	BD
A3210BH	SO	A3210BH-SON01-002.0-003.0	580-115329-1		1/1	6/24/2022 15:10	6/30/2022 11:53	7/2/2022 09:14	395492/	N
A3210BH	SO	A3210BH-SON01-002.0-003.0	580-115329-1		1/1	6/24/2022 15:10	6/30/2022 11:53	7/2/2022 09:34	395492/	MS
A3210BH	SO	A3210BH-SON01-002.0-003.0	580-115329-1		1/1	6/24/2022 15:10	6/30/2022 11:53	7/2/2022 09:53	395492/	SD
LABQC	SQ	LABQC	CCV58039578336		1/1	7/2/2022 10:52	7/2/2022 10:52	7/2/2022 10:52	395492/	CV

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RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

EBLOT	TBLOT	ABLOT	LOCID	Matrix	FLDSAMPID	LABSAMPID	LOGDATE	SACODE
24062201			A3210BH	SO	A3210BH-SON01-002.0-003.0	580-115329-1	6/24/2022 15:10	N

Test Method: BNASIM Extraction Method: SW3510 Leach Method: NONE

EBLOT	TBLOT	ABLOT	LOCID	Matrix	FLDSAMPID	LABSAMPID	LOGDATE	SACODE
24062201			FIELDQC	WQ	A3200-WQEB01-2206WK3	580-115329-2	6/24/2022 10:40	EB

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

EBLOT	TBLOT	ABLOT	LOCID	Matrix	FLDSAMPID	LABSAMPID	LOGDATE	SACODE
24062201			A3210BH	SO	A3210BH-SON01-002.0-003.0	580-115329-1	6/24/2022 15:10	MS
24062201			A3210BH	SO	A3210BH-SON01-002.0-003.0	580-115329-1	6/24/2022 15:10	N
24062201			A3210BH	SO	A3210BH-SON01-002.0-003.0	580-115329-1	6/24/2022 15:10	SD

Test Method: SW8015D Extraction Method: SW3510 Leach Method: NONE

EBLOT	TBLOT	ABLOT	LOCID	Matrix	FLDSAMPID	LABSAMPID	LOGDATE	SACODE
24062201			FIELDQC	WQ	A3200-WQEB01-2206WK3	580-115329-2	6/24/2022 10:40	EB

Automated Data Review Detail Report for 5801153291
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

QC Outliers Report

--No Records Found--

Qualified Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3210BH-SON01-002.0-003.0	580-115329-1	S	N	1-Methylnaphthalene	0.00680	0.00570 J M	0.00570 J		mg/kg	TR
A3210BH-SON01-002.0-003.0	580-115329-1	S	N	2-Methylnaphthalene	0.00680	0.00660 J	0.00660 J		mg/kg	TR

Qualified analytes in samples are reported as estimated, not detected (UJ) at the Limit of Detection (LOD).

Automated Data Review Detail Report for 5801153291
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3210BH-SON01-002.0-003.0	580-115329-1	S	N	1	1-Methylnaphthalene	0.00680	0.00570 J M	0.00570 J	mg/kg	TR
A3210BH-SON01-002.0-003.0	580-115329-1	S	N	1	2-Methylnaphthalene	0.00680	0.00660 J	0.00660 J	mg/kg	TR

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-115366-1
Eurofins, Seattle

Prepared by
ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for
AECOM Environmental

Released: 9/28/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

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412.408.3288 I www.eds-pa.com

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-115366-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 06/27/2022
Number of Samples: 2
Test Method: SW-846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3150BH-SON01-000.0-001.0	580-115366-1	solid	S2BVEM
A3050BH-SON01-004.0-005.0	580-115366-2	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No sample was submitted for the equipment blank in association with the samples in this sample delivery group (SDG).

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were not reviewed at the Stage 2B level.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

No sample was submitted for MS/MSD evaluation in association with this SDG.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. No problems were found for this criterion.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-115366-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 06/27/2022
Number of Samples: 2
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3150BH-SON01-000.0-001.0	580-115366-1	solid	S2BVEM
A3050BH-SON01-004.0-005.0	580-115366-2	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

Sample A3150BH-SON01-000.0-001.0 was submitted for MS/MSD analyses in association with this SDG. Upon evaluation, all accuracy and precision indicators were acceptable.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	x			
Compound Identification and Quantitation	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, 22F
Laboratory:	Eurofins, Seattle
SDG:	580-115366-1
Data Validator:	(b) (6) [redacted]
Validation Date:	9/26/2022
Reviewer:	(b) (6) [redacted]
Review Date:	9/28/2022

Analyzed for:
- ☐ GRO
- ☑ DRO
- ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded? ☐ Yes ☑ No

NOTE: Water and Soil sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	6/27/22	
Prepped	DRO/ORO: 6/30	ok
Analyzed	DRO/ORO: 7/2	ok

Surrogate Recovery

Are surrogate recoveries summarized within the report? ☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C23/24 4-Bromofluorobenzene aqueous 85-114%, solid 79-119)
(QSM 5.4 Table C14 o-Terphenyl aqueous 56-125%, solid 45-130%).

Were outliers marked as such? ☐ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☑ Yes ☑ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water? ☐ Yes ☐ No ☑ NA
b. low soil? ☐ Yes ☐ No ☑ NA
c. medium soil? ☐ Yes ☐ No ☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range? ☐ Yes ☐ No ☑ NA

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples.

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag
GRO				
NA				
DRO/ORO				
None				

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD	Flag	Associated samples:
GRO		
NA		
DRO /ORO		
LCS 580-395492/2-A	ok	
LCSD 580-395492/3-A	ok	

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022 ☐ Yes ☑ No

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			

DRO/ORO
All ND

Trip Blanks GRO
NA

Equipment Blank:
None

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			

DRO/ORO

ICAL on 6/28 TAC013	ok
ICV 580-395294/14	ok
CCV 580-395783/25 07/02/2022 07:17 1 070222_025B.D	ok
CCV 580-395783/36 07/02/2022 10:52 1 070222_036B.D	ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

☐ Yes ☐ No ☑ NA

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:
Level 2B for this SDG

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value (JH).

Table 3-2: DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m³) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6

Notes:

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/22/22

Reviewer: (b) (6)

Review Date: 9/28/22

Project: JBPHH Site Characterization

SDG: 580-115366-1

LAB: Eurofins Seattle

Samples Collected: 6/27/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 6/27
  Samples extracted on 6/30
  Samples analyzed on 7/2

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: SEA101

Tune: 03/24/2022 ok

ICAL: 3/24/2022 ok

ICB 580-385060/20 032522a004.D 03/25/2022 12:26

ICV 580-385060/21 032522a005.D 03/25/2022 12:50 ok

Tune: 07/02/2022 14:41 ok

CCVIS 580-395803/3 070222a005.D 07/02/2022 18:44 ok

Sample 1 and 2Sample 1

CCVC 580-395803/21 070222a023.D 07/03/2022 2:18 ok

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-395549/2-A
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

A3150BH-SON01-000.0-001.0 MS and MSD

All %Rs and RPDs acceptable

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch
- ✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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Department of Defense
Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS
May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

Solid

MB 580-395549/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B review

FIELD DUPLICATES

✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.

- ✓ See field duplicate worksheet

none

Automated Data Review Detail Report for 5801153661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
A3150BH	A3150BH-SON01-000.0-001.0	06-27-2022	1050	MS	SO	0.00	1.00	X	
A3150BH	A3150BH-SON01-000.0-001.0	06-27-2022	1050	N	SO	0.00	1.00	X	X
A3150BH	A3150BH-SON01-000.0-001.0	06-27-2022	1050	SD	SO	0.00	1.00	X	
A3050BH	A3050BH-SON01-004.0-005.0	06-27-2022	1529	N	SO	0.00	0.00	X	X
							Total	**4**	**2**

Automated Data Review Detail Report for 5801153661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 395803

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5803958033		1/1	7/2/2022 18:44	7/2/2022 18:44	7/2/2022 18:44	395549/	CV
LABQC	SQ	LABQC	MB5803955491A		1/1	6/30/2022 15:19	6/30/2022 15:19	7/2/2022 19:15	395549/	LB
LABQC	SQ	LABQC	LCS5803955492A		1/1	6/30/2022 15:19	6/30/2022 15:19	7/2/2022 19:40	395549/	BS
A3150BH	SO	A3150BH-SON01-000.0-001.0	580-115366-1		1/1	6/27/2022 10:50	6/30/2022 15:19	7/2/2022 22:11	395549/	N
A3150BH	SO	A3150BH-SON01-000.0-001.0	580-115366-1		1/1	6/27/2022 10:50	6/30/2022 15:19	7/2/2022 22:35	395549/	MS
A3150BH	SO	A3150BH-SON01-000.0-001.0	580-115366-1		1/1	6/27/2022 10:50	6/30/2022 15:19	7/2/2022 23:00	395549/	SD
A3050BH	SO	A3050BH-SON01-004.0-005.0	580-115366-2		1/1	6/27/2022 15:29	6/30/2022 15:19	7/2/2022 23:25	395549/	N
LABQC	SQ	LABQC	CCVC58039580321		1/1	7/3/2022 02:18	7/3/2022 02:18	7/3/2022 02:18	395549/	CV

Test Method: M8015D Analysis Batch: 395630

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5803956303		1/1	6/30/2022 19:35		6/30/2022 19:35	/	CV

Test Method: SW8015D Analysis Batch: 395783

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5803957833		1/1	7/2/2022 00:08	7/2/2022 00:08	7/2/2022 00:08	395492/	CV
LABQC	SQ	LABQC	CCV58039578325		1/1	7/2/2022 07:17	7/2/2022 07:17	7/2/2022 07:17	395492/	CV
LABQC	SQ	LABQC	MB5803954921A		1/1	6/30/2022 11:53	6/30/2022 11:53	7/2/2022 08:15	395492/	LB

Automated Data Review Detail Report for 5801153661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 395783

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	LCS5803954922A		1/1	6/30/2022 11:53	6/30/2022 11:53	7/2/2022 08:35	395492/	BS
LABQC	SQ	LABQC	LCSD5803954923A		1/1	6/30/2022 11:53	6/30/2022 11:53	7/2/2022 08:54	395492/	BD
A3150BH	SO	A3150BH-SON01-000.0-001.0	580-115366-1		1/1	6/27/2022 10:50	6/30/2022 11:53	7/2/2022 10:13	395492/	N
A3050BH	SO	A3050BH-SON01-004.0-005.0	580-115366-2		1/1	6/27/2022 15:29	6/30/2022 11:53	7/2/2022 10:32	395492/	N
LABQC	SQ	LABQC	CCV58039578336		1/1	7/2/2022 10:52	7/2/2022 10:52	7/2/2022 10:52	395492/	CV

Automated Data Review Detail Report for 5801153661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

--No Records Found--

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

QC Outliers Report

--No Records Found--

Automated Data Review Detail Report for 5801153661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Qualified Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3150BH-SON01-000.0-001.0	580-115366-1	S	N	Naphthalene	0.00580	0.00370 J M	0.00370 J		mg/kg	TR

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3150BH-SON01-000.0-001.0	580-115366-1	S	N	C10-C24 Petroleum Hydrocarbons	57.0	27.0 J	27.0 J		mg/kg	TR

Qualified analytes in samples are reported as estimated, not detected (UJ) at the Limit of Detection (LOD).

Automated Data Review Detail Report for 5801153661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3050BH-SON01-004.0-005.0	580-115366-2	S	N	1	1-Methylnaphthalene	0.00670	0.140	0.140	mg/kg	
A3050BH-SON01-004.0-005.0	580-115366-2	S	N	1	2-Methylnaphthalene	0.00670	0.100	0.100	mg/kg	
A3150BH-SON01-000.0-001.0	580-115366-1	S	N	1	1-Methylnaphthalene	0.00580	0.0120	0.0120	mg/kg	
A3150BH-SON01-000.0-001.0	580-115366-1	S	N	1	2-Methylnaphthalene	0.00580	0.0130	0.0130	mg/kg	
A3150BH-SON01-000.0-001.0	580-115366-1	S	N	1	Naphthalene	0.00580	0.00370 J M	0.00370 J	mg/kg	TR

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3050BH-SON01-004.0-005.0	580-115366-2	S	N	1	C10-C24 Petroleum Hydrocarbons	64.0	1200	1200	mg/kg	
A3150BH-SON01-000.0-001.0	580-115366-1	S	N	1	C10-C24 Petroleum Hydrocarbons	57.0	27.0 J	27.0 J	mg/kg	TR
A3150BH-SON01-000.0-001.0	580-115366-1	S	N	1	C24-C40 Petroleum Hydrocarbons	57.0	130	130	mg/kg	

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions

ENVIRONMENTAL DATA SERVICES, LTD.

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-115496-1
Eurofins, Seattle

Prepared by

ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for

AECOM Environmental

Released: 9/27/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

5 Brilliant Avenue, Pittsburgh, PA 15215
412.408.3288 I www.eds-pa.com

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-115496-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 06/29/2022
Number of Samples: 1
Test Method: SW-846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3087BH-SON01-004.0-005.0	580-115496-1	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No sample was submitted for the equipment blank in association with the samples in this sample delivery group (SDG).

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were not reviewed at the Stage 2B level.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

Sample A3087BH-SON01-004.0-005.0 was submitted for MS/MSD evaluation in association with this SDG. Upon evaluation all precision and accuracy indicators were favorable.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. No problems were found for this criterion.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	x			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-115496-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 06/29/2022
Number of Samples: 1
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3087BH-SON01-004.0-005.0	580-115496-1	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

Sample A3087BH-SON01-004.0-005.0 was submitted for MS/MSD analyses in association with this SDG. Upon evaluation, all accuracy and precision indicators were acceptable.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	x			
Compound Identification and Quantitation	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, 22F
Laboratory:	Eurofins, Seattle
SDG:	580-115496-1
Data Validator:	(b) (6) [redacted]
Validation Date:	9/26/2022
Reviewer:	(b) (6) [redacted]
Review Date:	9/27/2022

Analyzed for:
- ☐ GRO
- ☑ DRO
- ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded?

☐ Yes ☑ No

NOTE: Water and Soil sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	6/29/22	
Prepped	DRO/ORO: 7/5	ok
Analyzed	DRO/ORO: 7/8	ok

Surrogate Recovery

Are surrogate recoveries summarized within the report?

☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C23/24 4-Bromofluorobenzene aqueous 85-114%, solid 79-119)
(QSM 5.4 Table C14 o-Terphenyl aqueous 56-125%, solid 45-130%).

Were outliers marked as such? ☐ Yes ☐ No

Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☑ Yes ☐ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water?	☐ Yes	☐ No	☑ NA
b. low soil?	☑ Yes	☐ No	☐ NA
c. medium soil?	☐ Yes	☐ No	☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range? ☑ Yes ☐ No ☐ NA

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples.

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag
GRO				
NA				
DRO/ORO				
A3087BH-SON01-004.0-005.0	ok	ok	ok	
580-115496-1				

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD	Flag	Associated samples:
GRO		
NA		
DRO /ORO		
LCS 580-395966/2-A	ok	
LCSD 580-395966/3-A	ok	

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022 ☐ Yes ☑ No

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			
DRO/ORO			
All ND			

Trip Blanks GRO
NA

Equipment Blank:
None

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			
DRO/ORO			
ICAL on 7/1 TAC020			ok
ICV 580-395776/14 07/02/2022 01:39 1 0702ICAL22B_014			ok
CCV 580-396348/56 07/08/2022 11:35 1 070822B_047A.D			ok
CCV 580-396348/67 07/08/2022 15:17 1 070822B_058A.D			ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

☐ Yes ☐ No ☑ NA

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:
Level 2B for this SDG

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value (JH).

Table 3-2: DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m³) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6

Notes:

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/23/22

Reviewer: (b) (6)

Review Date: 9/27/22

Project: JBPHH Site Characterization

SDG: 580-115496-1

LAB: Eurofins Seattle

Samples Collected: 6/29/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 6/29
  Samples extracted on 7/6
  Samples analyzed on 7/7

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: TAC050

Tune: 06/30/2022 ok

ICAL: 06/30/2022 ok

ICV 580-395503/18 06/30/2022 22:33 1 SIM063022a018.D ok

Tune: 07/06/2022 22:57 ok

CCVIS 580-396185/3 SIM070622c003.D07/06/2022 23:20

Sample 1

CCVC 580-396185/27 SIM070622b027.D07/07/2022 7:05

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-396117/2-A  ok
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

A3087BH-SON01-004.0-005.0 MS and MSD

All %Rs and RPDs acceptable

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch
- ✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

Module 1 - Page 18 of 52

Department of Defense
Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS
May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

Solid

MB 580-396117/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B review

FIELD DUPLICATES

✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.

- ✓ See field duplicate worksheet

none

Automated Data Review Detail Report for 5801154961
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
A3087BH	A3087BH-SON01-004.0-005.0	06-29-2022	1001	MS	SO	0.00	0.00	X	X
A3087BH	A3087BH-SON01-004.0-005.0	06-29-2022	1001	N	SO	0.00	0.00	X	X
A3087BH	A3087BH-SON01-004.0-005.0	06-29-2022	1001	SD	SO	0.00	0.00	X	X
							Total	**3**	**3**

Automated Data Review Detail Report for 5801154961
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 396185

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5803961853		1/1	7/6/2022 23:20	7/6/2022 23:20	7/6/2022 23:20	396117/	CV
LABQC	SQ	LABQC	MB5803961171A		1/1	7/6/2022 14:50	7/6/2022 14:50	7/7/2022 00:37	396117/	LB
LABQC	SQ	LABQC	LCS5803961172A		1/1	7/6/2022 14:50	7/6/2022 14:50	7/7/2022 00:57	396117/	BS
A3087BH	SO	A3087BH-SON01-004.0-005.0	580-115496-1		1/1	6/29/2022 10:01	7/6/2022 14:50	7/7/2022 04:10	396117/	N
A3087BH	SO	A3087BH-SON01-004.0-005.0	580-115496-1		1/1	6/29/2022 10:01	7/6/2022 14:50	7/7/2022 04:30	396117/	MS
A3087BH	SO	A3087BH-SON01-004.0-005.0	580-115496-1		1/1	6/29/2022 10:01	7/6/2022 14:50	7/7/2022 04:49	396117/	SD
LABQC	SQ	LABQC	CCVC58039618527		1/1	7/7/2022 07:05	7/7/2022 07:05	7/7/2022 07:05	396117/	CV

Test Method: M8015D Analysis Batch: 396795

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5803967953		1/1	7/12/2022 13:13		7/12/2022 13:13	/	CV

Test Method: SW8015D Analysis Batch: 396348

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5803963483		1/1	7/7/2022 20:48	7/7/2022 20:48	7/7/2022 20:48	395966/	CV
LABQC	SQ	LABQC	CCV58039634834		1/1	7/8/2022 04:12	7/8/2022 04:12	7/8/2022 04:12	395966/	CV
LABQC	SQ	LABQC	MB5803959661A		1/1	7/5/2022 14:01	7/5/2022 14:01	7/8/2022 04:52	395966/	LB
LABQC	SQ	LABQC	LCS5803959662A		1/1	7/5/2022 14:01	7/5/2022 14:01	7/8/2022 05:12	395966/	BS
LABQC	SQ	LABQC	LCSD5803959663A		1/1	7/5/2022 14:01	7/5/2022 14:01	7/8/2022 05:32	395966/	BD
LABQC	SQ	LABQC	CCV58039634845		1/1	7/8/2022 07:53	7/8/2022 07:53	7/8/2022 07:53	395966/	CV

Automated Data Review Detail Report for 5801154961
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 396348

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCV58039634856		1/1	7/8/2022 11:35	7/8/2022 11:35	7/8/2022 11:35	395966/	CV
A3087BH	SO	A3087BH-SON01-004.0-005.0	580-115496-1		1/1	6/29/2022 10:01	7/5/2022 14:06	7/8/2022 14:17	395966/	N
A3087BH	SO	A3087BH-SON01-004.0-005.0	580-115496-1		1/1	6/29/2022 10:01	7/5/2022 14:06	7/8/2022 14:37	395966/	MS
A3087BH	SO	A3087BH-SON01-004.0-005.0	580-115496-1		1/1	6/29/2022 10:01	7/5/2022 14:06	7/8/2022 14:57	395966/	SD
LABQC	SQ	LABQC	CCV58039634867		1/1	7/8/2022 15:17	7/8/2022 15:17	7/8/2022 15:17	395966/	CV

Automated Data Review Detail Report for 5801154961
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

--No Records Found--

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

QC Outliers Report

--No Records Found--

Automated Data Review Detail Report for 5801154961
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Qualified Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3087BH-SON01-004.0-005.0	580-115496-1	S	N	Naphthalene	0.00550	0.00300 J M	0.00300 J		mg/kg	TR

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3087BH-SON01-004.0-005.0	580-115496-1	S	N	C10-C24 Petroleum Hydrocarbons	52.0	46.0 J	46.0 J		mg/kg	TR

Qualified analytes in samples are reported as estimated, not detected (UJ) at the Limit of Detection (LOD).

Automated Data Review Detail Report for 5801154961
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3087BH-SON01-004.0-005.0	580-115496-1	S	N	1	1-Methylnaphthalene	0.00550	0.0270 M	0.0270	mg/kg	
A3087BH-SON01-004.0-005.0	580-115496-1	S	N	1	2-Methylnaphthalene	0.00550	0.0320	0.0320	mg/kg	
A3087BH-SON01-004.0-005.0	580-115496-1	S	N	1	Naphthalene	0.00550	0.00300 J M	0.00300 J	mg/kg	TR

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3087BH-SON01-004.0-005.0	580-115496-1	S	N	1	C10-C24 Petroleum Hydrocarbons	52.0	46.0 J	46.0 J	mg/kg	TR
A3087BH-SON01-004.0-005.0	580-115496-1	S	N	1	C24-C40 Petroleum Hydrocarbons	52.0	92.0	92.0	mg/kg	

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions

ENVIRONMENTAL DATA SERVICES, LTD.

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-115521-1
Eurofins, Seattle

Prepared by

ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for

AECOM Environmental

Released: 9/27/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

5 Brilliant Avenue, Pittsburgh, PA 15215
412.408.3288 I www.eds-pa.com

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-115521-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 06/30/2022
Number of Samples: 2
Test Method: SW-846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
PS095BH-SON01-003.0-004.0	580-115521-1	solid	S2BVEM
A3-050BH-SON01-004.0-004.0	580-115521-2	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No sample was submitted for the equipment blank in association with the samples in this sample delivery group (SDG).

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were not reviewed at the Stage 2B level.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

Sample PS095BH-SON01-003.0-004.0 was submitted for MS/MSD evaluation in association with this SDG. Upon evaluation all precision and accuracy indicators were favorable.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. No problems were found for this criterion.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	x			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-115521-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 06/30/2022
Number of Samples: 2
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
PS095BH-SON01-003.0-004.0	580-115521-1	solid	S2BVEM
A3-050BH-SON01-004.0-004.0	580-115521-2	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition with the following exception. The sample label did not match the chain of custody (COC) report for sample PS095BH-SON01-003.0-004.0. The laboratory logged in the sample using the information on the COC. No qualification action taken on this basis.

Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No sample was submitted for MS/MSD analyses in association with this SDG.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Compound Identification and Quantitation	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, 22F
Laboratory:	Eurofins, Seattle
SDG:	580-115521-1
Data Validator:	(b) (6) [redacted]
Validation Date:	9/26/2022
Reviewer:	(b) (6) [redacted]
Review Date:	9/27/2022

Analyzed for:
- ☐ GRO
- ☑ DRO
- ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded? ☐ Yes ☑ No

NOTE: Water and Soil sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	6/30/22	
Prepped	DRO/ORO: 7/6	ok
Analyzed	DRO/ORO: 7/8	ok

Surrogate Recovery

Are surrogate recoveries summarized within the report? ☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C23/24 4-Bromofluorobenzene aqueous 85-114%, solid 79-119)
(QSM 5.4 Table C14 o-Terphenyl aqueous 56-125%, solid 45-130%).

Were outliers marked as such? ☐ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☑ Yes ☐ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water?	☐ Yes	☐ No	☑ NA
b. low soil?	☑ Yes	☐ No	☐ NA
c. medium soil?	☐ Yes	☐ No	☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range? ☑ Yes ☐ No ☐ NA

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples.

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag
GRO				
NA				
DRO/ORO				
PS095BH-SON01-003.0-004.0	ok	ok	ok	
580-115521-1				

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD	Flag	Associated samples:
GRO		
NA		
DRO /ORO		
LCS 580-396153/2-A	ok	
LCSD 580-396153/3-A	ok	

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? ☐ Yes ☑ No

use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			
DRO/ORO			
All ND			

Trip Blanks GRO
NA

Equipment Blank:
None

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			
DRO/ORO			
ICAL on 7/6 TAC013			ok
ICV 580-396192/14 07/07/2022 03:04 1 0706a22_014B.D Z			ok
CCV 580-396352/64 07/08/2022 15:26 1 070822_057B.D			ok
CCV 580-396352/72 07/08/2022 18:03 1 070822_065B.D			ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

☐ Yes ☐ No ☑ NA

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:
Level 2B for this SDG

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value (JH).

Table 3-2: DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m³) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6

Notes:

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/23/22

Reviewer: (b) (6)

Review Date: 9/27/22

Project: JBPHH Site Characterization

SDG: 580-115521-1

LAB: Eurofins Seattle

Samples Collected: 6/30/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found except

  Sample 1 - Container label did not match COC; logged in according to COC

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 6/30
  Samples extracted on 7/6
  Samples analyzed on 7/7

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: TAC050

Tune: 06/30/2022 ok

ICAL: 06/30/2022 ok

ICV 580-395503/18 06/30/2022 22:33 1 SIM063022a018.D ok

Tune: 07/06/2022 22:57 ok

CCVIS 580-396185/3 SIM070622c003.D07/06/2022 23:20

Samples 1 and 2

CCVC 580-396185/27 SIM070622b027.D07/07/2022 7:05

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-396117/2-A  ok
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

none

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch
- ✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

Solid

MB 580-396117/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B review

FIELD DUPLICATES

✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.

- ✓ See field duplicate worksheet

none

Automated Data Review Detail Report for 5801155211
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
PS095BH	PS095BH-SON01-003.0-004.0	06-30-2022	0953	MS	SO	3.00	4.00		X
PS095BH	PS095BH-SON01-003.0-004.0	06-30-2022	0953	N	SO	3.00	4.00	X	X
PS095BH	PS095BH-SON01-003.0-004.0	06-30-2022	0953	SD	SO	3.00	4.00		X
A3-050BH	A3-050BH-SON01-004.0-004.0	06-30-2022	1428	N	SO	4.00	4.00	X	X
							Total	**2**	**4**

Automated Data Review Detail Report for 5801155211
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 396185

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5803961853		1/1	7/6/2022 23:20	7/6/2022 23:20	7/6/2022 23:20	396117/	CV
LABQC	SQ	LABQC	MB5803961171A		1/1	7/6/2022 14:50	7/6/2022 14:50	7/7/2022 00:37	396117/	LB
LABQC	SQ	LABQC	LCS5803961172A		1/1	7/6/2022 14:50	7/6/2022 14:50	7/7/2022 00:57	396117/	BS
PS095BH	SO	PS095BH-SON01-003.0-004.0	580-115521-1		1/1	6/30/2022 09:53	7/6/2022 14:50	7/7/2022 05:09	396117/	N
A3-050BH	SO	A3-050BH-SON01-004.0-004.0	580-115521-2		1/1	6/30/2022 14:28	7/6/2022 14:50	7/7/2022 05:28	396117/	N
LABQC	SQ	LABQC	CCVC58039618527		1/1	7/7/2022 07:05	7/7/2022 07:05	7/7/2022 07:05	396117/	CV

Automated Data Review Detail Report for 5801155211
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: SW8015D Analysis Batch: 396352

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5803963523		1/1	7/7/2022 21:49	7/7/2022 21:49	7/7/2022 21:49	396153/	CV
LABQC	SQ	LABQC	CCV58039635233		1/1	7/8/2022 05:00	7/8/2022 05:00	7/8/2022 05:00	396153/	CV
LABQC	SQ	LABQC	CCV58039635264		1/1	7/8/2022 15:26	7/8/2022 15:26	7/8/2022 15:26	396153/	CV
LABQC	SQ	LABQC	MB5803961531A		1/1	7/6/2022 15:46	7/6/2022 15:46	7/8/2022 15:46	396153/	LB
LABQC	SQ	LABQC	LCS5803961532A		1/1	7/6/2022 15:46	7/6/2022 15:46	7/8/2022 16:05	396153/	BS
LABQC	SQ	LABQC	LCSD5803961533A		1/1	7/6/2022 15:46	7/6/2022 15:46	7/8/2022 16:25	396153/	BD
A3-050BH	SO	A3-050BH-SON01-004.0-004.0	580-115521-2		1/1	6/30/2022 14:28	7/6/2022 15:46	7/8/2022 16:44	396153/	N
PS095BH	SO	PS095BH-SON01-003.0-004.0	580-115521-1		1/1	6/30/2022 09:53	7/6/2022 15:46	7/8/2022 17:03	396153/	N
PS095BH	SO	PS095BH-SON01-003.0-004.0	580-115521-1		1/1	6/30/2022 09:53	7/6/2022 15:46	7/8/2022 17:23	396153/	MS
PS095BH	SO	PS095BH-SON01-003.0-004.0	580-115521-1		1/1	6/30/2022 09:53	7/6/2022 15:46	7/8/2022 17:43	396153/	SD
LABQC	SQ	LABQC	CCV58039635272		1/1	7/8/2022 18:03	7/8/2022 18:03	7/8/2022 18:03	396153/	CV

Automated Data Review Detail Report for 5801155211
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

--No Records Found--

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

QC Outliers Report

--No Records Found--

Qualified Results

Automated Data Review Detail Report for 5801155211
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

--No Records Found--

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-050BH-SON01-004.0-004.0	580-115521-2	S	N	1	1-Methylnaphthalene	0.00520	0.820	0.820	mg/kg	
A3-050BH-SON01-004.0-004.0	580-115521-2	S	N	1	2-Methylnaphthalene	0.00520	1.00	1.00	mg/kg	
A3-050BH-SON01-004.0-004.0	580-115521-2	S	N	1	Naphthalene	0.00520	0.280	0.280	mg/kg	

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-050BH-SON01-004.0-004.0	580-115521-2	S	N	1	C10-C24 Petroleum Hydrocarbons	55.0	270	270	mg/kg	

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions

ENVIRONMENTAL DATA SERVICES, LTD.

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-116547-1
Eurofins, Seattle

Prepared by

ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for

AECOM Environmental

Released: 9/27/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

5 Brilliant Avenue, Pittsburgh, PA 15215
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ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116547-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 07/29/2022 and 08/01/2022
Number of Samples: 3
Test Method: SW-846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-100BH-SON01-003.0--004.0	580-116547-1	solid	S4VEM
A3-150BH-SON01-001.0-002.0	580-116547-2	solid	S4VEM
A3-200BH-SON01-004.0-005.0	580-116547-3	solid	S4VEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No sample was submitted for the equipment blank in association with the samples in this sample delivery group (SDG).

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were reviewed at the Stage 4 level. No anomalies were identified.

Compound Quantification

Target compound results quantitation were reviewed at the Stage 4 level. No anomalies were identified.

Manual integrations were reviewed for samples at the Stage 4 level. No problems were found for this criterion.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

Sample A3-100BH-SON01-003.0--004.0 was submitted for MS/MSD evaluation in association with this SDG. Upon evaluation all precision and accuracy indicators were favorable or did not result in a need to qualify sample results.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. No problems were found for this criterion.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	x			
Matrix Spike/Matrix Spike Duplicate	x			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116547-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 07/29/2022 and 08/01/2022
Number of Samples: 3
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-100BH-SON01-003.0--004.0	580-116547-1	solid	S4VEM
A3-150BH-SON01-001.0-002.0	580-116547-2	solid	S4VEM
A3-200BH-SON01-004.0-005.0	580-116547-3	solid	S4VEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were positively identified in the method blank associated with all samples in this sample delivery group (SDG). Positive sample results for the impacted analytes have been evaluated and qualified per validation guidance as appropriate.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this SDG.

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

Sample A3-100BH-SON01-003.0--004.0 was submitted for MS/MSD analyses in association with this SDG. Upon evaluation, all accuracy and precision indicators were acceptable or did not result in a need to qualify sample results.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were reviewed at the Stage 4 level. No anomalies were identified.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were reviewed at the Stage 4 level, and no anomalies were identified in sample quantitation.

Manual integrations were reviewed for samples at the Stage 4 level. No problems were found for this criterion.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

Samples were re-extracted and/or reanalyzed confirm quality control results or bring analytes into calibration range. Upon review, the data validator has selected the best and final reportable result in each case.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank			x	3
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	x			
Compound Identification and Quantitation	x			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Calculation Documentation

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: DRO
Instrument: TAC020
Curve Date: 7/27/2022
Compound: C10-C24
Internal Standard: none

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
2025317	1	5	1	2025317	5	25	405063.400
3494893	1	10	1	3494893	10	100	349489.300
6130552	1	20	1	6130552	20	400	306527.600
14035266	1	50	1	14035266	50	2500	280705.320
27453771	1	100	1	27453771	100	10000	274537.710
53050661	1	200	1	53050661	200	40000	265253.305
140413742	1	500	1	140413742	500	250000	280827.484
255794456	1	1000	1	255794456	1000	1000000	255794.456
517316777	1	2000	1	517316777	2000	4000000	258658.389
1266361586	1	5000	1	1266361586	5000	25000000	253272.317
2575403219	1	10000	1	2575403219	10000	100000000	257540.322
SUM OF EACH COLUMN :				**4861480240.0000**	**18885**	**130303025**	**3187669.6026**

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

Average RF	289788.146	**AVERAGE(RF)**
RSD	16.4%	**STDEV(RF)/(AveRF)**

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	reported
Slope (m)	256581.40449	256883.22845	263403.83122	**SLOPE(RatioY,RatioX)**	263400
Intercept (b)	1449128.74620	930951.87655	746469.802351	**INTERCEPT(RatioY,RatioX)**	746500
CC (R)	0.99996	0.99986	0.99935	**CORREL(RatioY,RatioX)**	
COD (R^2)	0.99992	0.99972	0.99870	**POWER(R,2)**	0.999

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	0.59560	-0.34405	1.18400	**LINEST(RatioY,RatioX:RatioX^2,1,1)**
x Coefficient (b)	251041.49047	259781.53689	96080.00000	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)**
Intercept (c)	3904821.62774	30597.27876	8195000.00000	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)**
COD (R^2)	0.99995			**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)**

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					**Ax*Cis/Ais/RF**	**((Ax/Ais-b)/m)*Cis**			**(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis**			**Reported**
ICV	072722B_014A.D	133327133	1	1	460.085	513.981	515.394	503.336	514.912	513.459	1282.117	503.3
CCV	080922B_100A.D	125190945	1	1	432.009	482.271	483.722	472.447	482.579	482.099	1199.949	472.4
MB	080922B_099A.D	831879	1	1	2.871	-2.406	-0.386	0.324	-12.241	3.084	-76.708	0.3243
LCS	080922B_098A.D	124165733	1	1	428.471	478.276	479.731	468.555	478.505	478.147	1189.584	468.6
LCSD	080922B_097A.D	124589380	1	1	429.933	479.927	481.380	470.164	480.188	479.780	1193.868	470.2
580-116547-1	080922B_096A.D	1319651363	1	1	4553.849	5137.560	5133.540	5007.159	5177.551	5114.374	11903.526	5007.2

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: DRO
Instrument: TAC020
Curve Date: 7/27/2022
Compound: o-Terphenyl
Internal Standard: none

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
41774	1	0.1005	1	41774	0.1005	0.01010025	415661.692
81250	1	0.201	1	81250	0.201	0.040401	404228.856
160703	1	0.402	1	160703	0.402	0.161604	399758.706
397290	1	1.005	1	397290	1.005	1.010025	395313.433
795335	1	2.01	1	795335	2.01	4.0401	395689.055
1519351	1	4.02	1	1519351	4.02	16.1604	377948.010
3663805	1	10.05	1	3663805	10.05	101.0025	364557.711
6871832	1	20.1	1	6871832	20.1	404.01	341882.189
14154714	1	40.2	1	14154714	40.2	1616.04	352107.313
34711601	1	101.5	1	34711601	101.5	10302.25	341986.217
64503702	1	201	1	64503702	201	40401	320913.940
SUM OF EACH COLUMN :				**126901357.0000**	**380.5885**	**52845.72513**	**4110047.1222**

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

Average RF	373640.647	**AVERAGE(RF)**
RSD	8.3%	**STDEV(RF)/(AveRF)**

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	reported
Slope (m)	323858.31289	332762.67567	361610.46610	**SLOPE(RatioY,RatioX)**	3.62E+05
Intercept (b)	331327.95325	23246.31011	6841.272072	**INTERCEPT(RatioY,RatioX)**	6780
CC (R)	0.99950	0.99907	0.99760	**CORREL(RatioY,RatioX)**	
COD (R^2)	0.99899	0.99815	0.99520	**POWER(R,2)**	0.995

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-199.05311	-186.83375	-586.79158	**LINEST(RatioY,RatioX:RatioX^2,1,1)**
x Coefficient (b)	361042.64550	358759.99358	415262.53743	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)**
Intercept (c)	1071.28657	21344.90618	-12123.89048	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)**
COD (R^2)	0.99997			**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)**

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
		Equations:			**Ax*Cis/Ais/RF**	**((Ax/Ais-b)/m)*Cis**			**(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis**			**Reported**
ICV	072722B_014A.D	3438347	1	1	9.202	9.594	10.263	9.490	9.571	9.572	8.409	9.48
CCV	080922B_100A.D	3701632	1	1	9.907	10.407	11.054	10.218	10.308	10.314	9.059	10.2
MB	080922B_099A.D	2538375	1	1	6.794	6.815	7.558	7.001	7.055	7.042	6.196	6.99
LCS	080922B_098A.D	3479018	1	1	9.311	9.719	10.385	9.602	9.685	9.687	8.509	9.59
LCSD	080922B_097A.D	3447877	1	1	9.228	9.623	10.292	9.516	9.598	9.599	8.433	9.51
580-116547-1	080922B_096A.D	2821757	1	1	7.552	7.690	8.410	7.784	7.847	7.838	6.891	7.78

Internal Standard Initial Calibration and Calculation Worksheet

Lab:	Eurofins Seattle
Method:	8270 SIM
Instrument:	SEA101
Curve Date:	3/24/2022
Compound:	Napthalene
Internal Standard:	Naphthalene-d8

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
676	61165	1	100	0.011052072	0.01	0.0001	1.1052072
1315	63638	2	100	0.020663754	0.02	0.0004	1.0331877
2888	57477	5	100	0.050246185	0.05	0.0025	1.0049237
6855	60890	10	100	0.112580062	0.1	0.01	1.1258006
13252	61637	20	100	0.21500073	0.2	0.04	1.0750037
33763	63228	50	100	0.533988107	0.5	0.25	1.0679762
68550	64709	100	100	1.059358049	1	1	1.0593580
140438	66606	200	100	2.108488725	2	4	1.0542444
376666	72529	500	100	5.193315777	5	25	1.0386632
732424	70581	1000	100	10.37707032	10	100	1.0377070
1451849	70105	2000	100	20.70963555	20	400	1.0354818
3732877	74649	5000	100	50.0057201	50	2500	1.0001144
6804306	78466	10000	100	86.71661611	100	10000	0.8671662
SUM OF EACH COLUMN :				177.1137	188.88	13030.303	13.5048

CALIBRATION MODELS:

Average Response Factor:

Cx = Ax*Cis/Ais/RF

			Reported
Average RF	1.0388	AVERAGE(RF)	1.0388000
RSD	6.0211%	STDEV(RF)/(AveRF)	6

Linear Regression:

y = mx + b

Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	
Slope (m)	0.88938	0.93722	1.02921	SLOPE(RatioY,RatioX)	slope (m1)
Intercept (b)	0.70217	0.00699	0.000662	INTERCEPT(RatioY,RatioX)	y-intercept
CC (R)	0.99751	0.99673	0.99805	CORREL(RatioY,RatioX)	reported CC
COD (R^2)	0.99503	0.99348	0.99611	POWER(R,2)	reported COD

Quadratic Regression:

$y = ax^2 + bx + c$

Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-0.00246	-0.00217	-0.00199	LINEST(RatioY,RatioX:RatioX^2,1,1)
x Coefficient (b)	1.11543	1.08854	1.07507	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)
Intercept (c)	-0.11548	-0.01820	-0.00050	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)
COD (R^2)	0.99990			INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)

Sample Concentration Calculations

Sample ID	File ID	Compound Response Ax	ISTD Response Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					Ax*Cis/Ais/RF	((Ax/Ais-b)/m)*Cis			(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis			reported on column
ICV 580-385060/21	032522a005.D	674588	71701	100	905.665	978.908	1003.107	914.066	870.545	881.459	889.850	905.7
CCVIS 580-399912/3	080922a003.D	552979	113246	100	470.045	470.084	520.260	474.375	452.640	454.367	458.137	470
MB 580-399776/1-A	080922a004.D	2700	82745	100	3.141	-75.282	2.735	3.106	13.282	4.670	3.082	3.14
LCS 580-399776/2-A	080922a005.D	809033	86477	100	900.575	972.962	997.465	908.929	865.616	876.425	884.764	900.6
580-116547-1	080922a011.D	850286	92803	100	881.977	951.239	976.851	890.157	847.614	858.041	866.191	882
580-116547-1 MS	080922a012.D	863890	96510	100	861.669	927.518	954.341	869.659	827.975	837.983	845.925	861.7

Internal Standard Initial Calibration and Calculation Worksheet

Lab:	Eurofins Seattle
Method:	8270 SIM
Instrument:	SEA101
Curve Date:	3/24/2022
Compound:	2-methylnaphthalene-d10
Internal Standard:	Naphthalene-d8

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
335	61165	1	100	0.005476988	0.01	0.0001	0.5476988
647	63638	2	100	0.010166881	0.02	0.0004	0.5083441
1436	57477	5	100	0.024983907	0.05	0.0025	0.4996781
3236	60890	10	100	0.053145016	0.1	0.01	0.5314502
6555	61637	20	100	0.10634846	0.2	0.04	0.5317423
17172	63228	50	100	0.271588537	0.5	0.25	0.5431771
35592	64709	100	100	0.55003168	1	1	0.5500317
74088	66606	200	100	1.112332222	2	4	0.5561661
207280	72529	500	100	2.857891326	5	25	0.5715783
406827	70581	1000	100	5.763973307	10	100	0.5763973
824303	70105	2000	100	11.75811996	20	400	0.5879060
2134398	74649	5000	100	28.59245268	50	2500	0.5718491
4291990	78466	10000	100	54.69872301	100	10000	0.5469872
	1000			**105.8052**	**188.88**	**13030.303**	**7.1230**

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

			Reported
Average RF	0.5479	**AVERAGE(RF)**	0.5479000
RSD	4.7313%	**STDEV(RF)/(AveRF)**	4.7

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	
Slope (m)	0.55145	0.56023	0.55245	**SLOPE(RatioY,RatioX)**	slope (m1)
Intercept (b)	0.12668	-0.00085	-0.000312	**INTERCEPT(RatioY,RatioX)**	y-intercept
CC (R)	0.99974	0.99963	0.99887	**CORREL(RatioY,RatioX)**	reported CC
COD (R^2)	0.99948	0.99926	0.99775	**POWER(R,2)**	reported COD

Quadratic Regression:

$v = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-0.00049	-0.00051	0.00042	**LINEST(RatioY,RatioX:RatioX^2,1,1)**
x Coefficient (b)	0.59682	0.59837	0.53087	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)**
Intercept (c)	-0.03743	-0.04303	0.00075	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)**
COD (R^2)	0.99999			**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)**

Sample Concentration Calculations

Sample ID	File ID	Compound Response Ax	ISTD Response Ais	ISTD Conc Cis	Ave RF On-column Conc Equal Weighting	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					**Ax*Cis/Ais/RF**	**((Ax/Ais-b)/m)*Cis**			**(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis**			reported on column
ICV 580-385060/21	032522a005.D	370126	71701	100	942.116	913.115	921.572	934.452	877.570	876.436	964.800	942.1
CCVIS 580-399912/3	080922a003.D	298532	113246	100	481.114	455.063	470.697	477.228	449.639	449.467	494.472	481.1
MB 580-399776/1-A	080922a004.D	411233	82745	100	907.040	878.263	887.266	899.663	844.901	843.838	929.136	907
LCS 580-399776/2-A	080922a005.D	627223	86477	100	1323.736	1292.292	1294.809	1312.944	1234.154	1232.288	1351.523	1323.7
580-116547-1	080922a011.D	60595	92803	100	119.167	95.432	116.700	118.246	115.786	116.426	122.733	119.2
580-116547-1 MS	080922a012.D	52619	96510	100	99.506	75.898	97.472	98.747	97.704	98.390	102.477	99.5
580-116547-1 MSD	080922a013.D	55391	105961	100	95.405	71.823	93.461	94.680	93.933	94.629	98.251	95.4

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, 22F
Laboratory:	Eurofins, Seattle
SDG:	580-116547-1
Data Validator:	(b) (6) [redacted]
Validation Date:	9/26/2022
Reviewer:	(b) (6) [redacted]
Review Date:	9/27/2022

Analyzed for:
- ☐ GRO
- ☑ DRO
- ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded? ☐ Yes ☑ No

NOTE: Water and Soil sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	07/29/2022 and 08/01/2022	
Prepped	DRO/ORO: 8/8	ok
Analyzed	DRO/ORO: 8/9	ok

Surrogate Recovery

Are surrogate recoveries summarized within the report? ☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C23/24 4-Bromofluorobenzene aqueous 85-114%, solid 79-119)
(QSM 5.4 Table C14 o-Terphenyl aqueous 56-125%, solid 45-130%).

Were outliers marked as such? ☐ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☑ Yes ☐ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water?	☐ Yes	☐ No	☑ NA
b. low soil?	☑ Yes	☐ No	☐ NA
c. medium soil?	☐ Yes	☐ No	☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range? ☑ Yes ☐ No ☐ NA

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples.

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag	
GRO					
NA					
DRO/ORO					
A3-100BH-SON01-003.0--004.0	↓	↓	ok	no Q >4X	DRO
580-116547-1	ok	ok	ok		ORO

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD	Flag	Associated samples:
GRO		
NA		
DRO /ORO		
LCS 580-399779/2-A	ok	
LCSD 580-399779/3-A	ok	

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022 ☐ Yes ☑ No

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			
DRO/ORO			
All ND			

Trip Blanks GRO
NA

Equipment Blank:
None

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			
DRO/ORO			
ICAL on 7/27 TAC020			ok
ICV 580-398533/14 07/28/2022 01:42 1 072722B_014A.D 2			ok
CCV 580-399956/18 08/09/2022 17:59 1 080922B_100A.D			ok
CCV 580-399956/27 08/09/2022 21:00 1 080922B_091A.D			ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

☐ Yes ☐ No ☑ NA

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:
all samples

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value (JH).

Table 3-2: DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m³) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6

Notes:

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/23/22

Reviewer: (b) (6)

Review Date: 9/27/22

Project: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106

SDG: 580-116547-1

LAB: Eurofins Seattle

Samples Collected: 7/29/2022 and 8/1/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 7/29 and 8/1
  Samples extracted on 8/8; re on 8/12 (14 days after collection; ok)
  Samples analyzed on 8/9; re on 8/14 and 8/18

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: SEA101

Tune: 03/24/2022 ok

ICAL: 3/24/2022 ok

ICB 580-385060/20 032522a004.D 03/25/2022 12:26

ICV 580-385060/21 032522a005.D 03/25/2022 12:50 ok

Tune: 08/09/2022 10:20 ok

CCVIS 580-399912/3 080922a003.D 08/09/2022 10:48 ok

Samples 1,2,3 (initial analyses)

CCVC 580-399912/13 080922a016.D 08/09/2022 19:36 ok

Tune: 08/13/2022 23:33 ok

CCVIS 580-400498/3 081322a003.D 08/14/2022 0:00 ok

Samples 1,2,3 (RAs) not reported

CCVC 580-400498/22 081322a023.D 08/14/2022 8:15 ok

Tune: 08/17/2022 22:16 ok

CCVIS 580-400952/3 081722b003.D 08/17/2022 22:44 ok

Sample 1 RE not reported

CCVC 580-400952/16 081722b017.D 08/18/2022 4:37 ok

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-399776/2-A ok
LCS 580-400460/2-A and LCSD 580-400460/20-A ok
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

A3-100BH-SON01-003.0--004.0 MS and MSD

All out but 4X rule applies in all cases; no qualification action required

Blanks (Form IV/Form1)

✓ method blank – analyzed one per prep batch

✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

Solid

MB 580-399776/1-A associated with initial analyses (all used as reportable results)

1-Methylnaphthalene 0.00259 J sample 3: results >LOD but <5X blank J+

2-Methylnaphthalene 0.00393 J sample 3: results >LOD but <5X blank J+

Naphthalene 0.00314 J sample 3: U at LOD

MB 580-400460/1-A associated with Ras (not reported) ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Ok

FIELD DUPLICATES

✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.

- ✓ See field duplicate worksheet

none

Automated Data Review Detail Report for 5801165471
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
A3-100BH	A3-100BH-SON01-003.0--004.0	07-29-2022	1014	MS	SO	3.00	4.00	X	X
A3-100BH	A3-100BH-SON01-003.0--004.0	07-29-2022	1014	N	SO	3.00	4.00	X	X
A3-100BH	A3-100BH-SON01-003.0--004.0	07-29-2022	1014	SD	SO	3.00	4.00	X	X
A3-150BH	A3-150BH-SON01-001.0-002.0	07-29-2022	1408	N	SO	1.00	2.00	X	X
A3-200BH	A3-200BH-SON01-004.0-005.0	08-01-2022	0947	N	SO	4.00	5.00	X	X
							Total	**5**	**5**

Automated Data Review Detail Report for 5801165471
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 399912

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5803999123		1/1	8/9/2022 10:48	8/9/2022 10:48	8/9/2022 10:48	399776/	CV
LABQC	SQ	LABQC	MB5803997761A		1/1	8/8/2022 11:52	8/8/2022 11:52	8/9/2022 14:35	399776/	LB
LABQC	SQ	LABQC	LCS5803997762A		1/1	8/8/2022 11:52	8/8/2022 11:52	8/9/2022 15:00	399776/	BS
A3-200BH	SO	A3-200BH-SON01-004.0-005.0	580-116547-3		1/1	8/1/2022 09:47	8/8/2022 11:52	8/9/2022 15:25	399776/	N
A3-150BH	SO	A3-150BH-SON01-001.0-002.0	580-116547-2		1/1	7/29/2022 14:08	8/8/2022 11:52	8/9/2022 17:06	399776/	N
A3-100BH	SO	A3-100BH-SON01-003.0--004.0	580-116547-1		1/10	7/29/2022 10:14	8/8/2022 11:52	8/9/2022 17:31	399776/	N
A3-100BH	SO	A3-100BH-SON01-003.0--004.0	580-116547-1		1/10	7/29/2022 10:14	8/8/2022 11:52	8/9/2022 17:56	399776/	MS
A3-100BH	SO	A3-100BH-SON01-003.0--004.0	580-116547-1		1/10	7/29/2022 10:14	8/8/2022 11:52	8/9/2022 18:21	399776/	SD
LABQC	SQ	LABQC	CCVC58039991213		1/1	8/9/2022 19:36	8/9/2022 19:36	8/9/2022 19:36	399776/	CV

Test Method: BNASIM Analysis Batch: 400498

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5804004983		1/1	8/14/2022 00:00	8/14/2022 00:00	8/14/2022 00:00	400460/	CV
LABQC	SQ	LABQC	MB5804004601A		1/1	8/12/2022 19:41	8/12/2022 19:41	8/14/2022 00:25	400460/	LB
LABQC	SQ	LABQC	LCS5804004602A		1/1	8/12/2022 19:41	8/12/2022 19:41	8/14/2022 00:50	400460/	BS
LABQC	SQ	LABQC	LCSD58040046020A		1/1	8/12/2022 19:41	8/12/2022 19:41	8/14/2022 01:15	400460/	BD
A3-100BH	SO	A3-100BH-SON01-003.0--004.0	580-116547-1		2/1	7/29/2022 10:14	8/12/2022 19:41	8/14/2022 05:23	400460/	N
A3-150BH	SO	A3-150BH-SON01-001.0-002.0	580-116547-2		2/1	7/29/2022 14:08	8/12/2022 19:41	8/14/2022 05:47	400460/	N
A3-200BH	SO	A3-200BH-SON01-004.0-005.0	580-116547-3		2/1	8/1/2022 09:47	8/12/2022 19:41	8/14/2022 07:25	400460/	N

Automated Data Review Detail Report for 5801165471
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: BNASIM Analysis Batch: 400498

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVC58040049822		1/1	8/14/2022 08:15	8/14/2022 08:15	8/14/2022 08:15	400460/	CV

Test Method: BNASIM Analysis Batch: 400952

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5804009523		1/1	8/17/2022 22:44	8/17/2022 22:44	8/17/2022 22:44	400460/	CV
A3-100BH	SO	A3-100BH-SON01-003.0--004.0	580-116547-1		3/10	7/29/2022 10:14	8/12/2022 19:41	8/18/2022 00:25	400460/	N
LABQC	SQ	LABQC	CCVC58040095216		1/1	8/18/2022 04:37	8/18/2022 04:37	8/18/2022 04:37	400460/	CV

Automated Data Review Detail Report for 5801165471
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: SW8015D Analysis Batch: 399956

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5803999563		1/1	8/9/2022 15:17	8/9/2022 15:17	8/9/2022 15:17	399779/	CV
LABQC	SQ	LABQC	CCV58039995618		1/1	8/9/2022 17:59	8/9/2022 17:59	8/9/2022 17:59	399779/	CV
LABQC	SQ	LABQC	MB5803997791A		1/1	8/8/2022 11:58	8/8/2022 11:58	8/9/2022 18:19	399779/	LB
LABQC	SQ	LABQC	LCS5803997792A		1/1	8/8/2022 11:58	8/8/2022 11:58	8/9/2022 18:39	399779/	BS
LABQC	SQ	LABQC	LCSD5803997793A		1/1	8/8/2022 11:58	8/8/2022 11:58	8/9/2022 18:59	399779/	BD
A3-100BH	SO	A3-100BH-SON01-003.0--004.0	580-116547-1		1/1	7/29/2022 10:14	8/8/2022 11:58	8/9/2022 19:19	399779/	N
A3-100BH	SO	A3-100BH-SON01-003.0--004.0	580-116547-1		1/1	7/29/2022 10:14	8/8/2022 11:58	8/9/2022 19:39	399779/	MS
A3-100BH	SO	A3-100BH-SON01-003.0--004.0	580-116547-1		1/1	7/29/2022 10:14	8/8/2022 11:58	8/9/2022 19:59	399779/	SD
A3-150BH	SO	A3-150BH-SON01-001.0-002.0	580-116547-2		1/1	7/29/2022 14:08	8/8/2022 11:58	8/9/2022 20:20	399779/	N
A3-200BH	SO	A3-200BH-SON01-004.0-005.0	580-116547-3		1/1	8/1/2022 09:47	8/8/2022 11:58	8/9/2022 20:40	399779/	N
LABQC	SQ	LABQC	CCV58039995627		1/1	8/9/2022 21:00	8/9/2022 21:00	8/9/2022 21:00	399779/	CV

Automated Data Review Detail Report for 5801165471
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

--No Records Found--

MS Mismatch Report

BNASIM	FLDSAMPID	LABSAMPID	EXMCODE / LCHMETH	Analyte	Run#/ Dil.	MS/MSD FLDSAMPID	MS/MSD LABSAMPID	MS/MSD Run#/ Dil.	Sample Type
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	1-Methylnaphthalene	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	1-Methylnaphthalene	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	2-Methylnaphthalene-d10	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	2-Methylnaphthalene-d10	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	Fluoranthene-d10	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	Fluoranthene-d10	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	Naphthalene	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	Naphthalene	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	Terphenyl-d14	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N
	A3-100BH-SON01-003.0--004.0	580-116547-1	SW3546	Terphenyl-d14	2	A3-100BH-SON01-003.0--004.0	580-116547-1	1/10	N

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

Automated Data Review Detail Report for 5801165471
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

QC Outlier Report

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
Lab Blank	MB5803997761A (LB) / MB5803997761A	1 / 1.00	1-Methylnaphthalene	0.002590 (mg/kg)	U/None*	< 0.00063	< 0.005	L			
Lab Blank	MB5803997761A (LB) / MB5803997761A	1 / 1.00	2-Methylnaphthalene	0.003930 (mg/kg)	U/None*	< 0.0021	< 0.005	L			
Lab Blank	MB5803997761A (LB) / MB5803997761A	1 / 1.00	Naphthalene	0.003140 (mg/kg)	U/None*	< 0.0016	< 0.005	L			
MS Recovery	A3-100BH-SON01-003.0--004.0 (MS) / 580-116547-1	1 / 10.00	1-Methylnaphthalene	-100.0 (percent)	J/X	43 - 111	10 - 111	M			
MS Recovery	A3-100BH-SON01-003.0--004.0 (SD) / 580-116547-1	1 / 10.00	1-Methylnaphthalene	-85.00 (percent)	J/X	43 - 111	10 - 111	M			
MS Recovery	A3-100BH-SON01-003.0--004.0 (MS) / 580-116547-1	1 / 10.00	2-Methylnaphthalene	-108.0 (percent)	J/X	39 - 114	10 - 114	M			
MS Recovery	A3-100BH-SON01-003.0--004.0 (SD) / 580-116547-1	1 / 10.00	2-Methylnaphthalene	-131.0 (percent)	J/X	39 - 114	10 - 114	M			
MS Recovery	A3-100BH-SON01-003.0--004.0 (SD) / 580-116547-1	1 / 10.00	Naphthalene	-54.00 (percent)	J/X	38 - 111	10 - 111	M			
MS Recovery	A3-100BH-SON01-003.0--004.0 (MS) / 580-116547-1	1 / 10.00	Naphthalene	-58.00 (percent)	J/X	38 - 111	10 - 111	M			
Prep Hold Time	A3-100BH-SON01-003.0--004.0 (N) / 580-116547-1	2 / 1.00	All in Run	14.39 (days)	J/UJ	< 14	< 28	H2	Prep Exceeds UWL		
Prep Hold Time	A3-100BH-SON01-003.0--004.0 (N) / 580-116547-1	3 / 10.00	All in Run	14.39 (days)	J/UJ	< 14	< 28	H2	Prep Exceeds UWL		

Automated Data Review Detail Report for 5801165471
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

QC Outlier Report

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
Prep Hold Time	A3-150BH-SON01-001.0-002.0 (N) / 580-116547-2	2 / 1.00	All in Run	14.23 (days)	J/UJ	< 14	< 28	H2	Prep Exceeds UWL		

*Blank flags displayed in the above table identify qualification of the sample result when it is less than or equal to the LOQ/RL. Sample results above the LOQ will be qualified based on the validation type such as J+ at the sample result.

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
MS Recovery	A3-100BH-SON01-003.0--004.0 (MS) / 580-116547-1	1 / 1.00	C10-C24 Petroleum Hydrocarbons	-33.00 (percent)	J/X	38 - 132	20 - 132	M			
MS Recovery	A3-100BH-SON01-003.0--004.0 (SD) / 580-116547-1	1 / 1.00	C10-C24 Petroleum Hydrocarbons	-98.00 (percent)	J/X	38 - 132	20 - 132	M			

Rule is the multiplier used when blank contamination occurs to determine action level.

Automated Data Review Detail Report for 5801165471
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Qualified Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3-200BH-SON01-004.0-005.0	580-116547-3	S	N	1-Methylnaphthalene	0.00490	0.00220 J B	0.00220 J	+	mg/kg	TR/L
A3-200BH-SON01-004.0-005.0	580-116547-3	S	N	2-Methylnaphthalene	0.00490	0.00330 J B	0.00330 J	+	mg/kg	TR/L
A3-200BH-SON01-004.0-005.0	580-116547-3	S	N	Naphthalene	0.00490	0.00220 J B M	0.00390 U		mg/kg	L

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3-100BH-SON01-003.0--004.0	580-116547-1	S	N	C24-C40 Petroleum Hydrocarbons	64.0	26.0 J	26.0 J		mg/kg	TR
A3-200BH-SON01-004.0-005.0	580-116547-3	S	N	C10-C24 Petroleum Hydrocarbons	49.0	10.0 J	10.0 J		mg/kg	TR

Qualified analytes in samples are reported as estimated, not detected (UJ) at the Limit of Detection (LOD).

Automated Data Review Detail Report for 5801165471
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-100BH-SON01-003.0--004.0	580-116547-1	S	N	10	1-Methylnaphthalene	0.0600	19.0 D B J1	19.0	mg/kg	
A3-100BH-SON01-003.0--004.0	580-116547-1	S	N	10	2-Methylnaphthalene	0.0600	27.0 D B J1	27.0	mg/kg	
A3-100BH-SON01-003.0--004.0	580-116547-1	S	N	10	Naphthalene	0.0600	11.0 D B J1	11.0	mg/kg	
A3-150BH-SON01-001.0-002.0	580-116547-2	S	N	1	1-Methylnaphthalene	0.00520	0.0620 B	0.0620	mg/kg	
A3-150BH-SON01-001.0-002.0	580-116547-2	S	N	1	2-Methylnaphthalene	0.00520	0.0490 B	0.0490	mg/kg	
A3-200BH-SON01-004.0-005.0	580-116547-3	S	N	1	1-Methylnaphthalene	0.00490	0.00220 J B	0.00220 J	mg/kg	TR/L
A3-200BH-SON01-004.0-005.0	580-116547-3	S	N	1	2-Methylnaphthalene	0.00490	0.00330 J B	0.00330 J	mg/kg	TR/L

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-100BH-SON01-003.0--004.0	580-116547-1	S	N	1	C10-C24 Petroleum Hydrocarbons	64.0	6400 J1	6400 J	mg/kg	
A3-100BH-SON01-003.0--004.0	580-116547-1	S	N	1	C24-C40 Petroleum Hydrocarbons	64.0	26.0 J	26.0 J	mg/kg	TR
A3-150BH-SON01-001.0-002.0	580-116547-2	S	N	1	C10-C24 Petroleum Hydrocarbons	61.0	84.0	84.0	mg/kg	
A3-200BH-SON01-004.0-005.0	580-116547-3	S	N	1	C10-C24 Petroleum Hydrocarbons	49.0	10.0 J	10.0 J	mg/kg	TR

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions

ENVIRONMENTAL DATA SERVICES, LTD.

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-116630-1
Eurofins, Seattle

Prepared by

ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for

AECOM Environmental

Released: 9/27/22

Data Validators and Peer Reviewers:

(b) (6)

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ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116630-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/02/2022
Number of Samples: 2
Test Method: SW-846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
1S025BH-SON01-005.0-006.0	580-116630-1	solid	S2BVEM
2S025BH-SON01-003.0-004.0	580-116630-2	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No sample was submitted for the equipment blank in association with the samples in this sample delivery group (SDG).

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were not reviewed at the Stage 2B level.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

No sample was submitted for MS/MSD evaluation in association with this SDG.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. Upon evaluation all precision and accuracy indicators were favorable or did not result in a need to qualify sample results.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116630-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/02/2022
Number of Samples: 2
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
1S025BH-SON01-005.0-006.0	580-116630-1	solid	S2BVEM
2S025BH-SON01-003.0-004.0	580-116630-2	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No sample was submitted for MS/MSD analyses in association with this SDG.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Compound Identification and Quantitation	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, 22F
Laboratory:	Eurofins, Seattle
SDG:	580-116630-1
Data Validator:	(b) (6) [redacted]
Validation Date:	9/26/2022
Reviewer:	(b) (6) [redacted]
Review Date:	9/27/2022

Analyzed for:
- ☐ GRO
- ☑ DRO
- ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded?

☐ Yes ☑ No

NOTE: Water and Soil sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	8/2/22	
Prepped	DRO/ORO: 8/9	ok
Analyzed	DRO/ORO: 8/10	ok

Surrogate Recovery

Are surrogate recoveries summarized within the report?

☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C23/24 4-Bromofluorobenzene aqueous 85-114%, solid 79-119)
(QSM 5.4 Table C14 o-Terphenyl aqueous 56-125%, solid 45-130%).

Were outliers marked as such? ☐ Yes ☐ No

Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☐ Yes ☑ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water? ☐ Yes ☐ No ☑ NA
b. low soil? ☐ Yes ☐ No ☑ NA
c. medium soil? ☐ Yes ☐ No ☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range? ☐ Yes ☐ No ☑ NA

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples.

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag
GRO				
NA				
DRO/ORO				
None				

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD		Flag	Associated samples:
GRO			
NA			
DRO /ORO			
LCS 580-399999/2-A	ok		DRO
	↑	ND, no Q	ORO
LCSD 580-399999/3-A	ok		DRO
	↑	ND, no Q	ORO

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022 ☐ Yes ☑ No

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			
DRO/ORO			
All ND			

Trip Blanks GRO
NA

Equipment Blank:
None

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			
DRO/ORO			
ICAL on 7/27 TAC020			ok
ICV 580-398533/14 07/28/2022 01:42 1 072722B_014A.D 2			ok
CCVRT 580-400086/3 08/10/2022 19:39 1 0810A22B_003A			ok
CCV 580-400086/69 08/10/2022 22:41 1 0810A22B_012A.I			ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

☐ Yes ☐ No ☑ NA

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:
Level 2B for this SDG

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value (JH).

Table 3-2: DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m³) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6

Notes:

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/23/22

Reviewer: (b) (6)

Review Date: 9/27/22

Project: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106

SDG: 580-116630-1

LAB: Eurofins Seattle

Samples Collected: 8/2/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 8/2
  Samples extracted on 8/9
  Samples analyzed on 8/11

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: SEA101

Tune: 03/24/2022 ok

ICAL: 3/24/2022 ok

ICB 580-385060/20 032522a004.D 03/25/2022 12:26

ICV 580-385060/21 032522a005.D 03/25/2022 12:50 ok

Tune: 08/11/2022 10:10 ok

CCVIS 580-400170/3 081122a003.D 08/11/2022 10:38

Samples 1 and 2

CCVC 580-400170/11 081122a011.D 08/11/2022 14:20

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-400002/2-A  and LCSD 580-400002/3-A ok
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

none

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch
- ✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

Solid

MB 580-400002/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B review

FIELD DUPLICATES

✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.

- ✓ See field duplicate worksheet

none

Automated Data Review Detail Report for 5801166301
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
1S025BH	1S025BH-SON01-005.0-006.0	08-02-2022	1448	N	SO	5.00	6.00	X	X
2S025BH	2S025BH-SON01-003.0-004.0	08-02-2022	0907	N	SO	3.00	4.00	X	X
							Total	**2**	**2**

Automated Data Review Detail Report for 5801166301
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 400170

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5804001703		1/1	8/11/2022 10:38	8/11/2022 10:38	8/11/2022 10:38	400002/	CV
LABQC	SQ	LABQC	MB5804000021A		1/1	8/9/2022 15:24	8/9/2022 15:24	8/11/2022 11:46	400002/	LB
LABQC	SQ	LABQC	LCS5804000022A		1/1	8/9/2022 15:24	8/9/2022 15:24	8/11/2022 12:11	400002/	BS
LABQC	SQ	LABQC	LCSD5804000023A		1/1	8/9/2022 15:24	8/9/2022 15:24	8/11/2022 12:37	400002/	BD
1S025BH	SO	1S025BH-SON01-005.0-006.0	580-116630-1		1/1	8/2/2022 14:48	8/9/2022 15:24	8/11/2022 13:28	400002/	N
2S025BH	SO	2S025BH-SON01-003.0-004.0	580-116630-2		1/1	8/2/2022 09:07	8/9/2022 15:24	8/11/2022 13:54	400002/	N
LABQC	SQ	LABQC	CCVC58040017011		1/1	8/11/2022 14:20	8/11/2022 14:20	8/11/2022 14:20	400002/	CV

Test Method: SW8015D Analysis Batch: 400086

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5804000863		1/1	8/10/2022 19:39	8/10/2022 19:39	8/10/2022 19:39	399999/	CV
LABQC	SQ	LABQC	MB5803999991A		1/1	8/9/2022 14:52	8/9/2022 14:52	8/10/2022 19:59	399999/	LB
LABQC	SQ	LABQC	LCS5803999992A		1/1	8/9/2022 14:52	8/9/2022 14:52	8/10/2022 20:19	399999/	BS
LABQC	SQ	LABQC	LCSD5803999993A		1/1	8/9/2022 14:52	8/9/2022 14:52	8/10/2022 20:39	399999/	BD
1S025BH	SO	1S025BH-SON01-005.0-006.0	580-116630-1		1/1	8/2/2022 14:48	8/9/2022 14:52	8/10/2022 22:00	399999/	N
2S025BH	SO	2S025BH-SON01-003.0-004.0	580-116630-2		1/1	8/2/2022 09:07	8/9/2022 14:52	8/10/2022 22:20	399999/	N

Automated Data Review Detail Report for 5801166301
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 400086

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCV58040008669		1/1	8/10/2022 22:41	8/10/2022 22:41	8/10/2022 22:41	399999/	CV

Automated Data Review Detail Report for 5801166301
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

--No Records Found--

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

Automated Data Review Detail Report for 5801166301
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

QC Outlier Report

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
LCS Recovery	LCS5803999992A (BS) / LCS5803999992A	1 / 1.00	C24-C40 Petroleum Hydrocarbons	108.0 (percent)	J/None	39 - 106	39 - 106	C			
LCS Recovery	LCSD5803999993A (BD) / LCSD5803999993A	1 / 1.00	C24-C40 Petroleum Hydrocarbons	108.0 (percent)	J/None	39 - 106	39 - 106	C			

Rule is the multiplier used when blank contamination occurs to determine action level.

Automated Data Review Detail Report for 5801166301
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Qualified Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
1S025BH-SON01-005.0-006.0	580-116630-1	S	N	2-Methylnaphthalene	0.00520	0.00360 J	0.00360 J		mg/kg	TR
1S025BH-SON01-005.0-006.0	580-116630-1	S	N	Naphthalene	0.00520	0.00180 J M	0.00180 J		mg/kg	TR

Qualified analytes in samples are reported as estimated, not detected (UJ) at the Limit of Detection (LOD).

Automated Data Review Detail Report for 5801166301
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
1S025BH-SON01-005.0-006.0	580-116630-1	S	N	1	2-Methylnaphthalene	0.00520	0.00360 J	0.00360 J	mg/kg	TR
1S025BH-SON01-005.0-006.0	580-116630-1	S	N	1	Naphthalene	0.00520	0.00180 J M	0.00180 J	mg/kg	TR
2S025BH-SON01-003.0-004.0	580-116630-2	S	N	1	1-Methylnaphthalene	0.00580	1.70	1.70	mg/kg	
2S025BH-SON01-003.0-004.0	580-116630-2	S	N	1	2-Methylnaphthalene	0.00580	1.70	1.70	mg/kg	
2S025BH-SON01-003.0-004.0	580-116630-2	S	N	1	Naphthalene	0.00580	0.170 M	0.170	mg/kg	

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
2S025BH-SON01-003.0-004.0	580-116630-2	S	N	1	C10-C24 Petroleum Hydrocarbons	51.0	720	720	mg/kg	

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-116666-1
Eurofins, Seattle

Prepared by
ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for
AECOM Environmental

Released: 9/28/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

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ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116666-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/03/2022
Number of Samples: 1
Test Method: SW-846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-040BH-SON01-005.0-006.0	580-116666-1	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No sample was submitted for the equipment blank in association with the samples in this sample delivery group (SDG).

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were not reviewed at the Stage 2B level.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

Sample A3-040BH-SON01-005.0-006.0 was submitted for MS/MSD evaluation in association with this SDG. Upon evaluation all precision and accuracy indicators were favorable or did not result in a need to qualify sample results with the following exceptions.

The observed recovery for DRO was lower than the lowest acceptance limit in both the MS and MSD evaluations. The relative percent difference (RPD) was outside acceptance limits. The DRO result reported for the parent sample has been qualified "J" on this basis.

The observed ORO relative percent difference (RPD) was outside acceptance limits. The ORO result reported for the parent sample has been qualified "J" on this basis.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. Upon evaluation all precision and accuracy indicators were favorable.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	**No**		
DRO / ORO		**Major**	**Minor**	**Number of Results Qualified**
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate			x	2
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116666-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/03/2022
Number of Samples: 1
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-040BH-SON01-005.0-006.0	580-116666-1	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No sample was submitted for MS/MSD analyses in association with this SDG.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Compound Identification and Quantitation	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, 22F
Laboratory:	Eurofins, Seattle
SDG:	580-116666-1
Data Validator:	(b) (6) [redacted]
Validation Date:	9/26/2022
Reviewer:	(b) (6) [redacted]
Review Date:	9/28/2022

Analyzed for:
- ☐ GRO
- ☑ DRO
- ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded? ☐ Yes ☑ No

NOTE: Water sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction. Soil samples extracted within 14 days and analyzed within 40 days following extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	8/3/22	
Prepped	DRO/ORO: 8/12	ok
Analyzed	DRO/ORO: 8/15	ok

Surrogate Recovery

Are surrogate recoveries summarized within the report? ☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C23/24 4-Bromofluorobenzene aqueous 85-114%, solid 79-119)
(QSM 5.4 Table C14 o-Terphenyl aqueous 56-125%, solid 45-130%).

Were outliers marked as such? ☐ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☑ Yes ☐ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water?	☐ Yes	☐ No	☑ NA
b. low soil?	☑ Yes	☐ No	☐ NA
c. medium soil?	☐ Yes	☐ No	☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range? ☐ Yes ☑ No ☐ NA

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples.

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag		
GRO						
NA						
DRO/ORO						
A3-040BH-SON01-005.0-006.0	↓	↓	out	Q J (M/D)	DRO	580-116666-1
	ok	↓	out	Q J (D)	ORO	recovery inconclusive

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD	Flag	Associated samples:
GRO		
NA		
DRO /ORO		
LCS 580-400464/2-A	ok	DRO
	ok	ORO
LCSD 580-400464/3-A	ok	DRO
	ok	ORO

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022 ☐ Yes ☑ No

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			
DRO/ORO			
All ND			

Trip Blanks GRO
NA

Equipment Blank:
None

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			
DRO/ORO			
ICAL on 7/27 TAC020			ok
ICV 580-398533/14 07/28/2022 01:42 1 072722B_014A.D 2			ok
CCV 580-400663/9 08/15/2022 20:54 1 0815A22B_100A.D			ok
CCV 580-400663/13 08/15/2022 22:35 1 0815A22B_012A.I			ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

☐ Yes ☐ No ☑ NA

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:
Level 2B for this SDG

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value (JH).

Table 3-2: DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m³) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6

Notes:

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/23/22

Reviewer: (b) (6)

Review Date: 9/27/22

Project: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106

SDG: 580-116666-1

LAB: Eurofins Seattle

Samples Collected: 8/3/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 8/3
  Samples extracted on 8/12
  Samples analyzed on 8/14

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: SEA101

Tune: 03/24/2022 ok

ICAL: 3/24/2022 ok

ICB 580-385060/20 032522a004.D 03/25/2022 12:26

ICV 580-385060/21 032522a005.D 03/25/2022 12:50 ok

Tune: 08/13/2022 23:33 ok

CCVIS 580-400498/3 081322a003.D 08/14/2022 0:00 ok

Sample 1

CCVC 580-400498/22 081322a023.D 08/14/2022 8:15 ok

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-400460/2-A  and LCSD LCSD 580-400460/20-A ok
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

none

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch
- ✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

Solid

MB 580-400460/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B review

FIELD DUPLICATES

✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.

- ✓ See field duplicate worksheet

none

Automated Data Review Detail Report for 5801166661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
A3-040BH	A3-040BH-SON01-005.0-006.0	08-03-2022	1023	MS	SO	5.00	6.00		X
A3-040BH	A3-040BH-SON01-005.0-006.0	08-03-2022	1023	N	SO	5.00	6.00	X	X
A3-040BH	A3-040BH-SON01-005.0-006.0	08-03-2022	1023	SD	SO	5.00	6.00		X
							Total	**1**	**3**

Automated Data Review Detail Report for 5801166661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 400498

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5804004983		1/1	8/14/2022 00:00	8/14/2022 00:00	8/14/2022 00:00	400460/	CV
LABQC	SQ	LABQC	MB5804004601A		1/1	8/12/2022 19:41	8/12/2022 19:41	8/14/2022 00:25	400460/	LB
LABQC	SQ	LABQC	LCS5804004602A		1/1	8/12/2022 19:41	8/12/2022 19:41	8/14/2022 00:50	400460/	BS
LABQC	SQ	LABQC	LCSD58040046020A		1/1	8/12/2022 19:41	8/12/2022 19:41	8/14/2022 01:15	400460/	BD
A3-040BH	SO	A3-040BH-SON01-005.0-006.0	580-116666-1		1/1	8/3/2022 10:23	8/12/2022 19:41	8/14/2022 07:01	400460/	N
LABQC	SQ	LABQC	CCVC58040049822		1/1	8/14/2022 08:15	8/14/2022 08:15	8/14/2022 08:15	400460/	CV

Test Method: SW8015D Analysis Batch: 400663

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5804006633		1/1	8/15/2022 18:53	8/15/2022 18:53	8/15/2022 18:53	400464/	CV
LABQC	SQ	LABQC	MB5804004641A		1/1	8/12/2022 20:07	8/12/2022 20:07	8/15/2022 19:13	400464/	LB
LABQC	SQ	LABQC	LCS5804004642A		1/1	8/12/2022 20:07	8/12/2022 20:07	8/15/2022 19:33	400464/	BS
LABQC	SQ	LABQC	LCSD5804004643A		1/1	8/12/2022 20:07	8/12/2022 20:07	8/15/2022 19:53	400464/	BD
LABQC	SQ	LABQC	CCV5804006639		1/1	8/15/2022 20:54	8/15/2022 20:54	8/15/2022 20:54	400464/	CV
A3-040BH	SO	A3-040BH-SON01-005.0-006.0	580-116666-1		1/1	8/3/2022 10:23	8/12/2022 20:07	8/15/2022 21:34	400464/	N
A3-040BH	SO	A3-040BH-SON01-005.0-006.0	580-116666-1		1/1	8/3/2022 10:23	8/12/2022 20:07	8/15/2022 21:54	400464/	MS
A3-040BH	SO	A3-040BH-SON01-005.0-006.0	580-116666-1		1/1	8/3/2022 10:23	8/12/2022 20:08	8/15/2022 22:15	400464/	SD

Automated Data Review Detail Report for 5801166661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 400663

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCV58040066313		1/1	8/15/2022 22:35	8/15/2022 22:35	8/15/2022 22:35	400464/	CV
LABQC	SQ	LABQC	CCV58040066327		1/1	8/16/2022 02:57	8/16/2022 02:57	8/16/2022 02:57	400464/	CV

Automated Data Review Detail Report for 5801166661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

--No Records Found--

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

Automated Data Review Detail Report for 5801166661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

QC Outlier Report

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
MS Recovery	A3-040BH-SON01-005.0-006.0 (SD) / 580-116666-1	1 / 1.00	C10-C24 Petroleum Hydrocarbons	-123.0 (percent)	J/X	38 - 132	20 - 132	M			
MS Recovery	A3-040BH-SON01-005.0-006.0 (MS) / 580-116666-1	1 / 1.00	C10-C24 Petroleum Hydrocarbons	-75.00 (percent)	J/X	38 - 132	20 - 132	M			
MS Recovery	A3-040BH-SON01-005.0-006.0 (SD) / 580-116666-1	1 / 1.00	C24-C40 Petroleum Hydrocarbons	28.00 (percent)	J/UJ	39 - 106	20 - 106	M			
Surrogate	A3-040BH-SON01-005.0-006.0 (SD) / 580-116666-1	1 / 1.00	o-Terphenyl	39.00 (percent)	J/UJ	45 - 130	10 - 130	I			

Rule is the multiplier used when blank contamination occurs to determine action level.

Automated Data Review Detail Report for 5801166661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Qualified Results

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3-040BH-SON01-005.0-006.0	580-116666-1	S	N	C10-C24 Petroleum Hydrocarbons	70.0	1800 J1	1800 J		mg/kg	M/D
A3-040BH-SON01-005.0-006.0	580-116666-1	S	N	C24-C40 Petroleum Hydrocarbons	70.0	34.0 J J1	34.0 J		mg/kg	D/TR

Qualified analytes in samples are reported as estimated, not detected (UJ) at the Limit of Detection (LOD).

Automated Data Review Detail Report for 5801166661
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-040BH-SON01-005.0-006.0	580-116666-1	S	N	1	1-Methylnaphthalene	0.00680	6.50	6.50	mg/kg	
A3-040BH-SON01-005.0-006.0	580-116666-1	S	N	1	2-Methylnaphthalene	0.00680	9.10	9.10	mg/kg	
A3-040BH-SON01-005.0-006.0	580-116666-1	S	N	1	Naphthalene	0.00680	3.40	3.40	mg/kg	

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-040BH-SON01-005.0-006.0	580-116666-1	S	N	1	C10-C24 Petroleum Hydrocarbons	70.0	1800 J1	1800 J	mg/kg	M/D
A3-040BH-SON01-005.0-006.0	580-116666-1	S	N	1	C24-C40 Petroleum Hydrocarbons	70.0	34.0 J J1	34.0 J	mg/kg	D/TR

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

ENVIRONMENTAL DATA SERVICES, LTD.

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-116684-1
Eurofins, Seattle

Prepared by

ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for

AECOM Environmental

Released: 9/27/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

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ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116684-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/04/2022
Number of Samples: 1
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-300BH-SON01-004.0-005.0	580-116684-1	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No sample was submitted for MS/MSD analyses in association with this SDG.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Compound Identification and Quantitation	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116684-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/04/2022
Number of Samples: 1
Test Method: SW-846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-300BH-SON01-004.0-005.0	580-116684-1	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No sample was submitted for the equipment blank in association with the samples in this sample delivery group (SDG).

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were not reviewed at the Stage 2B level.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

Sample A3-300BH-SON01-004.0-005.0 was submitted for MS/MSD evaluation in association with this SDG. Upon evaluation all precision and accuracy indicators were favorable.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. Upon evaluation all precision and accuracy indicators were favorable.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	x			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Data Validation Worksheet

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/23/22

Reviewer: (b) (6)

Review Date: 9/27/22

Project: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106

SDG: 580-116684-1

LAB: Eurofins Seattle

Samples Collected: 8/4/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 8/4
  Samples extracted on 8/9
  Samples analyzed on 8/11

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: SEA101

Tune: 03/24/2022 ok

ICAL: 3/24/2022 ok

ICB 580-385060/20 032522a004.D 03/25/2022 12:26

ICV 580-385060/21 032522a005.D 03/25/2022 12:50 ok

Tune: 08/11/2022 10:10 ok

CCVIS 580-400170/3 081122a003.D 08/11/2022 10:38

Sample 1

CCVC 580-400170/11 081122a011.D 08/11/2022 14:20

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-400002/2-A  and LCSD 580-400002/3-A ok
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

none

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch
- ✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

Solid

MB 580-400002/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B review

FIELD DUPLICATES

✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.

- ✓ See field duplicate worksheet

none

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, 22F
Laboratory:	Eurofins, Seattle
SDG:	580-116684-1
Data Validator:	(b) (6) [redacted]
Validation Date:	9/26/2022
Reviewer:	(b) (6) [redacted]
Review Date:	9/27/2022

Analyzed for:
- ☐ GRO
- ☑ DRO
- ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded? ☐ Yes ☑ No

NOTE: Water sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction. Soil samples extracted within 14 days and analyzed within 40 days following extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	8/4/22	
Prepped	DRO/ORO: 8/9	ok
Analyzed	DRO/ORO: 8/10	ok

Surrogate Recovery

Are surrogate recoveries summarized within the report? ☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C23/24 4-Bromofluorobenzene aqueous 85-114%, solid 79-119)
(QSM 5.4 Table C14 o-Terphenyl aqueous 56-125%, solid 45-130%).

Were outliers marked as such? ☐ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☑ Yes ☐ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water?	☐ Yes	☐ No	☑ NA
b. low soil?	☑ Yes	☐ No	☐ NA
c. medium soil?	☐ Yes	☐ No	☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range? ☑ Yes ☐ No ☐ NA

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples.

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag	
GRO					
NA					
DRO/ORO					
A3-300BH-SON01-004.0-005.0	ok	ok	ok	DRO	580-116684-1
	ok	ok	ok	ORO	

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD	Flag	Associated samples:
GRO		
NA		
DRO /ORO		
LCS 580-399999/2-A	ok	DRO
	ok	ORO
LCSD 580-399999/3-A	ok	DRO
	ok	ORO

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022 ☐ Yes ☑ No

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			
DRO/ORO			
All ND			

Trip Blanks GRO
NA

Equipment Blank:
None

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			
DRO/ORO			
ICAL on 7/27 TAC020			ok
ICV 580-398533/14 07/28/2022 01:42 1 072722B_014A.D 2			ok
CCVRT 580-400086/3 08/10/2022 19:39 1 0810A22B_003A			ok
CCV 580-400086/69 08/10/2022 22:41 1 0810A22B_012A.I			ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

☐ Yes ☐ No ☑ NA

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:
Level 2B for this SDG

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value (JH).

Table 3-2: DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m³) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6

Notes:

Automated Data Review Detail Report for 5801166841
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
A3-300BH	A3-300BH-SON01-004.0-005.0	08-04-2022	1500	MS	SO	4.00	5.00		X
A3-300BH	A3-300BH-SON01-004.0-005.0	08-04-2022	1500	N	SO	4.00	5.00	X	X
A3-300BH	A3-300BH-SON01-004.0-005.0	08-04-2022	1500	SD	SO	4.00	5.00		X
							Total	**1**	**3**

Automated Data Review Detail Report for 5801166841
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 400170

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5804001703		1/1	8/11/2022 10:38	8/11/2022 10:38	8/11/2022 10:38	400002/	CV
LABQC	SQ	LABQC	MB5804000021A		1/1	8/9/2022 15:24	8/9/2022 15:24	8/11/2022 11:46	400002/	LB
LABQC	SQ	LABQC	LCS5804000022A		1/1	8/9/2022 15:24	8/9/2022 15:24	8/11/2022 12:11	400002/	BS
LABQC	SQ	LABQC	LCSD5804000023A		1/1	8/9/2022 15:24	8/9/2022 15:24	8/11/2022 12:37	400002/	BD
A3-300BH	SO	A3-300BH-SON01-004.0-005.0	580-116684-1		1/1	8/4/2022 15:00	8/9/2022 15:24	8/11/2022 13:02	400002/	N
LABQC	SQ	LABQC	CCVC58040017011		1/1	8/11/2022 14:20	8/11/2022 14:20	8/11/2022 14:20	400002/	CV

Test Method: SW8015D Analysis Batch: 400086

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5804000863		1/1	8/10/2022 19:39	8/10/2022 19:39	8/10/2022 19:39	399999/	CV
LABQC	SQ	LABQC	MB5803999991A		1/1	8/9/2022 14:52	8/9/2022 14:52	8/10/2022 19:59	399999/	LB
A3-300BH	SO	A3-300BH-SON01-004.0-005.0	580-116684-1		1/1	8/4/2022 15:00	8/9/2022 14:52	8/10/2022 21:00	399999/	N
A3-300BH	SO	A3-300BH-SON01-004.0-005.0	580-116684-1		1/1	8/4/2022 15:00	8/9/2022 14:52	8/10/2022 21:20	399999/	MS
A3-300BH	SO	A3-300BH-SON01-004.0-005.0	580-116684-1		1/1	8/4/2022 15:00	8/9/2022 14:52	8/10/2022 21:40	399999/	SD
LABQC	SQ	LABQC	CCV58040008669		1/1	8/10/2022 22:41	8/10/2022 22:41	8/10/2022 22:41	399999/	CV

Test Method: SW8015D Analysis Batch: 400128

Automated Data Review Detail Report for 5801166841
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 400128

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5804001283		1/1	8/11/2022 00:51	8/11/2022 00:51	8/11/2022 00:51	400128/	CV
LABQC	SQ	LABQC	CCV58040012839		1/1	8/11/2022 13:00	8/11/2022 13:00	8/11/2022 13:00	400128/	CV
LABQC	SQ	LABQC	LCS5803999992A		1/1	8/9/2022 14:52	8/9/2022 14:52	8/11/2022 14:46	399999/	BS
LABQC	SQ	LABQC	LCSD5803999993A		1/1	8/9/2022 14:52	8/9/2022 14:52	8/11/2022 15:08	399999/	BD
LABQC	SQ	LABQC	CCV58040012866		1/1	8/11/2022 15:29	8/11/2022 15:29	8/11/2022 15:29	400128/	CV

Automated Data Review Detail Report for 5801166841
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

--No Records Found--

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

QC Outliers Report

--No Records Found--

Qualified Results

Automated Data Review Detail Report for 5801166841
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

--No Records Found--

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-300BH-SON01-004.0-005.0	580-116684-1	S	N	1	1-Methylnaphthalene	0.00440	1.80	1.80	mg/kg	
A3-300BH-SON01-004.0-005.0	580-116684-1	S	N	1	2-Methylnaphthalene	0.00440	2.40	2.40	mg/kg	
A3-300BH-SON01-004.0-005.0	580-116684-1	S	N	1	Naphthalene	0.00440	0.730	0.730	mg/kg	

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-300BH-SON01-004.0-005.0	580-116684-1	S	N	1	C10-C24 Petroleum Hydrocarbons	47.0	300 J1	300	mg/kg	
A3-300BH-SON01-004.0-005.0	580-116684-1	S	N	1	C24-C40 Petroleum Hydrocarbons	47.0	70.0	70.0	mg/kg	

Automated Data Review Detail Report for 5801166841
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-116756-1
Eurofins, Seattle

Prepared by

ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for

AECOM Environmental

Released: 9/27/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

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ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116756-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/05/2022
Number of Samples: 2
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-240BH-SON01-004.0-005.0	580-116756-1	solid	S2BVEM
A3-350BH-SON01-002.0-003.0	580-116756-2	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No sample was submitted for MS/MSD analyses in association with this SDG.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Compound Identification and Quantitation	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-116756-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/05/2022
Number of Samples: 2
Test Method: SW-846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

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A3-350BH-SON01-002.0-003.0	580-116756-2	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No sample was submitted for the equipment blank in association with the samples in this sample delivery group (SDG).

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were not reviewed at the Stage 2B level.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

No sample was submitted for MS/MSD evaluation in association with this SDG.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. Upon evaluation all precision and accuracy indicators were favorable.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Data Validation Worksheet

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/23/22

Reviewer: (b) (6)

Review Date: 9/27/22

Project: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106

SDG: 580-116756-1

LAB: Eurofins Seattle

Samples Collected: 8/5/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 8/5
  Samples extracted on 8/12
  Samples analyzed on 8/14

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: SEA101

Tune: 03/24/2022 ok

ICAL: 3/24/2022 ok

ICB 580-385060/20 032522a004.D 03/25/2022 12:26

ICV 580-385060/21 032522a005.D 03/25/2022 12:50 ok

Tune: 08/13/2022 23:33 ok

CCVIS 580-400498/3 081322a003.D 08/14/2022 0:00 ok

Samples 1 and 2

CCVC 580-400498/22 081322a023.D 08/14/2022 8:15 ok

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-400460/2-A  and LCSD 580-400460/20-A ok
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

none

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch
- ✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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Department of Defense
Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS
May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

Solid

MB 580-400460/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B review

FIELD DUPLICATES

✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.

- ✓ See field duplicate worksheet

none

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV2
Laboratory:	Eurofins, Seattle
SDG:	580-116756-1
Data Validator:	(b) (6) [redacted]
Validation Date:	9/26/2022
Reviewer:	(b) (6) [redacted]
Review Date:	9/27/2022

Analyzed for:
- ☐ GRO
- ☑ DRO
- ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded? ☐ Yes ☑ No

NOTE: Water sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction. Soil samples extracted within 14 days and analyzed within 40 days following extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	8/5/22	
Prepped	DRO/ORO: 8/12	ok
Analyzed	DRO/ORO: 8/15	ok

Surrogate Recovery

Are surrogate recoveries summarized within the report? ☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C23/24 4-Bromofluorobenzene aqueous 85-114%, solid 79-119)
(QSM 5.4 Table C14 o-Terphenyl aqueous 56-125%, solid 45-130%).

Were outliers marked as such? ☐ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☐ Yes ☑ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water? ☐ Yes ☐ No ☑ NA
b. low soil? ☐ Yes ☐ No ☑ NA
c. medium soil? ☐ Yes ☐ No ☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range? ☐ Yes ☐ No ☑ NA

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples.

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag
GRO				
NA				
DRO/ORO				
None				

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD	Flag	Associated samples:
GRO		
NA		
DRO /ORO		
LCS 580-400464/2-A	ok	DRO
	ok	ORO
LCSD 580-400464/3-A	ok	DRO
	ok	ORO

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022 ☐ Yes ☑ No

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			
DRO/ORO			
All ND			

Trip Blanks GRO
NA

Equipment Blank:
None

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			
DRO/ORO			
ICAL on 7/27 TAC020			ok
ICV 580-398533/14 07/28/2022 01:42 1 072722B_014A.D 2			ok
CCVRT 580-400663/3 08/15/2022 18:53 1 0815A22B_003A			ok
CCV 580-400663/9 08/15/2022 20:54 1 0815A22B_100A.D			ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

☐ Yes ☐ No ☑ NA

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:
Level 2B for this SDG

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value (JH).

Table 3-2: DOH Environmental Action Levels

Analytical Method	Analyte	Environmental Action Levels (EALs)		
		Soil (mg/kg) [a]	Groundwater (µg/L) [b]	Soil Vapor (µg/m³) [c]
SW-8260	TPH-g	100 / 450 / 700	500 / 300	4.9×10^6
	Benzene	500 / 1.2 / 0.3	170 / 5	6,300
	Toluene	500 / 820 / 0.78	40 / 1,000	1.8×10^7
	Ethylbenzene	480 / 62 / 0.9	30 / 700	2×10^5
	Xylenes	260 / 130 / 1.4	20 / 10,000	3.5×10^5
SW-8270	Naphthalene	500 / 28 / 3.1	21 / 17	1.1×10^4
	1-Methylnaphthalene	500 / 170 / 0.89	10 / 27	9.8×10^5
	2-Methylnaphthalene	500 / 39 / 1.9	10 / 24	5.6×10^4
SW-8015	TPH-d	500 / 220 / 940	500 / 400	2.2×10^6

Notes:

Automated Data Review Detail Report for 5801167561
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
A3-240BH	A3-240BH-SON01-004.0-005.0	08-05-2022	1036	N	SO	4.00	5.00	X	X
A3-350BH	A3-350BH-SON01-002.0-003.0	08-05-2022	1404	N	SO	2.00	3.00	X	X
							Total	**2**	**2**

Automated Data Review Detail Report for 5801167561
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 400498

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5804004983		1/1	8/14/2022 00:00	8/14/2022 00:00	8/14/2022 00:00	400460/	CV
LABQC	SQ	LABQC	MB5804004601A		1/1	8/12/2022 19:41	8/12/2022 19:41	8/14/2022 00:25	400460/	LB
LABQC	SQ	LABQC	LCS5804004602A		1/1	8/12/2022 19:41	8/12/2022 19:41	8/14/2022 00:50	400460/	BS
LABQC	SQ	LABQC	LCSD58040046020A		1/1	8/12/2022 19:41	8/12/2022 19:41	8/14/2022 01:15	400460/	BD
A3-350BH	SO	A3-350BH-SON01-002.0-003.0	580-116756-2		1/1	8/5/2022 14:04	8/12/2022 19:41	8/14/2022 06:12	400460/	N
A3-240BH	SO	A3-240BH-SON01-004.0-005.0	580-116756-1		1/1	8/5/2022 10:36	8/12/2022 19:41	8/14/2022 06:36	400460/	N
LABQC	SQ	LABQC	CCVC58040049822		1/1	8/14/2022 08:15	8/14/2022 08:15	8/14/2022 08:15	400460/	CV

Test Method: SW8015D Analysis Batch: 400663

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5804006633		1/1	8/15/2022 18:53	8/15/2022 18:53	8/15/2022 18:53	400464/	CV
LABQC	SQ	LABQC	MB5804004641A		1/1	8/12/2022 20:07	8/12/2022 20:07	8/15/2022 19:13	400464/	LB
LABQC	SQ	LABQC	LCS5804004642A		1/1	8/12/2022 20:07	8/12/2022 20:07	8/15/2022 19:33	400464/	BS
LABQC	SQ	LABQC	LCSD5804004643A		1/1	8/12/2022 20:07	8/12/2022 20:07	8/15/2022 19:53	400464/	BD
A3-240BH	SO	A3-240BH-SON01-004.0-005.0	580-116756-1		1/1	8/5/2022 10:36	8/12/2022 20:07	8/15/2022 20:14	400464/	N
A3-350BH	SO	A3-350BH-SON01-002.0-003.0	580-116756-2		1/1	8/5/2022 14:04	8/12/2022 20:07	8/15/2022 20:34	400464/	N

Automated Data Review Detail Report for 5801167561
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 400663

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCV5804006639		1/1	8/15/2022 20:54	8/15/2022 20:54	8/15/2022 20:54	400464/	CV

Automated Data Review Detail Report for 5801167561
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

--No Records Found--

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

QC Outliers Report

--No Records Found--

Automated Data Review Detail Report for 5801167561
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Qualified Results

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3-240BH-SON01-004.0-005.0	580-116756-1	S	N	C24-C40 Petroleum Hydrocarbons	53.0	22.0 J	22.0 J		mg/kg	TR
A3-350BH-SON01-002.0-003.0	580-116756-2	S	N	C24-C40 Petroleum Hydrocarbons	59.0	34.0 J	34.0 J		mg/kg	TR

Qualified analytes in samples are reported as estimated, not detected (UJ) at the Limit of Detection (LOD).

Automated Data Review Detail Report for 5801167561
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-240BH-SON01-004.0-005.0	580-116756-1	S	N	1	1-Methylnaphthalene	0.00570	1.20	1.20	mg/kg	
A3-240BH-SON01-004.0-005.0	580-116756-1	S	N	1	2-Methylnaphthalene	0.00570	1.60	1.60	mg/kg	
A3-240BH-SON01-004.0-005.0	580-116756-1	S	N	1	Naphthalene	0.00570	0.440	0.440	mg/kg	
A3-350BH-SON01-002.0-003.0	580-116756-2	S	N	1	1-Methylnaphthalene	0.00530	0.610	0.610	mg/kg	
A3-350BH-SON01-002.0-003.0	580-116756-2	S	N	1	2-Methylnaphthalene	0.00530	0.740	0.740	mg/kg	
A3-350BH-SON01-002.0-003.0	580-116756-2	S	N	1	Naphthalene	0.00530	0.0310 M	0.0310	mg/kg	

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-240BH-SON01-004.0-005.0	580-116756-1	S	N	1	C10-C24 Petroleum Hydrocarbons	53.0	230	230	mg/kg	
A3-240BH-SON01-004.0-005.0	580-116756-1	S	N	1	C24-C40 Petroleum Hydrocarbons	53.0	22.0 J	22.0 J	mg/kg	TR
A3-350BH-SON01-002.0-003.0	580-116756-2	S	N	1	C10-C24 Petroleum Hydrocarbons	59.0	180	180	mg/kg	
A3-350BH-SON01-002.0-003.0	580-116756-2	S	N	1	C24-C40 Petroleum Hydrocarbons	59.0	34.0 J	34.0 J	mg/kg	TR

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-117282-1
Eurofins, Seattle

Prepared by
ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for
AECOM Environmental

Released: 9/27/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

5 Brilliant Avenue, Pittsburgh, PA 15215
412.408.3288 I www.eds-pa.com

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-117282-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/23/2022
Number of Samples: 2
Test Method: SW-846 8260/CALUFT; SW-846 8015D
Analysis: Petroleum Hydrocarbons C6-C10 (GRO), C10-C24 Diesel Range Organics (DRO), and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-010SVMP-WGN01B-2208WK4	580-117282-1	water	S2BVEM
A3SVMP-WQTB01-2208WK4[1]	580-117282-2	trip blank	S2BVEM

[1]GRO analysis only

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

C) Trip Blank

Sample A3SVMP-WQTB01-2208WK4 was submitted as a trip blank for GRO analysis in association with this SDG. No problems were found for this criterion.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion with the following exception.

The o-terphenyl surrogate recovery observed during the DRO/ORO analysis of sample A3-010SVMP-WGN01B-2208WK4 was less than the lower acceptance limit. Potential low bias is indicated. DRO/ORO results reported for the impacted sample have been qualified estimated low "J-" on this basis.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

No problems were found for this criterion.

Note: Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were not reviewed at the Stage 2B level.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

No sample was submitted for MS/MSD evaluation in association with this SDG.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. No problems were found for this criterion.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory with the following exception. Sample A3-010SVMP-WGN01B-2208WK4 was re-analyzed for GRO upon client request. The result form the initial analysis was used as the reportable result.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
GRO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	x			
Surrogates	x			
Internal Standards	x			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			
	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates			x	2
Internal Standards	NA			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-117282-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/23/2022
Number of Samples: 1
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-010SVMP-WGN01B-2208WK4	580-117282-1	water	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

All surrogate recoveries observed during the analysis of sample A3-010SVMP-WGN01B-2208WK4 were less than the lower acceptance limit. Potential low bias is indicated. All results reported for the impacted samples have been qualified estimated "UJ" on this basis.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No sample was submitted for MS/MSD analyses in association with this SDG.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates			x	3
Matrix Spike/Matrix Spike Duplicate	NA			
Compound Identification and Quantitation	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-117282-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/23/2022
Number of Samples: 2
Test Method: SW 846 8260D
Analysis: Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3-010SVMP-WGN01B-2208WK4	580-117282-1	water	S2BVEM
A3SVMP-WQTB01-2208WK4	580-117282-2	trip blank	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than two times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organics is bromofluorobenzene. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

No problems were found for this criterion.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks (TB) measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Field/Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

C) Trip blank contamination:

Sample A3SVMP-WQTB01-2208WK4 was submitted as a trip blank in association with this SDG. No problems were found for this criterion.

D) Storage Blank associated with volatile samples only:

No storage blank was submitted in association with this SDG.

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No samples were submitted for MS/MSD evaluation in association with this SDG.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified and positive results are flagged as estimated with potential negative bias, "J-". If the area count is less than 50%, positive results are flagged as estimated with potential positive bias, "J+", and non-detected results are flagged "UJ". If the area count is less than 20%, positive results and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

The LCS evaluations were performed at the appropriate frequency. No problems were found for this criterion.

13. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

14. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Volatiles		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Difference	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	x			
Storage Blank	NA			
Surrogates	x			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification Dilutions	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F
Laboratory:	Eurofins, Seattle
SDG:	580-117282-1
Data Validator:	(b) (6)
Validation Date:	9/26/2022
Reviewer:	(b) (6)
Review Date:	9/27/2022

Analyzed for: ☐ GRO ☑ DRO ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:
sample 1 was reanalyzed at client result; RA was not used as reportable result

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded? ☐ Yes ☑ No

NOTE: Water and Soil sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	8/23/22	
Prepped	DRO/ORO: 8/30	ok
	GRO: 8/31	
Analyzed	DRO/ORO: 9 8/31	ok
	GRO: 8/31	

Surrogate Recovery

Are surrogate recoveries summarized within the report? ☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C24 4-Bromofluorobenzene method 8260 aqueous 85-114%) solid 79-119%
(QSM 5.4 Table C14 o-Terphenyl method 8015 aqueous 56-125%). solid 45-130%

Were outliers marked as such? ☑ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☑ Yes ☐ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),
GRO			
all ok			
DRO			
sample 1	↓	J-	

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☑ Yes ☐ No

from VII for sample 2 incomplete; areas within range; used raw data to eval
Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☑ Yes ☐ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water? ☐ Yes ☐ No ☑ NA
b. low soil? ☑ Yes ☐ No ☐ NA
c. medium soil? ☐ Yes ☐ No ☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range?
ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples. ☐ Yes ☑ No ☐ NA

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag
GRO				
none				
DRO/ORO				
none				

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD		Flag	Associated samples:
GRO			
LCS 580-402429/8	ok		
LCSD 580-402429/9	ok		
LCS 580-402520/7	ok		
LCSD 580-402520/8	ok		
LCS 580-403931/5	ok		
LCSD 580-403931/6	ok		
DRO /ORO			
LCS 580-402293/2-A	ok		
LCSD 580-402293/3-A	ok		

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? ☐ Yes ☑ No

use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
MB 580-402429/5	ND		sample 2
MB 580-402520/4	ND		sample 1
MB 580-403931/4	ND		sample 1RA
DRO/ORO			
MB 580-402293/1-A	ND		

Trip Blanks GRO

A3SVMP-WQTB01-2208WK4	ND

Equipment Blank:
none

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20 will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected. Associated detected sample data will be qualified as estimated and associated non-detected sample data will be qualified as estimated if low bias is determined to be present. Check calibration factors and % RSD values back to raw data for 10% of data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK	
GRO(C6-C10)				
ICAL on 8/26 SEA102			ok	
ICV 580-402714/23	8/26/2022		ok	
CCVIS 580-402429/4 sample 2	8/30/2022	21:53	ok	
CCV 580-402429/15	8/31/2022	2:22	ok	
ICAL on 8/10 TAC036			ok	
ICV 580-400034/13			ok	
CCVIS 580-402520/3 sample 2	8/31/2022	10:01	ok	
CCV 580-402520/12	8/31/2022	13:43	ok	
CCVIS 580-403931/3	9/15/2022	0:56	ok	
CCV 580-403931/25 sample 1RA	9/15/2022	5:27	ok	
CCV 580-403931/25	9/15/2022	9:57	ok	RA not used as reportable result
DRO/ORO				
ICAL on 7/27 TAC020			ok	

ICV 580-398533/14		ok
CCVRT 580-402451/3	8/30/2022 20:47	ok
CCV 580-402451/81	8/31/2022 5:18	ok
sample 2 and 3	9/9/2022	ok
CCV 580-402451/92	8/31/2022 7:19	surr out; no action on surr; ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

☐ Yes ☐ No ☑ NA

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

Notes and validation action:
Level 2B package

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☐ Yes ☑ No

List samples reviewed and bold samples used for calculations:

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value
(JH).

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/26/22

Reviewer: (b) (6)

Review Date: 9/27/22

Project: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106

SDG: 580-117282-1

LAB: Eurofins Seattle

Samples Collected: 8/23/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 8/23
  Samples extracted on 8/30
  Samples analyzed on 8/31

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: SEA101

Tune: 03/24/2022 ok

ICAL: 3/24/2022 ok

ICB 580-385060/20 032522a004.D 03/25/2022 12:26

ICV 580-385060/21 032522a005.D 03/25/2022 12:50 ok

Tune: 08/30/2022 21:55 ok

CCVIS 580-402455/3 083022b003.D 08/30/2022 22:22 ok

Sample 1

CCVC 580-402455/29 083022b029.D 08/31/2022 9:16 ok

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C

- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All surr low but >10% for sample 1; UJ all results

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
water
LCS 580-402294/2-A  and LCSD 580-402294/3-A ok
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

none

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch
- ✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

Module 1 - Page 18 of 52

Department of Defense
Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS
May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

water

MB 580-402294/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

case narrative noted IS areas were high for MB and it was not reanalyzed; however, it appears to have been re-analyzed and reported with all passing; no action taken on this basis

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B review

FIELD DUPLICATES

- ✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.
- ✓ See field duplicate worksheet

none

EDS internal checklist for:

Standard Operating Procedure Number: 11-B
Revised March 2015

Revision 1: April 2021

CLIENT: AECOM

PROJECT: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106

SDG: J117282-1

Validated by: (b) (6) 9/27/2022

Reviewed by: (b) (6) **9/27/22**

LAB: Eurofins

Sample Receipt / Hold times (COC, receipt logs, case narrative)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

Department of Defense Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC March 2021
Evaluation of Holding Time
*If the holding time is exceeded, qualify all associated detects as estimated **J-** and all associated non-detects as estimated **UJ** and document that holding times were exceeded.*
*If holding times are grossly exceeded (defined as > 14 days to extraction for aqueous samples and > 28 days for solid samples), detects should be qualified as estimated **J-** and non-detects as **X**, exclusion of data recommended.*

Collected: 8/23/22
Analyzed: 8/31/22

Instrument Performance Check, Calibration and Verification (Form V, run log)

- ✓ BFB before calibrations and verifications and every 12 hours
- ✓ all ion abundance criteria within range

Ok – see below

Calibration and Verification (run log, Form VI, Form VII)

VOC

- ✓ minimum RF ≥0.05 unless listed below in Table VI or 0.01 for analytes in Table VIII in Module 1
- ✓ if RF out then qualify J / X
- ✓ ICAL: all %RSDs ≤15% except the CCC listed in Table VII below - %RSD ≤30% or r2≥0.99

  Per SAP ICV/CCV 20%D, closing CCV 50%

- ✓ if %RSD out then qualify J / UJ (>30% J / X)

TAC036

BFB 8/10/22	ok
ICAL: 8/10/22 3:06 to 6:47	ok
ICV: 580-400031/13 8/10/22 7:11	ok
BFB 8/24/22	
CCVIS: 580-402517/2 8/31/22 9:36	ok
CCVC 580-502517/11 8/31/22 13:18	ok

Table VI: SPCCs average RFs should meet the following criteria (Method 8260B):

Analyte	Minimum Average RF (method uses the term "mean")
Chloromethane	0.1
1,1-Dichloroethane	0.1
Bromoform	0.1
Chlorobenzene	0.3
1,1,2,2-Tetrachloroethane	0.3

Table VII: CCCs (Method 8260B)

Analyte	
1,1-Dichloroethene	Toluene
Chloroform	Ethylbenzene
1,2-Dichloropropane	Vinyl Chloride

Table VIII: VOC Poor Performers (Method 8260B):

Analyte	
Acetone	1,2-Dibromo-3-chloropropane
2-Butanone	Isopropylbenzene
Carbon disulfide	Methyl acetate
Chloroethane	Methylene chloride
Cyclohexane	Methylcyclohexane
1,2-Dibromoethane	Methyl-tert-butyl ether
Dichlorodifluoromethane	trans-1,2-Dichloroethene
1,2-Dichloropropane	4-Methyl-2-pentanone
cis-1,2-Dichloroethene	2-Hexanone
1,4-Dioxane	Trichlorofluoroethane
1,2-Dibromo-3-chloropropane	1,1,2-Trichloro-1,2,2-triflouroethane

Evaluation of VOC RFs and %RSD

Blanks (Form IV, Form 1)

- ✓ evaluate storage, method, field and trip blanks
- ✓ method blank were prepared and analyzed in association with all samples in SDG
- ✓ method blank – analyzed one per prep batch

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

10x for common lab contaminates: methylene chloride, acetone, 2-butanone, cyclohexane

Method Blank
MB5804025174 all ND

Trip Blanks
A3SVMP-WQTB01-2208WK4 all ND

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Surrogates (Form II)

- ✓ Use laboratory or method specific criteria to evaluate
- ✓ do not evaluate if surrogates are diluted out
- ✓ if surrogate %R is outside limits qualify as noted below

ACTION: if any surrogate is below the lower acceptance limit but has a recovery greater than 10%, qualify positive results as estimated "J" and non-detects as estimated "UJ". If any surrogate is above the upper acceptance limit, qualify detects in the sample as estimated "J". Compounds with non-detects should not be qualified. If any surrogate in a fraction shows less than 10% recovery, flag detects for that fraction as estimated "J", and non-detects for the fraction as unusable "R".

All ok

LCS (Form III, batch worksheet)

- ✓ use lab limits to evaluate accuracy (%R)

  ACTION: -If the LCS results are below the control limits, but above 10%, but the MS/MSD results are within control limits, sample data associated with the out-of-control point shall be discussed in the data validation report. No qualification of the data is necessary.

  -If the LCS results are below the control limits, but above 10% and if the MS/MSD results are below the control limits but above 10%, spiked analytes that showed low recovery in all associated samples shall be flagged as estimated "J" or "UJ".

  -If the LCS results are below 10% and if the MS/MSD results are below 10%, only the spiked analytes that showed low recovery in all associated samples shall be flagged as "R" for non-detects and "J" for detects.

  -If the associated blank spike and the MS/MSD recoveries are above the control limits, all positive results for only the spiked analyte that showed high recovery shall be estimated "J" in the associated samples.

  -If the blank spike/LCS results are outside the control limits and no MS/MSD results are available, only the spiked analytes in all associated samples shall be qualified as listed:

    a) If blank spike/LCS results are below the control limits (above 10%), spiked analytes that showed low recovery in all associated samples shall be flagged as estimated "UJ" or "J".

    b) If blank spike/LCS results are below 10%, only the spiked analytes that showed low recovery in all associated samples shall be flagged as "R" for non-detects and "J" for detects.

    c) If blank spike/LCS results are above the control limits, detects for only the spiked analytes that showed high recovery in all associated samples shall be flagged as "J".

- ✓ if qualification is required, qualified all samples prepped with the LCS

LCS 580-402517/5 all ok
LCSD 580-402517/6 all ok

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only)
- ✓ qualify parent sample only

List samples, results affected and qualifications below.

MS MSD RPD Parent Flag

None

Internal Standards (Form VIII)

areas within -50% to +100% of ICAL midpoint standard

- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

List samples, results affected and qualifications below.

All ok

Target Compound Identification (Form1, raw data)

- ✓ RRTs for all positive results withing ±0.06 of standard
- ✓ primary and secondary ion intensities within 20% of that in the standard

Level 2B

TICs (Form 1)

- ✓ all TICs should be qualified as tentatively identified - NJ
- ✓ any semi-volatile reported as a TIC should be qualified as rejected, "R"

None

Compound Quantitation (Form 1, run log, prep log, EDD)

✓ evaluate dilutions, re-extractions and re-analyses to confirm best results is reported and all other results are not reportable in EDD Ok

Field Duplicates

- ✓ Evaluate and qualify per QAPP if available for project
- ✓ see field duplicate worksheet

see field duplicate table

None

Automated Data Review Detail Report for 5801172821
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D	SW8260	SW8260D
A3-010SVMP	A3-010SVMP-WGN01B-2208WK4	08-23-2022	1030	N	WG	0.00	0.00	X	X	X	X
FIELDQC	A3SVMP-WQTB01-2208WK4	08-23-2022	0001	TB	WQ	0.00	0.00			X	X
							Total	**1**	**1**	**2**	**2**

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RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 402455

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVIS5804024553		1/1	8/30/2022 22:22	8/30/2022 22:22	8/30/2022 22:22	402294/	CV
LABQC	WQ	LABQC	LCS5804022942A		1/1	8/30/2022 09:17	8/30/2022 09:17	8/31/2022 00:29	402294/	BS
LABQC	WQ	LABQC	LCSD5804022943A		1/1	8/30/2022 09:17	8/30/2022 09:17	8/31/2022 00:55	402294/	BD
A3-010SVMP	WG	A3-010SVMP-WGN01B-2208WK4	580-117282-1		1/1	8/23/2022 10:30	8/30/2022 09:17	8/31/2022 08:01	402294/	N
LABQC	WQ	LABQC	CCVC58040245529		1/1	8/31/2022 09:16	8/31/2022 09:16	8/31/2022 09:16	402294/	CV

Test Method: BNASIM Analysis Batch: 402509

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	MB5804022941A		1/1	8/30/2022 09:17	8/30/2022 09:17	8/31/2022 11:25	402294/	LB

Test Method: SW8015D Analysis Batch: 402451

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVRT5804024513		1/1	8/30/2022 20:47	8/30/2022 20:47	8/30/2022 20:47	402293/	CV
LABQC	WQ	LABQC	CCV58040245112		1/1	8/30/2022 23:54	8/30/2022 23:54	8/30/2022 23:54	402293/	CV
LABQC	WQ	LABQC	LCS5804022932A		1/1	8/30/2022 09:11	8/30/2022 09:11	8/31/2022 00:35	402293/	BS
LABQC	WQ	LABQC	LCSD5804022933A		1/1	8/30/2022 09:11	8/30/2022 09:11	8/31/2022 00:55	402293/	BD
LABQC	WQ	LABQC	CCV58040245181		1/1	8/31/2022 03:37	8/31/2022 03:37	8/31/2022 03:37	402293/	CV

Automated Data Review Detail Report for 5801172821
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 402451

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
A3-010SVMP	WG	A3-010SVMP-WGN01B-2208WK4	580-117282-1		1/1	8/23/2022 10:30	8/30/2022 09:11	8/31/2022 05:18	402293/	N
LABQC	WQ	LABQC	CCV58040245192		1/1	8/31/2022 07:19	8/31/2022 07:19	8/31/2022 07:19	402293/	CV
LABQC	WQ	LABQC	CCV58040245199		1/1	8/31/2022 09:40	8/31/2022 09:40	8/31/2022 09:40	402293/	CV
LABQC	WQ	LABQC	CCV580402451108		1/1	8/31/2022 12:41	8/31/2022 12:41	8/31/2022 12:41	402293/	CV
LABQC	WQ	LABQC	MB5804022931A		1/1	8/30/2022 09:11	8/30/2022 09:11	8/31/2022 14:07	402293/	LB
LABQC	WQ	LABQC	CCV580402451114		1/1	8/31/2022 14:29	8/31/2022 14:29	8/31/2022 14:29	402293/	CV

Test Method: SW8260 Analysis Batch: 402429

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVIS5804024294		1/1	8/30/2022 21:53	8/30/2022 21:53	8/30/2022 21:53	402429/	CV
LABQC	WQ	LABQC	MB5804024295		1/1	8/30/2022 22:17	8/30/2022 22:17	8/30/2022 22:17	402429/	LB
LABQC	WQ	LABQC	LCS5804024298		1/1	8/30/2022 23:30	8/30/2022 23:30	8/30/2022 23:30	402429/	BS
LABQC	WQ	LABQC	LCSD5804024299		1/1	8/30/2022 23:55	8/30/2022 23:55	8/30/2022 23:55	402429/	BD
FIELDQC	WQ	A3SVMP-WQTB01-2208WK4	580-117282-2		1/1	8/23/2022 00:01	8/31/2022 00:43	8/31/2022 00:43	402429/	TB
LABQC	WQ	LABQC	CCV58040242915		1/1	8/31/2022 02:22	8/31/2022 02:22	8/31/2022 02:22	402429/	CV

Automated Data Review Detail Report for 5801172821
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: SW8260 Analysis Batch: 402520

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVIS5804025203		1/1	8/31/2022 10:01	8/31/2022 10:01	8/31/2022 10:01	402520/	CV
LABQC	WQ	LABQC	MB5804025204		1/1	8/31/2022 10:25	8/31/2022 10:25	8/31/2022 10:25	402520/	LB
LABQC	WQ	LABQC	LCS5804025207		1/1	8/31/2022 11:39	8/31/2022 11:39	8/31/2022 11:39	402520/	BS
LABQC	WQ	LABQC	LCSD5804025208		1/1	8/31/2022 12:04	8/31/2022 12:04	8/31/2022 12:04	402520/	BD
A3-010SVMP	WG	A3-010SVMP-WGN01B-2208WK4	580-117282-1		1/1	8/23/2022 10:30	8/31/2022 12:53	8/31/2022 12:53	402520/	N
LABQC	WQ	LABQC	CCV58040252012		1/1	8/31/2022 13:43	8/31/2022 13:43	8/31/2022 13:43	402520/	CV

Test Method: SW8260D Analysis Batch: 402517

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVIS5804025172		1/1	8/31/2022 09:36	8/31/2022 09:36	8/31/2022 09:36	402517/	CV
LABQC	WQ	LABQC	MB5804025174		1/1	8/31/2022 10:25	8/31/2022 10:25	8/31/2022 10:25	402517/	LB
LABQC	WQ	LABQC	LCS5804025175		1/1	8/31/2022 10:50	8/31/2022 10:50	8/31/2022 10:50	402517/	BS
LABQC	WQ	LABQC	LCSD5804025176		1/1	8/31/2022 11:14	8/31/2022 11:14	8/31/2022 11:14	402517/	BD
FIELDQC	WQ	A3SVMP-WQTB01-2208WK4	580-117282-2		1/1	8/23/2022 00:01	8/31/2022 12:29	8/31/2022 12:29	402517/	TB
A3-010SVMP	WG	A3-010SVMP-WGN01B-2208WK4	580-117282-1		1/1	8/23/2022 10:30	8/31/2022 12:53	8/31/2022 12:53	402517/	N

Automated Data Review Detail Report for 5801172821
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Test Method: SW8260D Analysis Batch: 402517

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVC58040251711		1/1	8/31/2022 13:18	8/31/2022 13:18	8/31/2022 13:18	402517/	CV

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RHBFS Site Characterization
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Field Batch Report

Test Method: SW8260 Extraction Method: SW5030 Leach Method: NONE

EBLOT	TBLOT	ABLOT	LOCID	Matrix	FLDSAMPID	LABSAMPID	LOGDATE	SACODE
	23082201		FIELDQC	WQ	A3SVMP-WQTB01-2208WK4	580-117282-2	8/23/2022 00:01	TB

Test Method: SW8260D Extraction Method: SW5030 Leach Method: NONE

EBLOT	TBLOT	ABLOT	LOCID	Matrix	FLDSAMPID	LABSAMPID	LOGDATE	SACODE
	23082201		FIELDQC	WQ	A3SVMP-WQTB01-2208WK4	580-117282-2	8/23/2022 00:01	TB

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

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QC Outlier Report

Test Method: BNASIM Extraction Method: SW3510 Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
Surrogate	A3-010SVMP-WGN01B-2208WK4 (N) / 580-117282-1	1 / 1.00	2-Methylnaphthalene-d10	15.00 (percent)	J/UJ	40 - 140	10 - 140	I			
Surrogate	A3-010SVMP-WGN01B-2208WK4 (N) / 580-117282-1	1 / 1.00	Fluoranthene-d10	30.00 (percent)	J/UJ	40 - 140	10 - 140	I			
Surrogate	A3-010SVMP-WGN01B-2208WK4 (N) / 580-117282-1	1 / 1.00	Terphenyl-d14	37.00 (percent)	J/UJ	58 - 132	10 - 132	I			

Test Method: SW8015D Extraction Method: SW3510 Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
Surrogate	A3-010SVMP-WGN01B-2208WK4 (N) / 580-117282-1	1 / 1.00	o-Terphenyl	12.00 (percent)	J/UJ	56 - 125	10 - 125	I			

Rule is the multiplier used when blank contamination occurs to determine action level.

Automated Data Review Detail Report for 5801172821
RHBFS Site Characterization
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Qualified Results

Test Method: BNASIM Extraction Method: SW3510 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3-010SVMP-WGN01B-2208WK4	580-117282-1	W	N	1-Methylnaphthalene	0.100	0.0840 U Q	0.0840 UJ		ug/l	I
A3-010SVMP-WGN01B-2208WK4	580-117282-1	W	N	2-Methylnaphthalene	0.210	0.0840 U Q	0.0840 UJ		ug/l	I
A3-010SVMP-WGN01B-2208WK4	580-117282-1	W	N	Naphthalene	0.520	0.420 U Q	0.420 UJ		ug/l	I

Test Method: SW8015D Extraction Method: SW3510 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3-010SVMP-WGN01B-2208WK4	580-117282-1	W	N	C10-C24 Petroleum Hydrocarbons	110	1500	1500 J	-	ug/l	I
A3-010SVMP-WGN01B-2208WK4	580-117282-1	W	N	C24-C40 Petroleum Hydrocarbons	360	500	500 J	-	ug/l	I

Test Method: SW8260 Extraction Method: SW5030 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3-010SVMP-WGN01B-2208WK4	580-117282-1	W	N	C6-C10 Gasoline Range Organics	100	92.0 J	92.0 J		ug/l	TR

Qualified analytes in samples are reported as estimated, not detected (UJ) at the Limit of Detection (LOD).

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Detected Results

Test Method: SW8015D Extraction Method: SW3510 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-010SVMP-WGN01B-2208WK4	580-117282-1	W	N	1	C10-C24 Petroleum Hydrocarbons	110	1500	1500 J	ug/l	I
A3-010SVMP-WGN01B-2208WK4	580-117282-1	W	N	1	C24-C40 Petroleum Hydrocarbons	360	500	500 J	ug/l	I

Test Method: SW8260 Extraction Method: SW5030 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-010SVMP-WGN01B-2208WK4	580-117282-1	W	N	1	C6-C10 Gasoline Range Organics	100	92.0 J	92.0 J	ug/l	TR

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG 580-117418-1
Eurofins, Seattle

Prepared by
ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for
AECOM Environmental

Released: 9/27/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

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ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-117418-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/26/2022 and 08/29/2022
Number of Samples: 3
Test Method: SW846 8015D
Analysis: C10-C24 Diesel Range Organics (DRO) and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3375BH-SON01-000.0-001.0	580-117418-1	solid	S2BVEM
A3-110BH-SON01-004.0-005.0	580-117418-2	solid	S2BVEM
A3-090BH-SON01-003.0-004.0	580-117418-3	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

C) Trip Blank

No sample was submitted as a trip blank in association with this SDG.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were not reviewed at the Stage 2B level.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

Sample A3375BH-SON01-000.0-001.0 was submitted for MS/MSD evaluation in association with this SDG. Upon evaluation, all precision and accuracy indicators were acceptable.

Sample A3-110BH-SON01-004.0-005.0 was submitted for MS/MSD evaluation in association with this SDG. Upon evaluation, all precision and accuracy indicators were acceptable or did not result in a need to qualify sample results.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. No problems requiring result qualification were found for this criterion.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	NA			
Matrix Spike/Matrix Spike Duplicate	x			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-117418-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 08/26/2022 and 08/29/2022
Number of Samples: 3
Test Method: SW-846 8270E Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3375BH-SON01-000.0-001.0	580-117418-1	solid	S2BVEM
A3-110BH-SON01-004.0-005.0	580-117418-2	solid	S2BVEM
A3-090BH-SON01-003.0-004.0	580-117418-3	solid	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No sample was submitted for MS/MSD analyses in association with this SDG.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were not reviewed at the Stage 2B level.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were not reviewed at the Stage 2B level.

Manual integrations were not reviewed for samples at the Stage 2B level.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Compound Identification and Quantitation	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F
Laboratory:	Eurofins, Seattle
SDG:	580-117418-1
Data Validator:	(b) (6) [redacted]
Validation Date:	9/26/2022
Reviewer:	(b) (6) [redacted]
Review Date:	9/27/2022

Analyzed for: ☐ GRO ☑ DRO ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded?

☐ Yes ☑ No

NOTE: Water and Soil sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	8/26 and 8/29		Per QAPP: for unconsolidated (Solid) Samples extracted within 14 days and analyzed within 40 days following extraction.
Prepped	DRO/ORO: 9/7 and 9/8	ok	
Analyzed	DRO/ORO: 9/9	ok	

Surrogate Recovery

Are surrogate recoveries summarized within the report?

☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C24 4-Bromofluorobenzene method 8260 aqueous 85-114%) solid 79-119%
(QSM 5.4 Table C14 o-Terphenyl method 8015 aqueous 56-125%). solid 45-130%

Were outliers marked as such? ☐ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☐ Yes ☑ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),

All ok

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☐ Yes ☐ No

Notes: IS for GRO via 8260, no IS for DRO/ORO

No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☑ Yes ☐ No

Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water? ☐ Yes ☐ No ☑ NA

b. low soil? ☑ Yes ☐ No ☐ NA

c. medium soil? ☐ Yes ☐ No ☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range?

ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples. ☐ Yes ☑ No ☐ NA

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag
GRO				
NA				
DRO/ORO				
A3375BH-SON01-000.0-001.0	ok	ok	ok	
580-117418-1				
A3-110BH-SON01-004.0-005.0	C10-C24 ↑	C10-C24 ↑	ok	ok; 4Xrule
580-117418-2	C24-C40 ok	C24-C40 ↑	out	parent ND; n no action

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☐ Yes ☑ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD		Flag	Associated samples:	
GRO				
NA				
DRO /ORO				
LCS 580-403103/2-A	C24-C40	↑	sample 1	sample ND; no flag
LCSD 580-403103/3-A	C24-C40	↑	sample 1	
LCS 580-403152/2-A	all ok		samples 2 and 3	
LCSD 580-403152/3-A	all ok		samples 2 and 3	

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? ☐ Yes ☑ No

use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
NA			
DRO/ORO			
MB 580-403103/1-A	ND		sample 1
MB 580-403152/1-A	ND		samples 2 and 3
Trip Blanks GRO			
NA			

Equipment Blank:
none

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20
will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected.
Associated detected sample
data will be qualified as estimated and associated non-detected sample
data will be qualified as estimated if low bias is determined to be present.
Check calibration factors and % RSD values back to raw data for 10% of
data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time	%D and RT OK
GRO(C6-C10)			
NA			
DRO/ORO			
ICAL on 9/1 TAC020			ok
ICV 580-402639/14			ok
CCVRT 580-403368/3	9/8/2022	23:08	ok
sample 1			ok
CCV 580-403368/11	9/9/2022	1:49	ok
CCVRT 580-403440/3	9/9/2022	13:49	ok
sample 2 and 3	9/9/2022		ok
CCV 580-403440/14	9/9/2022	17:31	surr out; no action on surr; ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

☐ Yes ☐ No ☑ NA

Notes and validation action:
Level 2B package

Field Duplicates

Were field duplicates submitted for TEPH analysis?

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☐ Yes ☑ No

List samples reviewed and bold samples used for calculations:

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value
(JH).

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 9/26/22

Reviewer: (b) (6)

Review Date: 9/27/2022

Project: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106

SDG: 580-117418-1

LAB: Eurofins Seattle

Samples Collected: 8/26/2022 and 8/29/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 8/26 and 8/29
  Samples extracted on 8/31
  Samples analyzed on 9/6

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IV in method

1-methylnaphthalene not listed in method; lab used 0.4

2-methylnaphthalene 0.4

Naphthalene 0.7

- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: SEA101

Tune: 03/24/2022 ok

ICAL: 3/24/2022 ok

ICB 580-385060/20 032522a004.D 03/25/2022 12:26

ICV 580-385060/21 032522a005.D 03/25/2022 12:50 ok

Tune: 09/06/2022 21:55 ok

CCVIS 580-402980/3 090622a004.D 09/06/2022 10:38

All samples

CCVC 580-402980/18 090622a021.D 09/06/2022 21:32

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

No surrogate limits for SIM analyses is QSM; used lab limits

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

lab limits match QSM

```
solid
LCS 580-402547/2-A  ok
```

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits

Table C method 8270 SIM	solids	aqueous
1-methylnaphthalene	43-111%	41-115%
2-methylnaphthalene	39-114%	39-114%
Naphthalene	38-111%%	43-114%

- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

none

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch
- ✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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Department of Defense
Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS
May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

solid

MB 580-402547/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

case narrative noted IS areas were high for MB and it was not reanalyzed; however, it appears to have been re-analyzed and reported with all passing; no action taken on this basis

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B review

FIELD DUPLICATES

- ✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.
- ✓ See field duplicate worksheet

none

Automated Data Review Detail Report for 5801174181
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D
A3375BH	A3375BH-SON01-000.0-001.0	08-26-2022	1020	MS	SO	0.00	1.00		X
A3375BH	A3375BH-SON01-000.0-001.0	08-26-2022	1020	N	SO	0.00	1.00	X	X
A3375BH	A3375BH-SON01-000.0-001.0	08-26-2022	1020	SD	SO	0.00	1.00		X
A3-110BH	A3-110BH-SON01-004.0-005.0	08-29-2022	0958	MS	SO	4.00	5.00		X
A3-110BH	A3-110BH-SON01-004.0-005.0	08-29-2022	0958	N	SO	4.00	5.00	X	X
A3-110BH	A3-110BH-SON01-004.0-005.0	08-29-2022	0958	SD	SO	4.00	5.00		X
A3-090BH	A3-090BH-SON01-003.0-004.0	08-29-2022	1141	N	SO	3.00	4.00	X	X
							Total	**3**	**7**

Automated Data Review Detail Report for 5801174181
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 402980

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVIS5804029803		1/1	9/6/2022 10:38	9/6/2022 10:38	9/6/2022 10:38	402547/	CV
LABQC	SQ	LABQC	MB5804025471A		1/1	8/31/2022 13:16	8/31/2022 13:16	9/6/2022 14:54	402547/	LB
LABQC	SQ	LABQC	LCS5804025472A		1/1	8/31/2022 13:16	8/31/2022 13:16	9/6/2022 15:19	402547/	BS
A3375BH	SO	A3375BH-SON01-000.0-001.0	580-117418-1		1/1	8/26/2022 10:20	8/31/2022 13:16	9/6/2022 16:58	402547/	N
A3-110BH	SO	A3-110BH-SON01-004.0-005.0	580-117418-2		1/1	8/29/2022 09:58	8/31/2022 13:16	9/6/2022 17:23	402547/	N
A3-090BH	SO	A3-090BH-SON01-003.0-004.0	580-117418-3		1/1	8/29/2022 11:41	8/31/2022 13:16	9/6/2022 17:48	402547/	N
LABQC	SQ	LABQC	CCVC58040298018		1/1	9/6/2022 21:32	9/6/2022 21:32	9/6/2022 21:32	402547/	CV

Test Method: SW8015D Analysis Batch: 403368

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5804033683		1/1	9/8/2022 23:08	9/8/2022 23:08	9/8/2022 23:08	403103/	CV
LABQC	SQ	LABQC	MB5804031031A		1/1	9/7/2022 08:33	9/7/2022 08:33	9/8/2022 23:48	403103/	LB
LABQC	SQ	LABQC	LCS5804031032A		1/1	9/7/2022 08:33	9/7/2022 08:33	9/9/2022 00:09	403103/	BS
LABQC	SQ	LABQC	LCSD5804031033A		1/1	9/7/2022 08:33	9/7/2022 08:33	9/9/2022 00:29	403103/	BD
A3375BH	SO	A3375BH-SON01-000.0-001.0	580-117418-1		1/1	8/26/2022 10:20	9/7/2022 08:33	9/9/2022 00:49	403103/	N
A3375BH	SO	A3375BH-SON01-000.0-001.0	580-117418-1		1/1	8/26/2022 10:20	9/7/2022 08:33	9/9/2022 01:09	403103/	MS
A3375BH	SO	A3375BH-SON01-000.0-001.0	580-117418-1		1/1	8/26/2022 10:20	9/8/2022 14:10	9/9/2022 01:29	403103/	SD
LABQC	SQ	LABQC	CCV58040336811		1/1	9/9/2022 01:49	9/9/2022 01:49	9/9/2022 01:49	403103/	CV

Automated Data Review Detail Report for 5801174181
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 403440

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	CCVRT5804034403		1/1	9/9/2022 13:49	9/9/2022 13:49	9/9/2022 13:49	403152/	CV
LABQC	SQ	LABQC	MB5804031521A		1/1	9/7/2022 12:38	9/7/2022 12:38	9/9/2022 15:10	403152/	LB
LABQC	SQ	LABQC	LCS5804031522A		1/1	9/7/2022 12:38	9/7/2022 12:38	9/9/2022 15:30	403152/	BS
LABQC	SQ	LABQC	LCSD5804031523A		1/1	9/7/2022 12:38	9/7/2022 12:38	9/9/2022 15:50	403152/	BD
A3-110BH	SO	A3-110BH-SON01-004.0-005.0	580-117418-2		1/1	8/29/2022 09:58	9/7/2022 12:38	9/9/2022 16:10	403152/	N
A3-110BH	SO	A3-110BH-SON01-004.0-005.0	580-117418-2		1/1	8/29/2022 09:58	9/7/2022 12:38	9/9/2022 16:30	403152/	MS
A3-110BH	SO	A3-110BH-SON01-004.0-005.0	580-117418-2		1/1	8/29/2022 09:58	9/7/2022 12:38	9/9/2022 16:50	403152/	SD
A3-090BH	SO	A3-090BH-SON01-003.0-004.0	580-117418-3		1/1	8/29/2022 11:41	9/7/2022 12:38	9/9/2022 17:10	403152/	N
LABQC	SQ	LABQC	CCV58040344014		1/1	9/9/2022 17:31	9/9/2022 17:31	9/9/2022 17:31	403152/	CV

Automated Data Review Detail Report for 5801174181
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

--No Records Found--

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

Automated Data Review Detail Report for 5801174181
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

QC Outlier Report

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
LCS Recovery	LCS5804031032A (BS) / LCS5804031032A	1 / 1.00	C24-C40 Petroleum Hydrocarbons	111.0 (percent)	J/None	39 - 106	39 - 106	C			
LCS Recovery	LCSD5804031033A (BD) / LCSD5804031033A	1 / 1.00	C24-C40 Petroleum Hydrocarbons	109.0 (percent)	J/None	39 - 106	39 - 106	C			
MS Recovery	A3-110BH-SON01-004.0-005.0 (SD) / 580-117418-2	1 / 1.00	C10-C24 Petroleum Hydrocarbons	149.0 (percent)	J/None	38 - 132	20 - 132	M			
MS Recovery	A3-110BH-SON01-004.0-005.0 (MS) / 580-117418-2	1 / 1.00	C10-C24 Petroleum Hydrocarbons	153.0 (percent)	J/None	38 - 132	20 - 132	M			
MS Recovery	A3-110BH-SON01-004.0-005.0 (SD) / 580-117418-2	1 / 1.00	C24-C40 Petroleum Hydrocarbons	135.0 (percent)	J/None	39 - 106	20 - 106	M			

Rule is the multiplier used when blank contamination occurs to determine action level.

Automated Data Review Detail Report for 5801174181
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Qualified Results

--No Records Found--

Detected Results

Test Method: BNASIM Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-090BH-SON01-003.0-004.0	580-117418-3	S	N	1	1-Methylnaphthalene	0.00690	3.20	3.20	mg/kg	
A3-090BH-SON01-003.0-004.0	580-117418-3	S	N	1	2-Methylnaphthalene	0.00690	4.50	4.50	mg/kg	
A3-090BH-SON01-003.0-004.0	580-117418-3	S	N	1	Naphthalene	0.00690	1.50	1.50	mg/kg	
A3-110BH-SON01-004.0-005.0	580-117418-2	S	N	1	1-Methylnaphthalene	0.00740	6.50	6.50	mg/kg	
A3-110BH-SON01-004.0-005.0	580-117418-2	S	N	1	2-Methylnaphthalene	0.00740	8.90	8.90	mg/kg	
A3-110BH-SON01-004.0-005.0	580-117418-2	S	N	1	Naphthalene	0.00740	3.30	3.30	mg/kg	

Test Method: SW8015D Extraction Method: SW3546 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3-090BH-SON01-003.0-004.0	580-117418-3	S	N	1	C10-C24 Petroleum Hydrocarbons	70.0	1900	1900	mg/kg	
A3-110BH-SON01-004.0-005.0	580-117418-2	S	N	1	C10-C24 Petroleum Hydrocarbons	75.0	3100 J1	3100	mg/kg	

Automated Data Review Detail Report for 5801174181
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions

DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CTO CV22F0106

SDG: 580-117885-1
Eurofins, Seattle

Prepared by
ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for
AECOM Environmental

Released: 10/5/22

Data Validators and Peer Reviewers:

(b) (6)

[redacted]

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ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-117885-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 09/12/2022
Number of Samples: 5
Test Method: SW-846 8260/CALUFT; SW-846 8015D
Analysis: Petroleum Hydrocarbons C6-C10 (GRO), C10-C24 Diesel Range Organics (DRO), and C24-C40 Total Petroleum Hydrocarbons Oil Range Organics (ORO)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 4: Data Validation Procedure for Organic Analysis by GC, March 2021; Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3375TW-WGN01LF-2209WK3	580-117885-1	water	S4VEM
A3325TW-WGN01LF-2209WK3	580-117885-2	water	S4VEM
A3210TW-WGN01LF-2209WK3	580-117885-3	water	S4VEM
A3050TW-WGN01LF-2209WK3	580-117885-4	water	S4VEM
Trip Blank-WQTBLF-2209WK3[1]	580-117885-5	trip blank	S4VEM

[1]GRO analysis only

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

All sample analyses reported were within the validation guidance.

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Initial Calibration

Percent Relative Standard Deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent RSD must be less than the maximum %RSD of 20% or, in cases where linear and non-linear regressions are used, linear correlation coefficients must be greater than or equal to 0.995. If the %RSD or correlation coefficient do not meet quality control criteria, detects may be qualified as "J" and professional judgement is used to qualify non-detects. Qualifications were applied to the samples and analytes as shown below.

All associated initial calibrations met validation criteria.

B) Continuing Calibration

Percent difference (%D) compares the response factor of the continuing calibration check to mean response factor (RF) from the initial calibration. For the opening continuing calibration verification (CCV) the %D must be <20% for all target compounds. For the closing CCV the %D must be less than limits outlined in validation guidance. A value outside of these limits indicates potential detection and quantitation errors. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

All associated continuing calibrations met validation criteria.

5. BLANKS:

Quality assurance (QA) blanks (i.e. method, trip, field, or rinse blanks) are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below.

A) Method Blank

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Equipment Blank

No samples were submitted as equipment / field blanks in association with the samples in this sample delivery group (SDG).

C) Trip Blank

Sample Trip Blank-WQTBLF-2209WK3 was submitted as a trip blank for GRO analysis in association with this SDG. No problems were found for this criterion.

6. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion with the following exception.

The observed surrogate recoveries were less than the lower acceptance limit for all samples in this SDG. Potential low bias is indicated. All GRO results reported for the impacted samples were all non-detected, therefore, the results have been qualified estimated "UJ" on this basis.

7. INTERNAL STANDARDS PERFORMANCE:

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard.

No problems were found for this criterion.

Note: Internal standards were not used for DRO / ORO analyses via method 8015D.

8. COMPOUND IDENTIFICATION:

Compound Identification

The compounds are identified on the GC-FID by using the analytes relative retention time (RRT) on the chromatogram. For the results to be a positive hit, the sample peak must be within the anticipated RRT range for VPH, GRO, DRO, and RRO compounds.

Target compound identifications were reviewed at the Stage 4 level. No anomalies were identified.

Compound Quantification

Target compound results quantitation were reviewed at the Stage 4 level. No anomalies were identified.

Manual integrations were reviewed for samples at the Stage 4 level. No anomalies were identified.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

No sample was submitted for MS/MSD evaluation in association with this SDG.

10. LABORATORY CONTROL SAMPLE:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

LCS/LCS duplicate (LCSD) evaluations were performed at the appropriate frequency. No problems were found for this criterion.

11. FIELD DUPLICATE:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 30% for the Relative Percent Difference (RPD) for water samples and ≤ 50% RPD for solid samples, shall be used. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

13. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
GRO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	x			
Surrogates			x	5
Internal Standards	x			
Compound Identification	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			
	Were acceptance criteria met?			
	Yes	No		
DRO / ORO		Major	Minor	Number of Results Qualified
Sample Delivery Condition	x			
Holding Time	x			
Percent Relative Standard Deviation and Percent Difference	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	NA			
Surrogates	x			
Internal Standards	NA			
Compound Identification	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-117885-1
Laboratory: Eurofins, Seattle
Site: Red Hill Bulk Storage Facility, CTO CV22F0106 - P-Wells
Sampling dates: 09/12/2022
Number of Samples: 4
Test Method: 8270D Selective Ion Monitoring (SIM)
Analysis: Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
A3375TW-WGN01LF-2209WK3	580-117885-1	water	S4VEM
A3325TW-WGN01LF-2209WK3	580-117885-2	water	S4VEM
A3210TW-WGN01LF-2209WK3	580-117885-3	water	S4VEM
A3050TW-WGN01LF-2209WK3	580-117885-4	water	S4VEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented. No qualification was required.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than three times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for semi-volatile organics is decafluorotriphenylphosphine. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field and rinse blanks measure cross-contamination of samples during field operations. Qualifications were applied to the samples and analytes as shown below. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

No problems were found for this criterion.

B) Field /Equipment blank contamination:

No samples were submitted as field/equipment blanks in association with the samples in this sample delivery group (SDG).

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No samples were submitted for MS/MSD analyses in association with this SDG.

9. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were reviewed at the Stage 4 level. No anomalies were identified.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were reviewed at the Stage 4 level, and no anomalies were identified in sample quantitation.

Manual integrations were reviewed for samples at the Stage 4 level. No problems were found for this criterion.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±30 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified, and positive results are flagged as estimated "J". If the area count is less than 50%, positive results are flagged as estimated "J" and non-detected results are flagged "UJ". If the area count is less than 25%, positive results are flagged as estimated "J" and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 30% for the Relative Percent Difference (RPD) for water samples and ≤ 50% RPD for solid samples, shall be used. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

13. OTHER PROBLEMS:

None

14. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Semi-volatiles SIM		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Calibration	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Deviation	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Surrogates	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Compound Identification and Quantitation	x			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Group: 580-117885-1
Laboratory: Eurofins, Seattle
Site: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106
Sampling dates: 09/12/2022
Number of Samples: 5
Test Method: SW 846 8260D
Analysis: Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX)

Quality Assurance Project Plan: NAVFAC Preliminary Site Characterization Plan, November 2021 Release, U.S. Navy Well 2254-01, JBPHH, O'ahu, Hawai'i (January 2022); NAFAC Site Characterization Plan, Adit 3 LNAPL Step-Out Addendum, November 2021 Release, U.S. Navy Well 2254-01, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (July 2022).

Validation Guidelines: Department of Defense Module 1: Data Validation Procedure for Organic Analysis by GC/MS, May 2020; and United States Department of Defense (DOD) Environmental Data Quality Workgroup (EDQW), November 2019, General Data Validation Guidelines, and Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories Version 5.4 (DoD and DOE 2021). United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
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A3325TW-WGN01LF-2209WK3	580-117885-2	water	S4VEM
A3210TW-WGN01LF-2209WK3	580-117885-3	water	S4VEM
A3050TW-WGN01LF-2209WK3	580-117885-4	water	S4VEM
Trip Blank-WQTBLF-2209WK3	580-117885-5	trip blank	S4VEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW:

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION:

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than two times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organics is bromofluorobenzene. If the mass calibration is in error, all associated data will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

5. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

No problems were found for this criterion.

A) Response Factor:

The response factor measures the instrument's response to specific chemical compounds. All analytes for initial and continuing calibration should meet the minimum relative response factor (RRF) criteria. If the RRF is less than minimum RRF specified, professional judgment is used, and all detects in the sample will be qualified as "J". All non-detects for that compound will be rejected "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

B) Percent Relative Standard Deviation and Percent Difference:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean RRF from the initial calibration.

Percent RSD must be less than maximum %RSD listed in the Department of Defense Quality Systems Manual or, in cases where linear and non-linear regressions are used, correlation coefficients must be greater than those listed in the Department of Defense Quality Systems Manual. For the opening or closing continuing calibration verification (CCV) the %D must be within the inclusive opening or closing maximum %D limits as listed in the Department of Defense Quality Systems Manual for all target compounds. A value outside of these limits indicates potential detection and quantitation errors. If the %RSD exceeds quality control criteria, detects may be qualified as "J" and professional judgment is used to qualify non-detects. If the %D exceeds quality control criteria, the positive results are flagged as estimated, "J" and non-detects are flagged "UJ". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

6. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks (TB) measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. When an equipment blank, trip blank, or lab blank has an analyte detection greater than ½ the analyte Limit of Quantitation (LOQ), then all associated field samples are flagged per validation guidance.

A) Method blank contamination:

Method blanks were analyzed with appropriate frequency. No problems were found for this criterion.

B) Field/Equipment blank contamination:

No sample was submitted as a field/equipment blank in association with the samples in this sample delivery group (SDG).

C) Trip blank contamination:

Sample Trip Blank-WQTBLF-2209WK3 was submitted as a trip blank in association with this SDG. No problems were found for this criterion.

D) Storage Blank associated with volatile samples only:

No storage blank was submitted in association with this SDG.

7. SURROGATES:

All samples are spiked with system monitoring compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate recovery limits were outside quality control limits established in the Department of Defense Quality Systems Manual, qualifications were applied to all the samples and analytes as shown below.

No problems were found for this criterion.

8. COMPOUND IDENTIFICATION AND QUANTIFICATION:

Compound Identification

The compounds are identified on the GC/MS by using the analytes relative retention time (RRT) and ion spectra. For the results to be a positive hit the sample peak must be within ±0.06 RRT units of the standard compound and have an ion spectrum which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Target compound identifications were reviewed at the Stage 4 level. No anomalies were identified.

Tentatively Identified Compounds (TICs) were not reported.

Compound Quantification

Target compound results quantitation were reviewed at the Stage 4 level, and no anomalies were identified in sample quantitation.

Manual integrations were reviewed for samples at the Stage 4 level. No problems were found for this criterion.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY:

Matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data. All MS/MSD percent recoveries must fall within the Department of Defense Quality Systems Manual limits. In addition, relative percent differences observed between results reported for the pair must be ≤ 20%.

No samples were submitted for MS/MSD evaluation in association with this SDG.

10. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph/mass spectrometer (GC/MS) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified and positive results are flagged as estimated with potential negative bias, "J-". If the area count is less than 50%, positive results are flagged as estimated with potential positive bias, "J+", and non-detected results are flagged "UJ". If the area count is less than 20%, positive results and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. FIELD DUPLICATES:

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of ≤ 50% for the Relative Percent Difference (RPD) for water samples and ≤ 100% RPD for solid samples, shall be used for original and duplicate sample values greater than or equal to the sample specific LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples were submitted as a field duplicate pair in association with this SDG.

12. LABORATORY CONTROL SAMPLES:

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the Department of Defense Quality Systems Manual limits. Qualifications were applied to the samples and analytes as shown below.

The LCS evaluations were performed at the appropriate frequency. No problems were found for this criterion.

13. DILUTIONS, RE-EXTRACTIONS & REANALYSIS:

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were reported by the laboratory.

14. OTHER PROBLEMS:

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?			
	Yes	No		
Volatiles		Major	Minor	Number of Results Qualified
Holding Time	x			
Mass Spectrometer Tuning	x			
Response Factor	x			
Percent Relative Standard Deviation and Percent Difference	x			
Internal Standards	x			
Method Blank	x			
Equipment Blank	NA			
Trip Blank	x			
Storage Blank	NA			
Surrogates	x			
Compound Identification	x			
Matrix Spike/Matrix Spike Duplicate	NA			
Field Duplicate	NA			
Laboratory Control Samples	x			
Other Quality Control Data out of Specification Dilutions	x			
Required Reporting Limits	x			

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Calculation Documentation

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: DRO
Instrument: TAC020
Curve Date: 9/1/2022
Compound: C10-C24
Internal Standard: none

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
1682458	1	5	1	1682458	5	25	336491.600
3182141	1	10	1	3182141	10	100	318214.100
5808503	1	20	1	5808503	20	400	290425.150
13142214	1	50	1	13142214	50	2500	262844.280
25760083	1	100	1	25760083	100	10000	257600.830
52250592	1	200	1	52250592	200	40000	261252.960
129702926	1	500	1	129702926	500	250000	259405.852
252196055	1	1000	1	252196055	1000	1000000	252196.055
524972283	1	2000	1	524972283	2000	4000000	262486.142
1259585747	1	5000	1	1259585747	5000	25000000	251917.149
2438394064	1	10000	1	2438394064	10000	100000000	243839.406
SUM OF EACH COLUMN :				**4706677066.0000**	**18885**	**130303025**	**2996673.5243**

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

Average RF	272424.866	**AVERAGE(RF)**
RSD	10.9%	**STDEV(RF)/(AveRF)**

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	reported
Slope (m)	245013.98124	248839.66220	256376.56275	**SLOPE(RatioY,RatioX)**	256376.563
Intercept (b)	7235275.48286	667276.85214	454041.497105	**INTERCEPT(RatioY,RatioX)**	454041.497
CC (R)	0.99982	0.99968	0.99928	**CORREL(RatioY,RatioX)**	
COD (R^2)	0.99964	0.99936	0.99855	**POWER(R,2)**	0.999

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-1.75402	-1.75141	1.18400	**LINEST(RatioY,RatioX:RatioX^2,1,1)**
x Coefficient (b)	261328.76803	261304.51206	96080.00000	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)**
Intercept (c)	3375.19531	14127.20662	8195000.00000	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)**
COD (R^2)	0.99997			**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)**

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					**Ax*Cis/Ais/RF**	**((Ax/Ais-b)/m)*Cis**			**(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis**			**Reported**
ICV	0831ICAL22B_015AA.D	133243263	1	1	489.101	514.289	532.777	517.946	511.612	511.616	1281.271	517.9
CCV	0919b22_012.D	131986607	1	1	484.488	509.160	527.727	513.044	506.770	506.774	1268.590	513
LCS	0919b22_014.D	117785007	1	1	432.358	451.198	470.655	457.651	452.075	452.073	1125.015	457.7
LCSD	0919b22_015.D	113208477	1	1	415.559	432.519	452.264	439.800	434.457	434.455	1078.642	439.8
MB	0919b22_013.D	1587066	1	1	5.826	-23.053	3.696	4.419	6.060	6.020	-68.834	4.42
580-117885-1	0919b22_020.D	2697145	1	1	9.901	-18.522	8.157	8.749	10.309	10.268	-57.262	8.75

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: DRO
Instrument: TAC020
Curve Date: 9/1/2022
Compound: o-Terphenyl
Internal Standard: none

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
78129	1	0.201	1	78129	0.201	0.040401	388701.493
146263	1	0.402	1	146263	0.402	0.161604	363838.308
354265	1	1.01	1	354265	1.01	1.0201	350757.426
713661	1	2.01	1	713661	2.01	4.0401	355055.224
1394683	1	4.02	1	1394683	4.02	16.1604	346936.070
3560875	1	10.1	1	3560875	10.1	102.01	352561.881
6498309	1	20.1	1	6498309	20.1	404.01	323298.955
14277170	1	40.2	1	14277170	40.2	1616.04	355153.483
32106702	1	101	1	32106702	101	10201	317888.139
SUM OF EACH COLUMN :				**59130057.0000**	**179.043**	**12344.48261**	**3154190.9779**

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

Average RF	350465.664	**AVERAGE(RF)**
RSD	6.0%	**STDEV(RF)/(AveRF)**

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	reported
Slope (m)	320456.38378	329232.36155	340076.44707	**SLOPE(RatioY,RatioX)**	341016.382
Intercept (b)	194953.85321	20367.47672	9965.578203	**INTERCEPT(RatioY,RatioX)**	9811.84923
CC (R)	0.99901	0.99874	0.99913	**CORREL(RatioY,RatioX)**	
COD (R^2)	0.99801	0.99748	0.99825	**POWER(R,2)**	0.998

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-463.27170	-332.53627	-1108.50048	**LINEST(RatioY,RatioX:RatioX^2,1,1)**
x Coefficient (b)	365762.75493	352977.28211	408414.85816	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)**
Intercept (c)	-70928.27640	4103.74789	-34433.28827	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)**
COD (R^2)	0.99942			**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)**

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					**Ax*Cis/Ais/RF**	**((Ax/Ais-b)/m)*Cis**			**(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis**			**Reported**
ICV	0831ICAL22B_015AA.D	3352738	1	1	9.567	9.854	10.122	9.829	9.474	9.573	8.489	9.8
CCV	0919b22_012.D	3856544	1	1	11.004	11.426	11.652	11.311	10.888	11.029	9.787	11.3
LCS	0919b22_014.D	3609244	1	1	10.298	10.654	10.901	10.584	10.193	10.314	9.149	10.6
LCSD	0919b22_015.D	3250966	1	1	9.276	9.536	9.813	9.530	9.189	9.280	8.228	9.5
MB	0919b22_013.D	2436315	1	1	6.952	6.994	7.338	7.135	6.915	6.936	6.152	7.12
580-117885-1	0919b22_020.D	2689874	1	1	7.675	7.786	8.108	7.880	7.622	7.664	6.796	7.86

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: GRO
Instrument: TAC036
Curve Date: 8/30/2022
Compound: GRO
Internal Standard: Fluorobenzene

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
1836880	171761	50	10	10.69439512	5	25	2.139
2771909	174406	100	10	15.89342683	10	100	1.589
5102059	176423	250	10	28.91946628	25	625	1.157
9103829	156901	500	10	58.02275957	50	2500	1.160
17725532	172095	1000	10	102.9985299	100	10000	1.030
79762295	160544	5000	10	496.8251383	500	250000	0.994
162909224	164843	10000	10	988.2689832	1000	1000000	0.988
238325951	158810	15000	10	1500.69864	1500	2250000	1.000
413552924	139169	26000	10	2971.587954	2600	6760000	1.143
SUM OF EACH COLUMN :				**6173.9093**	**5790**	**10273250**	**11.2007**

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

Average RF	1.245	**AVERAGE(RF)**
RSD	30.8%	**STDEV(RF)/(AveRF)**

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	Reported
Slope (m)	1.10808	1.05938	1.01142	**SLOPE(RatioY,RatioX)**	1.059
Intercept (b)	-26.87657	4.45478	5.608803	**INTERCEPT(RatioY,RatioX)**	44.55
CC (R)	0.99718	0.99740	0.99784	**CORREL(RatioY,RatioX)**	
COD (R^2)	0.99437	0.99481	0.99569	**POWER(R,2)**	0.995

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	0.00011	0.00007	1.18400	**LINEST(RatioY,RatioX:RatioX^2,1,1)**
x Coefficient (b)	0.84856	0.93858	96080.00000	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)**
Intercept (c)	14.67149	0.25978	8195000.00000	**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)**
COD (R^2)	0.99968			**INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)**

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
		Equations:			**Ax*Cis/Ais/RF**	**((Ax/Ais-b)/m)*Cis**			**(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis**			**Reported**
ICV	083022132.D	18883640	188762	10	803.835	1145.366	902.269	933.646	993.260	1054.589	-853.823	902.3
CCV	0922202205.D	19679076	214055	10	738.712	1072.224	825.764	853.513	900.034	969.554	-853.824	825.8
LCS	0922202209.D	23089701	232487	10	798.023	1138.838	895.441	926.494	984.949	1047.004	-853.823	895.4
LCSD	0922202210.D	23609400	249466	10	760.447	1096.636	851.299	880.258	931.174	997.948	-853.824	851.3
MB	0922202206.D	23609400	249466	10	760.447	1096.636	851.299	880.258	931.174	997.948	-853.824	851.3
580-117885-1	0922202212.D	1330912	235092	10	45.489	293.641	11.388	0.518	-106.329	57.524	-853.833	11.4

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: GRO
Instrument: TAC036
Curve Date: 8/30/2022
Compound: 4-Bromofluorobenzene
Internal Standard: Chlorobenzene-d5

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
67839	122365	10	10	0.554398725	1	1	0.554
71533	127263	10	10	0.56208796	1	1	0.562
74720	140353	10	10	0.532371948	1	1	0.532
66087	128373	10	10	0.514804515	1	1	0.515
64381	136645	10	10	0.471155183	1	1	0.471
56541	121466	10	10	0.465488285	1	1	0.465
63228	135059	10	10	0.468150956	1	1	0.468
63410	135247	10	10	0.468845889	1	1	0.469
61442	133293	10	10	0.460954439	1	1	0.461
SUM OF EACH COLUMN :				4.4983	9	9	4.4983

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

			Reported
Average RF	0.500	AVERAGE(RF)	0.4998
RSD	8.3%	STDEV(RF)/(AveRF)	8.3

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
Slope (m)	#DIV/0!	#DIV/0!	#DIV/0!	SLOPE(RatioY,RatioX)
Intercept (b)	#DIV/0!	#DIV/0!	#DIV/0!	INTERCEPT(RatioY,RatioX)
CC (R)	#DIV/0!	#DIV/0!	#DIV/0!	CORREL(RatioY,RatioX)
COD (R^2)	#DIV/0!	#DIV/0!	#DIV/0!	POWER(R,2)

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	0.00000	#DIV/0!	1.18400	LINEST(RatioY,RatioX:RatioX^2,1,1)
x Coefficient (b)	0.00000	#DIV/0!	96080.00000	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)
Intercept (c)	0.49981	#DIV/0!	8195000.00000	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)
COD (R^2)	0.20003			INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	Reported
Equations:					Ax*Cis/Ais/RF	((Ax/Ais-b)/m)*Cis			(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis			
ICV	083022132.D	65490	142633	10	9.187	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-853.833	9.19
CCV	0922202205.D	60616	145710	10	8.323	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-853.833	8.33
LCS	0922202209.D	66548	158290	10	8.412	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-853.833	8.42
LCSD	0922202210.D	61965	160406	10	7.729	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-853.833	7.73
MB	0922202206.D	65302	155942	10	8.378	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-853.833	8.38
580-117885-1	0922202212.D	58202	149583	10	7.785	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-853.833	7.79

Internal Standard Initial Calibration and Calculation Worksheet

Lab:	Eurofins Seattle
Method:	8270 SIM
Instrument:	TAC050
Curve Date:	6/30/2022
Compound:	Napthalene
Internal Standard:	Naphthalene-d8

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
263	19448	1	100	0.013523241	0.01	0.0001	1.3523241
469	19492	2	100	0.024061153	0.02	0.0004	1.2030577
1115	19837	5	100	0.056208096	0.05	0.0025	1.1241619
2202	20450	10	100	0.107677262	0.1	0.01	1.0767726
4322	21064	20	100	0.205184201	0.2	0.04	1.0259210
10807	23448	50	100	0.460892187	0.5	0.25	0.9217844
22658	20359	100	100	1.112923032	1	1	1.1129230
46219	20932	200	100	2.208054653	2	4	1.1040273
120481	24377	500	100	4.942404726	5	25	0.9884809
229653	24905	1000	100	9.22116041	10	100	0.9221160
423620	20190	2000	100	20.9816741	20	400	1.0490837
1060980	19870	5000	100	53.39607448	50	2500	1.0679215
1986946	18827	10000	100	105.5370479	100	10000	1.0553705
SUM OF EACH COLUMN :				198.2669	188.88	13030.303	14.0039

CALIBRATION MODELS:

Average Response Factor:

Cx = Ax*Cis/Ais/RF

			Reported
Average RF	1.0772	AVERAGE(RF)	1.0772000
RSD	10.5774%	STDEV(RF)/(AveRF)	10.6

Linear Regression:

y = mx + b

Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	
Slope (m)	1.05825	1.04957	1.02894	SLOPE(RatioY,RatioX)	slope (m1)
Intercept (b)	-0.12431	0.00190	0.003323	INTERCEPT(RatioY,RatioX)	y-intercept
CC (R)	0.99991	0.99947	0.99806	CORREL(RatioY,RatioX)	reported CC
COD (R^2)	0.99981	0.99894	0.99613	POWER(R,2)	reported COD

Quadratic Regression:

$y = ax^2 + bx + c$

Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-0.00004	0.00056	-0.00303	LINEST(RatioY,RatioX:RatioX^2,1,1)
x Coefficient (b)	1.06206	1.00663	1.25906	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)
Intercept (c)	-0.13806	0.06244	-0.00949	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)
COD (R^2)	0.99982			INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)

Sample Concentration Calculations

Sample ID	File ID	Compound Response Ax	ISTD Response Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					Ax*Cis/Ais/RF	((Ax/Ais-b)/m)*Cis			(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis			reported on column
ICV 580-395503/18	SIM063022a018.D	217169	22248	100	906.149	934.142	929.848	948.347	932.431	958.373	791.074	906.1
CCVIS 580-404363/3	SIM092022a003.D	119110	25669	100	430.757	450.226	441.928	450.647	449.988	453.617	372.637	430.8
MB 580-404068/1-A	SIM092022a004.D	ND	21854	100	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	ND
LCS 580-404068/2-A	SIM092022a005.D	169229	23180	100	677.726	701.623	695.405	709.205	700.598	716.193	588.937	677.7
580-117885-1	SIM092022a021.D	417	22804	100	1.698	13.474	1.561	1.454	14.721	-4.386	2.206	1.7
				100	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Internal Standard Initial Calibration and Calculation Worksheet

Lab:	Eurofins Seattle
Method:	8270 SIM
Instrument:	TAC050
Curve Date:	6/30/2022
Compound:	2-methylnaphthalene-d10
Internal Standard:	Naphthalene-d8

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
122	19448	1	100	0.006273139	0.01	0.0001	0.6273139
228	19492	2	100	0.011697107	0.02	0.0004	0.5848553
633	19837	5	100	0.031910067	0.05	0.0025	0.6382013
1178	20450	10	100	0.057603912	0.1	0.01	0.5760391
2287	21064	20	100	0.10857387	0.2	0.04	0.5428694
5578	23448	50	100	0.237888093	0.5	0.25	0.4757762
11592	20359	100	100	0.569379636	1	1	0.5693796
23706	20932	200	100	1.132524365	2	4	0.5662622
62286	24377	500	100	2.555113427	5	25	0.5110227
119434	24905	1000	100	4.795583216	10	100	0.4795583
224096	20190	2000	100	11.09935612	20	400	0.5549678
562607	19870	5000	100	28.31439356	50	2500	0.5662879
1061896	18827	10000	100	56.40282573	100	10000	0.5640283
	1000			105.3231	188.88	13030.303	7.2566

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

			Reported
Average RF	0.5582	AVERAGE(RF)	0.5882000
RSD	8.6451%	STDEV(RF)/(AveRF)	8.6

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	
Slope (m)	0.56498	0.55762	0.54438	SLOPE(RatioY,RatioX)	slope (m1)
Intercept (b)	-0.10701	0.00004	0.000951	INTERCEPT(RatioY,RatioX)	y-intercept
CC (R)	0.99989	0.99928	0.99695	CORREL(RatioY,RatioX)	reported CC
COD (R^2)	0.99978	0.99857	0.99391	POWER(R,2)	reported COD

Quadratic Regression:

v = ax^2 + bx + c
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	0.00007	0.00039	-0.00076	LINEST(RatioY,RatioX:RatioX^2,1,1)
x Coefficient (b)	0.55899	0.52887	0.61022	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)
Intercept (c)	-0.08532	0.02361	-0.00282	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)
COD (R^2)	0.99979			INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)

Sample Concentration Calculations

Sample ID	File ID	Compound Response Ax	ISTD Response Ais	ISTD Conc Cis	Ave RF On-column Conc Equal Weighting	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					Ax*Cis/Ais/RF	((Ax/Ais-b)/m)*Cis			(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis			reported on column
ICV 580-395503/18	SIM063022a018.D	112121	22248	100	902.835	910.929	903.768	925.570	915.840	941.837	835.008	902.8
CCVIS 580-404363/3	SIM092022a003.D	71300	25669	100	497.614	510.576	498.125	510.067	511.867	518.742	458.268	497.6
MB 580-404068/1-A	SIM092022a004.D	162924	21854	100	1335.570	1338.465	1336.953	1369.286	1346.822	1390.782	1241.354	1335.6
LCS 580-404068/2-A	SIM092022a005.D	194659	23180	100	1504.435	1505.302	1505.994	1542.436	1514.887	1565.179	1401.077	1504.4
580-117885-1	SIM092022a021.D	144306	22804	100	1133.668	1138.989	1134.841	1162.260	1145.792	1181.683	1051.239	1133.7
				100	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: 8260B
Instrument: TAC036
Curve Date: 8/10/2022
Compound: Benzene
Internal Standard: Fluorobenzene

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
16529	286554	0.5	10	0.057681973	0.05	0.0025	1.1536
31658	274414	1	10	0.115365834	0.1	0.01	1.1537
61951	272111	2	10	0.227668121	0.2	0.04	1.1383
154570	271475	5	10	0.569371029	0.5	0.25	1.1387
333835	285705	10	10	1.168460475	1	1	1.1685
608010	264090	20	10	2.302283313	2	4	1.1511
1500115	257008	50	10	5.836841655	5	25	1.1674
2240976	253490	75	10	8.840490749	7.5	56.25	1.1787
3406485	286760	100	10	11.87921956	10	100	1.1879
4849251	271228	150	10	17.87887313	15	225	1.1919
SUM OF EACH COLUMN :				48.8763	41.35	411.5525	11.6299

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

Average RF	1.1630	AVERAGE(RF)		Reported
RSD	1.638%	STDEV(RF)/(AveRF)		

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation	
Slope (m)	1.18897	1.18327	1.16758	SLOPE(RatioY,RatioX)	
Intercept (b)	-0.01798	-0.00520	-0.001177	INTERCEPT(RatioY,RatioX)	
CC (R)	0.99998	0.99995	0.99986	CORREL(RatioY,RatioX)	
COD (R^2)	0.99995	0.99990	0.99972	POWER(R,2)	1

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	0.00179	0.00223	0.00314	LINEST(RatioY,RatioX:RatioX^2,1,1)
x Coefficient (b)	1.16682	1.16090	1.15086	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)
Intercept (c)	-0.01077	-0.00278	-0.00013	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)
COD (R^2)	0.99999			INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	reported on column
Equations:					Ax*Cis/Ais/RF	((Ax/Ais-b)/m)*Cis			(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis			
ICV		632645	273722	10	19.8735	19.590	19.577	19.805	19.840	19.857	19.975	19.8
CCV		509300	228582	10	19.158	18.891	18.874	19.093	19.132	19.146	19.260	19.1
LCS		251410	224754	10	9.618	9.559	9.497	9.591	9.665	9.642	9.695	9.59
MB		ND	225106	10	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	NA
117885-1		ND	235092	10	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	NA

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins
Method: 8260B
Instrument: TAC036
Curve Date: 8/10/2022
Compound: 1,2-Dichloroethane-d4
Internal Standard: Fluorobenzene

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
79733	286554	10	10	0.27824773	1	1	0.2782
75891	274414	10	10	0.27655659	1	1	0.2766
74756	272111	10	10	0.274726123	1	1	0.2747
73855	271475	10	10	0.272050833	1	1	0.2721
78549	285705	10	10	0.274930435	1	1	0.2749
72193	264090	10	10	0.273365141	1	1	0.2734
69625	257008	10	10	0.270905964	1	1	0.2709
66976	253490	10	10	0.264215551	1	1	0.2642
78011	286760	10	10	0.272042823	1	1	0.2720
73247	271228	10	10	0.270056926	1	1	0.2701
SUM OF EACH COLUMN :				2.7271	10	10	2.7271

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

			Reported
Average RF	0.2727	AVERAGE(RF)	0.2727
RSD	1.437%	STDEV(RF)/(AveRF)	1.400

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
Slope (m)	0.27271	#DIV/0!	#DIV/0!	SLOPE(RatioY,RatioX)
Intercept (b)	0.00000	#DIV/0!	#DIV/0!	INTERCEPT(RatioY,RatioX)
CC (R)	0.99981	#DIV/0!	#DIV/0!	CORREL(RatioY,RatioX)
COD (R^2)	0.99963	#DIV/0!	#DIV/0!	POWER(R,2)

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	0.00000	#DIV/0!	#DIV/0!	LINEST(RatioY,RatioX:RatioX^2,1,1)
x Coefficient (b)	0.00000	#DIV/0!	#DIV/0!	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)
Intercept (c)	0.27271	#DIV/0!	#DIV/0!	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)
COD (R^2)	0.04921			INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)

Sample Concentration Calculations

Sample ID	File ID	Compound Area Ax	ISTD Area Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	reported on column
Equations:					Ax*Cis/Ais/RF	((Ax/Ais-b)/m)*Cis			(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis			
ICV		72924	273722	10	9.769	9.769	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	9.77
CCV		52607	228582	10	8.439	8.439	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	8.44
LCS		51512	224754	10	8.404	8.404	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	8.4000
MB		52073	225106	10	8.483	8.483	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	8.48
117885-1		ND	235092	10	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#DIV/0!	#DIV/0!	NA

Data Validation Worksheet

TEPH METHOD VALIDATION CHECKLIST

For Red Hill Site Characterization

Site:	Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F
Laboratory:	Eurofins, Seattle
SDG:	580-117885-1
Data Validator:	(b) (6)
Validation Date:	10/4/2022
Reviewer:	(b) (6)
Review Date:	10/4/2022

Analyzed for: ☑ GRO ☑ DRO ☑ ORO

Data Completeness and Deliverables

Have any missing deliverable been recieved and added to the data package? ☐ Yes ☑ No

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If the lab cannot provide them, note the effect on review of the data in the non-compliance section of the data assessment narrative.

Notes and validation action:

Custody Documents and Narratives

Are chains of custody present and complete for all samples? ☑ Yes ☐ No

ACTION: Contract lab for replacement of missing documents.

Do chains of custody or lab narratives indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ☐ Yes ☑ No

ACTION: If any sample analyzed as a soil other than a TCLP, contains 50-100% water, flag all data as estimated. If the soil sample, other than TCLP, contains more than 90% water, all data would be flagged as unusable.
ACTION: If samples were not iced upon receipt, flag all positive results as estimated, an all non-detects "UJ".

Notes and validation action:
sample 1 was reanalyzed at client result; RA was not used as reportable result

Holding Times

Have any TEPH technical holding times, determined from date of collection to date of extraction been exceeded? ☐ Yes ☑ No

NOTE: Water and Soil sample must be extracted within 7 days of sample collection. Extracts must be analyzed within forty days of extraction.

ACTION: If holding times are exceeded, flag all data as estimated ("J" for detects and "UJ" for non-detects). If holding times were grossly exceeded (i.e., more than 2x the holding time), flag all positive data as estimated and reject all non-detects as unusable ("R").

Notes and validation action:

Collected	9/12/22			
Prepped	DRO/ORO:	9/19/22	ok	
Analyzed	DRO/ORO: 9	9/19-20/22	ok	
	GRO:	9/22/22	ok	14 days preserved

Surrogate Recovery

Are surrogate recoveries summarized within the report? ☑ Yes ☐ No

ACTION: If no, contact the lab for explanation/re-submittals. If redeliverables are not available, document in the narrative notes.

(QSM 5.4 Table C24 4-Bromofluorobenzene method 8260 aqueous 85-114%) solid 79-119%
(QSM 5.4 Table C14 o-Terphenyl method 8015 aqueous 56-125%). solid 45-130%

Were outliers marked as such? ☑ Yes ☐ No
Were surrogate recoveries outside of specifications for any sample or method blank? ☑ Yes ☐ No

ACTION: If any surrogate recoveries are >10% but do not meet project requirements.
1. Flag all positive results as estimated.
2. Flagall non-detects as estimated detection limits when recoveries are less than the lower limit.
3. If recoveries are above the upper limit, do not flag non-detects.
4. If any surrogate recovery is less than 10%:
a. qualify positive results as estimated.
b. non-detects for that sample should be qualified as unusable.
Professional judgment is used to qualify data that have method

Are surrogate standard retention times within the retention time windows established during the initial calibration? ☑ Yes ☐ No

ACTION: If the retention time limits are not met, the analysis may be qualified unusable (R) for the affected sample on the basis of professional judgement.

Are there any transcription/calculation errors between the surrogate recoveries ☐ Yes ☑ No

Notes and validation action:

Sample	%R	Flag	per module 4 QAPP(10/21),
GRO			
All	↓	UJ (I)	
DRO/ORO			
All ok			

Were internal standard areas within -50% to 100% of ICAL midpoint standard and retention times +/- 30 seconds form retention time of the impoint ICAL standard? ☑ Yes ☐ No

from VII for sample 2 incomplete; areas within range; used raw data to eval
Notes: IS for GRO via 8260, no IS for DRO/ORO
GRO all ok
No IS used for 8015D

Matrix Spike

Is a matrix spike/matrix spike duplicate summary present? ☐ Yes ☑ No
Were matrix spikes analyzed at the required frequency for each of the following matrixes:

a. low water? ☐ Yes ☐ No ☑ NA
b. low soil? ☐ Yes ☐ No ☑ NA
c. medium soil? ☐ Yes ☐ No ☑ NA

ACTION: If any matrix spike data are missing, call the lab for explanation/re-submittal. If information is not available, document the effect in narrative notes.

Are all matrix spike and/or matrix spike duplicate %Rs or RPDs within acceptance range?
ACTION: Do not qualify associated sample results on the basis of the MS/MSD data alone. Use the MS/MSD results in conjunction with other QC criteria to determine the need for qualification of associated data. If the MS and MSD both have less than 10 percent recovery for an analyte, reject non-detect results for that analyte and qualify positive results for that analyte as estimated for the sample used for the MS/MSD analysis. If the MS and MSD both have greater than 200 percent recovery for ananalyte, reject detected results for that analyte and qualify non-detectresults for that analyte as estimated for the sample used for the MS/MSD analysis. Use professional judgment in applying this criterion to othersamples. ☐ Yes ☐ No ☑ NA

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

Notes and validation action:

Sample	MS %R	MSD %R	RPD	Flag
GRO				
none				
DRO/ORO				
none				

Laboratory Control Sample

Were LCS samples evaluated with each batch of 20 samples or less and were observed percent recoveries within the laboratory defined limits of (70-120%)? ☑ Yes ☐ No

QSM 5.4 Table C24 GRO not listed; used lab limits 78 - 112%
QSM 5.4 Table C13/14 aqueoous DRO 36-132%; ORO 41-113%, solid DRO 38-132%; ORO 39-106%

ACTION: Document in Data Assessment Narrative.

Notes and validation action:

LCS or LCSD		Flag	Associated samples:
GRO			
LCS 580-404701/8	ok		
LCSD 580-404701/9	ok		
DRO /ORO			
LCS 580-404222/2-A	ok		
LCSD 580-404222/3-A	ok		

Has a method blank analysis been reported per twenty samples of a similar matrix or concentration level, and for each extraction batch? ☑ Yes ☐ No

Upon examination of laboratory and field blank data, do any blanks contain positive results? ☐ Yes ☑ No

use United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Are there field/rinse/equipment blanks associated with every sample?

Are there field/rinse/equipment blanks associated with every sample?

Notes and validation action:

MB	positives	Flag	assocated samples
GRO			
MB 580-404701/5	ND		
DRO/ORO			
MB 580-404222/1-A	ND		
Trip Blanks GRO			
Trip Blank-WQTBLF-2209WK3	ND		

Equipment Blank:
none

Calibration

Are raw data and summary sheets present for both initial and continuing calibrations? ☑ Yes ☐ No

Are the % RSD values for the initial calibration less than or equal to 20% or correlation coefficient greater than 0.995? ☑ Yes ☐ No

ACTION: Associated sample data for those analytes with % RSD > 20 will be qualified as estimated.

Are the % D values between the true and measured concentration values for the continuing calibrations < 20? ☑ Yes ☐ No
ACTION: If no, data following the last in-control standard to the next-incontrol standard are potentially affected. Associated detected sample data will be qualified as estimated and associated non-detected sample data will be qualified as estimated if low bias is determined to be present. Check calibration factors and % RSD values back to raw data for 10% of data received.

Are miss-calculations or transcription errors found? ☐ Yes ☑ No
NOTE: If yes, contact the laboratory.

Notes and validation action:

Calibration	Date	Time		%D and RT OK	
GRO(C6-C10)					
IC 580-400034/3	08/10/2022	03:06	1 080902233.D 624SIL-MS	ok	Surr
ICV 580-400034/13	08/10/2022	07:11	1 080902243.D 624SIL-	ok	Surr
IC 580-402416/3	08/30/2022	18:50	1 083022123.D 624SIL-MS	ok	
ICV 580-402416/12	08/30/2022	22:32	1 083022132.D 624SIL-	ok	
CCVIS 580-404701/4	09/22/2022	14:32	1 0922202205.D 624S	ok	
CCV 580-404701/15	09/22/2022	19:02	1 0922202216.D 624SI	ok	

DRO/ORO
IC 580-402639/3 09/01/2022 00:23 1 0831ICAL22B_004 ZB-1 ok

ICV 580-402639/14 09/01/2022 04:05 1 0831ICAL22B_015 ZE ok
CCV 580-404286/27 09/19/2022 19:41 1 0919b22_012.D ZB-1 ok
CCV 580-404286/38 09/19/2022 23:49 1 0919b22_023.D ZB-1 ok
CCV 580-404286/40 09/20/2022 00:30 1 0919b22_025.D ZB-1 ok

Compound Quantitation and Reported Detection Limits

Check data for one or more detected target analytes per sample for ten percent of the data packages. Recalculate from the raw data to check for calculation and transcription errors.

Were miscalculation/transcription errors found?

☐ Yes ☑ No ☐ NA

ACTION: If errors are found 100% of the data will be evaluated. Contact the lab for the explanation/resubmittals.

Notes and validation action:

Field Duplicates

Were field duplicates submitted for TEPH analysis?

SAP limits aqueous 30%RPD, solids 50%RPD

☐ Yes ☑ No

ACTION: Where both the sample duplicate values are greater than 5 times the SQL, acceptable sampling and analytical precision is indicated by an RPD for the two field duplicate results of less than or equal to 100 percent. Where one or both analytes of the field duplicate pair are less than 5 times the SQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the SQL. If the above criteria are not met for an analyte, qualify all associated sample data for that analyte as estimated ("J").

Notes and validation action:
see field duplicate worksheet

Review Level
Is a level 4 review required for this project?

☑ Yes ☐ No

List samples reviewed and bold samples used for calculations:
all samples level 4 reviewed

As part of the data validation process, the following validation qualifiers and their meanings will be used:

"U" - Non-Detect – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

"J" - Estimated Value – The analyte was positively identified; but the associated numerical value is the approximate concentration of the analyte in the sample.

"NJ" - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

"UJ" - Estimated Non-Detect – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

"X" - The sample results are rejected. Due to significant QA/QC problems the analysis is invalid and provides no information as to whether the analyte is present or not. Once the data are flagged with "X", any further review or consideration is unnecessary.

If no determination of the overall bias of a result qualified as estimated can be made, the result will be flagged with "J". If the data reviewer can determine the overall bias for sample data qualified as estimated, the data reviewer will qualify the sample result as either an estimated minimum value (JL) or an estimated maximum value
(JH).

DATA VALIDATION GC/MS (8260/8270)

DOD MODULE 1

Validator: (b) (6)

Date Validated: 10/4/22

Reviewer: (b) (6)

Review Date: 10/5/22

Project: Red Hill P Well

SDG: 580-1178851-1

LAB: Eurofins Seattle

Samples Collected: 9/12/2022

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times (see Table 1 Module)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ SVOC: aqueous: ≤6◦C extraction within 7 days, analysis withing 40days of extraction
- ✓ SVOC: solid: ≤6◦C extraction within 14 days, analysis withing 40days of extraction
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

  Samples collected on 9/12
  Samples extracted on 9/16
  Samples analyzed on 9/20

  All ok

Tune Check/ICAL//ICV/CCV (from VI, VII, VII/Analysis Run Log)

- ✓ Tune check was performed at the beginning of each 12-hour period which sample were analyzed
- ✓ All tune check criteria is met
- ✓ minimum RF met listed below in Table IX
- ✓ if RF out then qualify J / UJ
- ✓ if RF <0.01 then qualify J / X
- ✓ ICAL: all %RSDs ≤15% or r2≥0.99
- ✓ if %RSD out then qualify J / UJ (>30% J / X)
- ✓ ICV after ICAL
- ✓ CCVs before sample, every 12 hours, ending
- ✓ all ICV/CCV %D ± 20%; if out ↑ qualify J+ / UJ; if out ↓ qualify J- / UJ
- ✓ closing CCV %D ± 50%
- ✓ RTs within established window
- ✓ For 8270 SIM analyses % degradation ≤20% for DDT

INST: TAC050

Tune: 06/30/2022 ok

ICAL: 06/30/2022 ok

ICV 580-395503/18 SIM063022a018.D06/30/2022 22:33 ok

Tune: 09/20/2022 09:43 ok

CCVIS 580-404363/3 SIM092022a003.D09/20/2022 10:05 ok

All samples

CCVC 580-404363/28 SIM092022a028.D09/20/2022 18:43 ok

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out

- ✓ if surrogate <lower limit but >10% within a fraction (acid or base/neutral) qualify associated fraction J- / UJ
- ✓ if surrogate >upper limit within a fraction (acid or base/neutral) qualify associated fraction J+
- ✓ if surrogate <10% within a fraction (acid or base/neutral) qualify associated fraction J- / X

All ok

LCS (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-15(solid) or C-16(aqueous) below then use lab limits
- ✓ if %R >upper limit qualify J+
- ✓ if %R <lower limit qualify J- / X
- ✓ if RPD out qualify J (positive results only)

used lab limits

LCS 580-404068/2-A and LCSD 580-404068/3-A all ok

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ If spike compound is not listed in Table C-25 to C-28 above then use lab limits
- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only) 20

Phenol 34-121

1-mnapth 41-115

Napth 43-114

2-mnapth 39-114

None

Blanks (Form IV/Form1)

✓ method blank – analyzed one per prep batch

✓ if method blank contamination is greater than field blank contamination then qualify the field blank (however, **do not** qualify a method blank for field blank contamination)

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

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Department of Defense
Module 1 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC/MS
May 2020 Revision 1

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Method Blank

MB 580-404068/1-A ND

Field Blank

- ✓ trip blanks required for VOC – one per cooler
- ✓ use 5X rule to qualify
- ✓ use 10X rule to qualify for methylene chloride, acetone, 2-butanone, phthalates(SVOC)

none submitted

<u>Internal Standard Areas and RTs (Form VIII)</u>

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

all ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 4 all ok

FIELD DUPLICATES

- ✓ if RPD is greater than those stated in the QAPP, qualification of the associated sample results is not necessary, but any non-conformities should be noted in the data validation summary.
- ✓ See field duplicate worksheet

None

EDS internal checklist for:

Standard Operating Procedure Number: 11-B
Revised March 2015

Revision 1: April 2021

CLIENT: AECOM

PROJECT: Joint Base Pearl Harbor-Hickam, Oahu, Hawaii, CV22F0106

SDG: 580-117885-1

Validated by: DM 10/5/2022

Reviewed by: GAP 10/5/22

LAB: Eurofins, Seattle

Sample Receipt / Hold times (COC, receipt logs, case narrative)

- ✓ VOC: aqueous: ≤6◦C analyzed and properly preserved analyzed within 14 days
- ✓ VOC: solid: ≤6◦C and properly preserved analyzed within 14 days
- ✓ VOC: if sample vial has air bubble or headspace, is cracked, or improperly sealed qualify J- / UJ
- ✓ If hold time is exceeded qualify J- / UJ
- ✓ If hold time is grossly exceeded by a factor of 2 qualify J- / X

Department of Defense Module 4 Data Validation Guidelines: Data Validation Procedure for Organic Analysis by GC March 2021
Evaluation of Holding Time
*If the holding time is exceeded, qualify all associated detects as estimated **J-** and all associated non-detects as estimated **UJ** and document that holding times were exceeded.*
*If holding times are grossly exceeded (defined as > 14 days to extraction for aqueous samples and > 28 days for solid samples), detects should be qualified as estimated **J-** and non-detects as **X**, exclusion of data recommended.*

Collected: 9/12/22
Analyzed: 9/22/22

Instrument Performance Check, Calibration and Verification (Form V, run log)

- ✓ BFB before calibrations and verifications and every 12 hours
- ✓ all ion abundance criteria within range

Ok – see below

Calibration and Verification (run log, Form VI, Form VII)

VOC

- ✓ minimum RF ≥0.05 unless listed below in Table VI or 0.01 for analytes in Table VIII in Module 1
- ✓ if RF out then qualify J / X
- ✓ ICAL: all %RSDs ≤15% except the CCC listed in Table VII below - %RSD ≤30% or r2≥0.99

  Per SAP ICV/CCV 20%D, closing CCV 50%

- ✓ if %RSD out then qualify J / UJ (>30% J / X)

TAC036

BFB 8/10/22	ok
ICAL: 8/10/22 3:06 to 6:47	ok
ICV: 580-400031/13 8/10/22 7:11	ok
BFB 9/22/22	
CCVIS: 580-404698/3 9/22	ok
CCVC 580-404698/16 9/22/22 19:27	ok

Table VI: SPCCs average RFs should meet the following criteria (Method 8260B):

Analyte	Minimum Average RF (method uses the term "mean")
Chloromethane	0.1
1,1-Dichloroethane	0.1
Bromoform	0.1
Chlorobenzene	0.3
1,1,2,2-Tetrachloroethane	0.3

Table VII: CCCs (Method 8260B)

Analyte	
1,1-Dichloroethene	Toluene
Chloroform	Ethylbenzene
1,2-Dichloropropane	Vinyl Chloride

Table VIII: VOC Poor Performers (Method 8260B):

Analyte	
Acetone	1,2-Dibromo-3-chloropropane
2-Butanone	Isopropylbenzene
Carbon disulfide	Methyl acetate
Chloroethane	Methylene chloride
Cyclohexane	Methylcyclohexane
1,2-Dibromoethane	Methyl-tert-butyl ether
Dichlorodifluoromethane	trans-1,2-Dichloroethene
1,2-Dichloropropane	4-Methyl-2-pentanone
cis-1,2-Dichloroethene	2-Hexanone
1,4-Dioxane	Trichlorofluoroethane
1,2-Dibromo-3-chloropropane	1,1,2-Trichloro-1,2,2-triflouroethane

Evaluation of VOC RFs and %RSD

Blanks (Form IV, Form 1)

- ✓ evaluate storage, method, field and trip blanks
- ✓ method blank were prepared and analyzed in association with all samples in SDG
- ✓ method blank – analyzed one per prep batch

United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022

Table A: Sample Qualification in the Presence of Blank Contamination

	Sample		
Row Number	Result	Validated Result	Validation Qualifier
1	non-detect or detect ≤ LOD	Report at LOD	U
2	> LOD and ≤ 5x blank	Report at Sample Result	J+
3	> 5x blank	Report at Sample Result	None

LOD = Limit of Detection

10x for common lab contaminates: methylene chloride, acetone, 2-butanone, cyclohexane

Method Blank
MB5804046985 all ND

Trip Blanks
Trip Blank-WQTBLF-2209WK3 all ND

Professional judgment should be applied to any field blank result that was associated with a contaminated method blank. Generally, if the blank result was qualified as a non-detect due to the method blank, it does not need to be applied to the associated sample results.

However, the fact that the field blank was qualified should be noted in the data validation report.

Multiple blank contaminations (such as a batch with field blanks and a method blank) does not establish a 'hierarchy' of one blank over another. Each blank must be evaluated individually. Blanks should not be qualified due to the results of other blanks.

Surrogates (Form II)

- ✓ Use laboratory or method specific criteria to evaluate
- ✓ do not evaluate if surrogates are diluted out
- ✓ if surrogate %R is outside limits qualify as noted below

ACTION: if any surrogate is below the lower acceptance limit but has a recovery greater than 10%, qualify positive results as estimated "J" and non-detects as estimated "UJ". If any surrogate is above the upper acceptance limit, qualify detects in the sample as estimated "J". Compounds with non-detects should not be qualified. If any surrogate in a fraction shows less than 10% recovery, flag detects for that fraction as estimated "J", and non-detects for the fraction as unusable "R".

All ok

LCS (Form III, batch worksheet)

- ✓ use lab limits to evaluate accuracy (%R)

  ACTION: -If the LCS results are below the control limits, but above 10%, but the MS/MSD results are within control limits, sample data associated with the out-of-control point shall be discussed in the data validation report. No qualification of the data is necessary.

  -If the LCS results are below the control limits, but above 10% and if the MS/MSD results are below the control limits but above 10%, spiked analytes that showed low recovery in all associated samples shall be flagged as estimated "J" or "UJ".

  -If the LCS results are below 10% and if the MS/MSD results are below 10%, only the spiked analytes that showed low recovery in all associated samples shall be flagged as "R" for non-detects and "J" for detects.

  -If the associated blank spike and the MS/MSD recoveries are above the control limits, all positive results for only the spiked analyte that showed high recovery shall be estimated "J" in the associated samples.

  -If the blank spike/LCS results are outside the control limits and no MS/MSD results are available, only the spiked analytes in all associated samples shall be qualified as listed:

    a) If blank spike/LCS results are below the control limits (above 10%), spiked analytes that showed low recovery in all associated samples shall be flagged as estimated "UJ" or "J".

    b) If blank spike/LCS results are below 10%, only the spiked analytes that showed low recovery in all associated samples shall be flagged as "R" for non-detects and "J" for detects.

    c) If blank spike/LCS results are above the control limits, detects for only the spiked analytes that showed high recovery in all associated samples shall be flagged as "J".

- ✓ if qualification is required, qualified all samples prepped with the LCS

LCS 580-404698/6 all ok
LCSD 580-404698/7 all ok

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ do not evaluate if sample concentration is >4X spike concentration
- ✓ if %R >upper limit qualify parent sample J+
- ✓ if %R <lower limit but >10%qualify parent sample J- / UJ
- ✓ if %R <10%qualify parent sample J- / X
- ✓ if RPD out qualify J (positive results only)
- ✓ qualify parent sample only

List samples, results affected and qualifications below.

MS MSD RPD Parent Flag

None

Internal Standards (Form VIII)

areas within -50% to +100% of ICAL midpoint standard

- ✓ if area >200% of ICAL midpoint standard qualify J- (no qual for ND)
- ✓ if area <50% but >20% of ICAL midpoint standard qualify J+ / UJ
- ✓ if area <20% of ICAL midpoint standard qualify positive and NDs X
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if RTs not withing 30 seconds qualify NDs X

List samples, results affected and qualifications below.

All ok

Target Compound Identification (Form1, raw data)

- ✓ RRTs for all positive results withing ±0.06 of standard
- ✓ primary and secondary ion intensities within 20% of that in the standard

Ok

TICs (Form 1)

- ✓ all TICs should be qualified as tentatively identified - NJ
- ✓ any semi-volatile reported as a TIC should be qualified as rejected, "R"

None

Compound Quantitation (Form 1, run log, prep log, EDD)

✓ evaluate dilutions, re-extractions and re-analyses to confirm best results is reported and all other results are not reportable in EDD Ok

Field Duplicates

- ✓ Evaluate and qualify per QAPP if available for project
- ✓ see field duplicate worksheet

Parent Sample	Field Duplicate

see field duplicate table

None

Automated Data Review Detail Report for 5801178851
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Sample Summary

Location	Field Sample ID	Date	Time	Sample Type	Matrix	SBD	SED	BNASIM	SW8015D	SW8260	SW8260D
A3375TW	A3375TW-WGN01LF-2209WK3	09-12-2022	1000	N	WG	0.00	0.00	X	X	X	X
A3325TW	A3325TW-WGN01LF-2209WK3	09-12-2022	1030	N	WG	0.00	0.00	X	X	X	X
A3210TW	A3210TW-WGN01LF-2209WK3	09-12-2022	1110	N	WG	0.00	0.00	X	X	X	X
A3050TW	A3050TW-WGN01LF-2209WK3	09-12-2022	1150	N	WG	0.00	0.00	X	X	X	X
FIELDQC	Trip Blank-WQTBLF-2209WK3	09-12-2022	0900	TB	WQ	0.00	0.00			X	X
							Total	**4**	**4**	**5**	**5**

Automated Data Review Detail Report for 5801178851
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: BNASIM Analysis Batch: 404363

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVIS5804043633		1/1	9/20/2022 10:05	9/20/2022 10:05	9/20/2022 10:05	404068/	CV
LABQC	WQ	LABQC	MB5804040681A		1/1	9/16/2022 09:10	9/16/2022 09:10	9/20/2022 10:55	404068/	LB
LABQC	WQ	LABQC	LCS5804040682A		1/1	9/16/2022 09:10	9/16/2022 09:10	9/20/2022 11:14	404068/	BS
LABQC	WQ	LABQC	LCSD5804040683A		1/1	9/16/2022 09:10	9/16/2022 09:10	9/20/2022 11:34	404068/	BD
A3375TW	WG	A3375TW-WGN01LF-2209WK3	580-117885-1		1/1	9/12/2022 10:00	9/16/2022 09:10	9/20/2022 16:26	404068/	N
A3325TW	WG	A3325TW-WGN01LF-2209WK3	580-117885-2		1/1	9/12/2022 10:30	9/16/2022 09:10	9/20/2022 16:46	404068/	N
A3210TW	WG	A3210TW-WGN01LF-2209WK3	580-117885-3		1/1	9/12/2022 11:10	9/16/2022 09:10	9/20/2022 17:05	404068/	N
A3050TW	WG	A3050TW-WGN01LF-2209WK3	580-117885-4		1/1	9/12/2022 11:50	9/16/2022 09:10	9/20/2022 17:25	404068/	N
LABQC	WQ	LABQC	CCVC58040436328		1/1	9/20/2022 18:43	9/20/2022 18:43	9/20/2022 18:43	404068/	CV

Test Method: SW8015D Analysis Batch: 404286

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVRT5804042863		1/1	9/19/2022 17:00	9/19/2022 17:00	9/19/2022 17:00	404222/	CV
LABQC	WQ	LABQC	CCV58040428627		1/1	9/19/2022 19:41	9/19/2022 19:41	9/19/2022 19:41	404222/	CV
LABQC	WQ	LABQC	MB5804042221A		1/1	9/19/2022 10:30	9/19/2022 10:30	9/19/2022 20:28	404222/	LB
LABQC	WQ	LABQC	LCS5804042222A		1/1	9/19/2022 10:30	9/19/2022 10:30	9/19/2022 20:48	404222/	BS
LABQC	WQ	LABQC	LCSD5804042223A		1/1	9/19/2022 10:30	9/19/2022 10:30	9/19/2022 21:08	404222/	BD

Automated Data Review Detail Report for 5801178851
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8015D Analysis Batch: 404286

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
A3375TW	WG	A3375TW-WGN01LF-2209WK3	580-117885-1		1/1	9/12/2022 10:00	9/19/2022 10:30	9/19/2022 22:49	404222/	N
A3325TW	WG	A3325TW-WGN01LF-2209WK3	580-117885-2		1/1	9/12/2022 10:30	9/19/2022 10:30	9/19/2022 23:09	404222/	N
A3210TW	WG	A3210TW-WGN01LF-2209WK3	580-117885-3		1/1	9/12/2022 11:10	9/19/2022 10:30	9/19/2022 23:29	404222/	N
LABQC	WQ	LABQC	CCV58040428638		1/1	9/19/2022 23:49	9/19/2022 23:49	9/19/2022 23:49	404222/	CV
A3050TW	WG	A3050TW-WGN01LF-2209WK3	580-117885-4		1/1	9/12/2022 11:50	9/19/2022 10:30	9/20/2022 00:09	404222/	N
LABQC	WQ	LABQC	CCV58040428640		1/1	9/20/2022 00:30	9/20/2022 00:30	9/20/2022 00:30	404222/	CV

Automated Data Review Detail Report for 5801178851
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Batch Report

Test Method: SW8260 Analysis Batch: 404701

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVIS5804047014		1/1	9/22/2022 14:32	9/22/2022 14:32	9/22/2022 14:32	404701/	CV
LABQC	WQ	LABQC	MB5804047015		1/1	9/22/2022 14:57	9/22/2022 14:57	9/22/2022 14:57	404701/	LB
LABQC	WQ	LABQC	LCS5804047018		1/1	9/22/2022 16:10	9/22/2022 16:10	9/22/2022 16:10	404701/	BS
LABQC	WQ	LABQC	LCSD5804047019		1/1	9/22/2022 16:35	9/22/2022 16:35	9/22/2022 16:35	404701/	BD
FIELDQC	WQ	Trip Blank-WQTBLF-2209WK3	580-117885-5		1/1	9/12/2022 09:00	9/22/2022 17:00	9/22/2022 17:00	404701/	TB
A3375TW	WG	A3375TW-WGN01LF-2209WK3	580-117885-1		1/1	9/12/2022 10:00	9/22/2022 17:24	9/22/2022 17:24	404701/	N
A3325TW	WG	A3325TW-WGN01LF-2209WK3	580-117885-2		1/1	9/12/2022 10:30	9/22/2022 17:49	9/22/2022 17:49	404701/	N
A3210TW	WG	A3210TW-WGN01LF-2209WK3	580-117885-3		1/1	9/12/2022 11:10	9/22/2022 18:13	9/22/2022 18:13	404701/	N
A3050TW	WG	A3050TW-WGN01LF-2209WK3	580-117885-4		1/1	9/12/2022 11:50	9/22/2022 18:38	9/22/2022 18:38	404701/	N
LABQC	WQ	LABQC	CCV58040470115		1/1	9/22/2022 19:02	9/22/2022 19:02	9/22/2022 19:02	404701/	CV

Test Method: SW8260D Analysis Batch: 404698

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	WQ	LABQC	CCVIS5804046983		1/1	9/22/2022 14:07	9/22/2022 14:07	9/22/2022 14:07	404698/	CV
LABQC	WQ	LABQC	MB5804046985		1/1	9/22/2022 14:57	9/22/2022 14:57	9/22/2022 14:57	404698/	LB
LABQC	WQ	LABQC	LCS5804046986		1/1	9/22/2022 15:21	9/22/2022 15:21	9/22/2022 15:21	404698/	BS
LABQC	WQ	LABQC	LCSD5804046987		1/1	9/22/2022 15:46	9/22/2022 15:46	9/22/2022 15:46	404698/	BD

Automated Data Review Detail Report for 5801178851
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Test Method: SW8260D Analysis Batch: 404698

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
FIELDQC	WQ	Trip Blank-WQTBLF-2209WK3	580-117885-5		1/1	9/12/2022 09:00	9/22/2022 17:00	9/22/2022 17:00	404698/	TB
A3375TW	WG	A3375TW-WGN01LF-2209WK3	580-117885-1		1/1	9/12/2022 10:00	9/22/2022 17:24	9/22/2022 17:24	404698/	N
A3325TW	WG	A3325TW-WGN01LF-2209WK3	580-117885-2		1/1	9/12/2022 10:30	9/22/2022 17:49	9/22/2022 17:49	404698/	N
A3210TW	WG	A3210TW-WGN01LF-2209WK3	580-117885-3		1/1	9/12/2022 11:10	9/22/2022 18:13	9/22/2022 18:13	404698/	N
A3050TW	WG	A3050TW-WGN01LF-2209WK3	580-117885-4		1/1	9/12/2022 11:50	9/22/2022 18:38	9/22/2022 18:38	404698/	N
LABQC	WQ	LABQC	CCVC58040469816		1/1	9/22/2022 19:27	9/22/2022 19:27	9/22/2022 19:27	404698/	CV

Automated Data Review Detail Report for 5801178851
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Field Batch Report

Test Method: SW8260 Extraction Method: SW5030 Leach Method: NONE

EBLOT	TBLOT	ABLOT	LOCID	Matrix	FLDSAMPID	LABSAMPID	LOGDATE	SACODE
	12092201		FIELDQC	WQ	Trip Blank-WQTBLF-2209WK3	580-117885-5	9/12/2022 09:00	TB

Test Method: SW8260D Extraction Method: SW5030 Leach Method: NONE

EBLOT	TBLOT	ABLOT	LOCID	Matrix	FLDSAMPID	LABSAMPID	LOGDATE	SACODE
	12092201		FIELDQC	WQ	Trip Blank-WQTBLF-2209WK3	580-117885-5	9/12/2022 09:00	TB

MS Mismatch Report

--No Records Found--

Section to identify Matrix Spike mismatches where parent sample differs from MS by dilution.

Automated Data Review Detail Report for 5801178851
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

QC Outlier Report

Test Method: SW8260 Extraction Method: SW5030 Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
Surrogate	A3050TW-WGN01LF-2209WK3 (N) / 580-117885-4	1 / 1.00	1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	82.00 (percent)	R/R	85 - 114	85 - 114	I			
Surrogate	A3210TW-WGN01LF-2209WK3 (N) / 580-117885-3	1 / 1.00	1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	79.00 (percent)	R/R	85 - 114	85 - 114	I			
Surrogate	A3325TW-WGN01LF-2209WK3 (N) / 580-117885-2	1 / 1.00	1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	78.00 (percent)	R/R	85 - 114	85 - 114	I			
Surrogate	A3375TW-WGN01LF-2209WK3 (N) / 580-117885-1	1 / 1.00	1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	78.00 (percent)	R/R	85 - 114	85 - 114	I			
Surrogate	TRIP BLANK-WQTBLF-2209WK3 (TB) / 580-117885-5	1 / 1.00	1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	79.00 (percent)	R/R	85 - 114	85 - 114	I			

Rule is the multiplier used when blank contamination occurs to determine action level.

Automated Data Review Detail Report for 5801178851
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Qualified Results

Test Method: SW8015D Extraction Method: SW3510 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3050TW-WGN01LF-2209WK3	580-117885-4	W	N	C24-C40 Petroleum Hydrocarbons	370	210 J	210 J		ug/l	TR
A3325TW-WGN01LF-2209WK3	580-117885-2	W	N	C24-C40 Petroleum Hydrocarbons	350	220 J	220 J		ug/l	TR
A3375TW-WGN01LF-2209WK3	580-117885-1	W	N	C10-C24 Petroleum Hydrocarbons	120	74.0 J	74.0 J		ug/l	TR

Test Method: SW8260 Extraction Method: SW5030 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
A3050TW-WGN01LF-2209WK3	580-117885-4	W	N	C6-C10 Gasoline Range Organics	100	80.0 U	80.0 UJ		ug/l	I
A3210TW-WGN01LF-2209WK3	580-117885-3	W	N	C6-C10 Gasoline Range Organics	100	80.0 U	80.0 UJ		ug/l	I
A3325TW-WGN01LF-2209WK3	580-117885-2	W	N	C6-C10 Gasoline Range Organics	100	80.0 U	80.0 UJ		ug/l	I
A3375TW-WGN01LF-2209WK3	580-117885-1	W	N	C6-C10 Gasoline Range Organics	100	80.0 U M	80.0 UJ		ug/l	I
Trip Blank-WQTBLF-2209WK3	580-117885-5	W	TB	C6-C10 Gasoline Range Organics	100	80.0 U	80.0 UJ		ug/l	I

Qualified analytes in samples are reported as estimated, not detected (UJ) at the Limit of Detection (LOD).

Automated Data Review Detail Report for 5801178851
RHBFS Site Characterization
Red Hill Bulk Fuel Storage Facility Site Characterization UFP-QAPP

Detected Results

Test Method: SW8015D Extraction Method: SW3510 Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Dilution	Analyte	LOQ	Lab Result	Qualified Result	Units	Reason
A3050TW-WGN01LF-2209WK3	580-117885-4	W	N	1	C10-C24 Petroleum Hydrocarbons	120	1200	1200	ug/l	
A3050TW-WGN01LF-2209WK3	580-117885-4	W	N	1	C24-C40 Petroleum Hydrocarbons	370	210 J	210 J	ug/l	TR
A3325TW-WGN01LF-2209WK3	580-117885-2	W	N	1	C10-C24 Petroleum Hydrocarbons	110	330	330	ug/l	
A3325TW-WGN01LF-2209WK3	580-117885-2	W	N	1	C24-C40 Petroleum Hydrocarbons	350	220 J	220 J	ug/l	TR
A3375TW-WGN01LF-2209WK3	580-117885-1	W	N	1	C10-C24 Petroleum Hydrocarbons	120	74.0 J	74.0 J	ug/l	TR

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Reporting Anomalies

--No Records Found--

Review Questions