



DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CV 23F0104

SDG: 580-121534-1
Eurofins Savannah

Prepared by
ENVIRONMENTAL DATA SERVICES, LTD.

Prepared for
AECOM Environmental

Released: 1/18/23

Data Validators and Peer Reviewers:

A handwritten signature in black ink, appearing to read "Diane Waldschmidt".

Diane Waldschmidt

A handwritten signature in black ink, appearing to read "Gretchen Phipps".

Gretchen Phipps

A handwritten signature in black ink, appearing to read "Dina Manov".

Dina Manov

A handwritten signature in black ink, appearing to read "Larry Lewis".

Larry Lewis

A handwritten signature in black ink, appearing to read "Paloma Hoelzle".

Paloma Hoelzle



EXECUTIVE NARRATIVE

Sample Delivery Groups: 580-121534-1
Laboratory: Eurofins, Savannah
Site: Red Hill Bulk Storage Facility, CV 23F0104
Sampling dates: 12/20/2022
Number of Samples: 1
Test Method: SW-846 8015C
Analysis: 2-(2-Butoxyethoxy)ethanol

Quality Assurance Project Plan: Sampling and Analysis Plan, Investigation and Remediation of Releases and Groundwater Protection and Evaluation, Red Hill Bulk Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, O’ahu, Hawai’i (Revision 01, April 2017); PFAS-Specific Sampling and Analysis plan, Red Hill Bulk Fuel Storage Facility, Adit 6, Joint Base Pearl Harbor-Hickam, O’Ahu, Hawai’i (November 30, 2022) (SAP).

Validation Guidelines: United States Department of Defense Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC, Environmental Data Quality Workgroup, March 9, 2021; United States Department of Defense (DOD) General Data Validation Guidelines Environmental Data Quality Workgroup (EDQW), November 2019. 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 |
|------------------------------|----------------------------------|--------|------------------|
| AF-HDMW225303-WGN01LF-2212W3 | 580-121534-1 | 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.

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.

All sample analyses 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.

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 response factor (RRF) from the initial calibration. Percent difference is a measure of the instrument's daily performance. If the %D exceeds 20% for any analyte, qualify all associated positive results "J" and non-detects "UJ". If %RSD and %D grossly exceed QC criteria, non-detect data may be qualified "X".

A multi-point initial calibration curve was used for the target analyte. The initial calibration demonstrated instrumental linearity. The %RSD was within validation guidelines.

Continuing calibrations were analyzed at the proper frequencies and the observed %D values met quality control criteria.

5. 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, equipment and rinse blanks measure cross-contamination of samples during field operations.

A) Method blank contamination

No problems were found for this criterion.

B) Field/Equipment blank contamination

No sample was submitted as a field/equipment blank in association with this sample delivery group (SDG).

6. SURROGATES / SYSTEM MONITORING COMPOUNDS

All samples are spiked with surrogate/system monitoring compounds (SMC) prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate/SMC concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

No surrogates were used for this analysis.

7. COMPOUND IDENTIFICATION

The retention times (RTs) of reported compounds must fall within the calculated retention time windows for chromatographic column.

Retention Time

Target compound identifications were not reviewed at the Stage 2B level.

Relative Percent Difference

No positive results were reported for the samples in this SDG.

8. COMPOUND QUANTIFICATION

Analyte quantitation was not reviewed at the Stage 2B level.

Manual integrations were not reviewed at the Stage 2B level.

9. MATRIX SPIKE / MATRIX SPIKE RECOVERY

Matrix spike / matrix spike duplicate (MS/MSD) data is 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 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 control limits. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

11. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph (GC) 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.

12. 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) shall be used for original and duplicate sample values greater than the LOQ in the case of solid samples and 30% RPD for water samples. A control limit of a difference between results no more than the LOQ shall be used if either the sample or duplicate value is less than the 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 performed. The level of quantitation (LOQ) specified in the SAP for the analytes reported have been achieved.

13. OTHER PROBLEMS

None.

Table 1 Major and Minor Findings

| | Were acceptance criteria met? | | |
|---|-------------------------------|-------|-------|
| | Yes | No | |
| 2-(2-Butoxyethoxy)ethanol | | Major | Minor |
| Holding Time | x | | |
| Calibration | x | | |
| Method Blank | x | | |
| Equipment/Field Blank | NA | | |
| Surrogates/System Monitoring Compounds | NA | | |
| Compound Identification | NA | | |
| Compound Quantitation | NA | | |
| Matrix Spike/Matrix Spike Duplicate | NA | | |
| Internal Standards | 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/r²/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 |
| 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 degreeec 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 (8015)

DOD

Validator: LL

Date Validated: 1/17/23

Reviewer: GAP

Date Reviewed: 1/17/2023

Project: Red Hill Bulk Storage Facility, CV 23F0104

SDG: 580-121534-1

LAB: Eurofins, Savannah

Samples Collected: 12/20/2022

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

- ✓ Aqueous samples extracted within 7 days of collection and analyzed within 40 days of extraction
- ✓ Solid samples extracted within 14 days of collection and analyzed within 40 days of extraction
- ✓ There is no specific holding time for PCB samples
- ✓ If temp of receipt is >6° but ≤15% qualify J-/UJ
- ✓ If temp >15°C qualify X
- ✓ If holding time is exceeded qualify J-/UJ
- ✓ If holding time is grossly exceeded (>2X) qualify J-/X

14-day holding time used for 8015 DAI

Samples collected on 12/20/2022

Samples analyzed on 12/31/2022

All ok

ICAL (Form VI)

- ✓ %RSD \leq 20% or $r > 0.995$ or $R^2 > 0.990$
- ✓ minimum 5 standards for linear; minimum 6 standards for quadratic
- ✓ 5-pt calibration for multicomponent analytes
- ✓ If %RSD $> 20\%$ or $r < 0.995$ or $r^2 < 0.990$ qualify J/UJ
- ✓ If %RSD $> 40\%$ or $r < 0.95$ or $r^2 < 0.90$ qualify X

IC 680-757531/5 12/31/2022 13:58 1 22GL31005.D RSD ok used avg RF

ICV/CCV (from VII/Analysis Run Log)

- ✓ ICV after ICAL; all %Ds within $\pm 20\%$
- ✓ CCVs before sample, every 10 samples
- ✓ all ICV/CCV %D $\pm 20\%$
- ✓ RTs within established window
- ✓ closing calibration is not required.
- ✓ if %D is high then qualify J+
- ✓ if %D is low then qualify J-/UJ
- ✓ if %D is $> 50\%$ then qualify X

ICV 680-757531/11 12/31/2022 16:14 1 22GL31011.D ok

CCV 680-757531/28 12/31/2022 22:40 1 22GL31028.D ok

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C below
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate recovery $< 10\%$ then qualify J-/X
- ✓ if surrogate recovery is low but $> 10\%$ then qualify J-/UJ
- ✓ if surrogate recovery is high then qualify J+

No surrogate used

LCS (Form III)

- ✓ one per prep batch
- ✓ used lab limits 50-150, RPD 50
- ✓ if recovery low then qualify J-/X
- ✓ if recovery is high then qualify J+
- ✓ if LCS/LCSD RPD is out then qualify detects J, do not qualify NDs

LCS 680-757531/12 LCSD 680-757531/13

All ok

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ used lab limits 50-150, RPD 50
- ✓ MS/MSD RPD \leq 30%
- ✓ if MS recovery <10% then qualify J-/X
- ✓ if MS recovery is low but >10% then qualify J-/UJ
- ✓ if MS recovery is high then qualify J+
- ✓ if MS/MSD RPD is out then qualify detects J, do not qualify NDs

none

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch

Method Blank

MB 680-757531/16 ND

Field Blank

None

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if IS recovery is >200% then detects qualify J (do not qualify NDs)
- ✓ if IS recovery is <50% but >20% then qualify J/UJ
- ✓ if IS recovery is <20% or RT out then qualify X

Internal standard used – n-Heptyl Alcohol all ok

Identification Summary / Second Column Confirmation (Form X)

- ✓ present for all positive results
- ✓ RTs within range for both columns (not applicable for single column 8015)
- ✓ RPD ≤ 40% [Single col analyses NA](#)
- ✓ if RPD >40% then qualify J [Single col analyses NA](#)

Level 2B

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

Level 2B

Field Duplicates

- ✓ no criteria per QSM; use project specific criteria when available in QAPP
- ✓ per Module 4: if RPD > QAPP limit qualify J, no Q for non-detects
- ✓ See field duplicate worksheet

use 30% for aqueous and solids

None

Automated Data Review Detail Report for 5801215341
 RH Fire Suppression System
 RHS PFAS UFP-QAPP

| Sample Summary | | | | | | | | | SW8015C |
|----------------|------------------------------|------------|------|-------------|--------|------|------|--|----------|
| Location | Field Sample ID | Date | Time | Sample Type | Matrix | SBD | SED | | |
| HDMW2253-03 | AF-HDMW225303-WGN01LF-2212W3 | 12-20-2022 | 1055 | N | WG | 0.00 | 0.00 | | X |
| Total | | | | | | | | | 1 |

Automated Data Review Detail Report for 5801215341
 RH Fire Suppression System
 RHS PFAS UFP-QAPP

Batch Report

| Test Method: SW8015C | | Analysis Batch: 757531 | | | | | | | | |
|----------------------|--------|------------------------------|-----------------|-----------------|-------------|----------------------|----------------------|--------------------|------------------|-------------|
| 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 | LCS68075753112 | | 1/1 | 12/31/2022 16:37 | 12/31/2022 16:37 | 12/31/2022 16:37 | 757531/ | BS |
| LABQC | WQ | LABQC | LCSD68075753113 | | 1/1 | 12/31/2022 17:00 | 12/31/2022 17:00 | 12/31/2022 17:00 | 757531/ | BD |
| LABQC | WQ | LABQC | MB68075753116 | | 1/1 | 12/31/2022 18:08 | 12/31/2022 18:08 | 12/31/2022 18:08 | 757531/ | LB |
| HDMW2253-03 | WG | AF-HDMW225303-WGN01LF-2212W3 | 580-121534-1 | | 1/1 | 12/20/2022 10:55 | 12/31/2022 21:54 | 12/31/2022 21:54 | 757531/ | N |
| LABQC | WQ | LABQC | CCV68075753128 | | 1/1 | 12/31/2022 22:40 | 12/31/2022 22:40 | 12/31/2022 22:40 | 757531/ | CV |
| LABQC | WQ | LABQC | CCV68075753138 | | 1/1 | 1/1/2023 02:26 | 1/1/2023 02:26 | 1/1/2023 02:26 | 757531/ | CV |

Automated Data Review Detail Report for 5801215341
RH Fire Suppression System
RHS PFAS 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 5801215341
 RH Fire Suppression System
 RHS PFAS UFP-QAPP

QC Outlier Report

| Test Method: SW8015C | | Extraction Method: METHOD | | 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 | AF-HDMW225303- WGN01LF-2212W3 (N) / 580-121534-1 | 1 / 1.00 | All in Run | 11.46 (days) | J/UJ | < 7 | < 14 | H2 | Prep Exceeds UWL | | |

Rule is the multiplier used when blank contamination occurs to determine action level.

Automated Data Review Detail Report for 5801215341
RH Fire Suppression System
RHS PFAS UFP-QAPP

Qualified Results

--No Records Found--

Detected Results

--No Records Found--

Rejected Results

--No Records Found--

Anomalies Count

--No Records Found--

Automated Data Review Detail Report for 5801215341
RH Fire Suppression System
RHS PFAS UFP-QAPP

Reporting Anomalies

--No Records Found--

Automated Data Review Detail Report for 5801215341
RH Fire Suppression System
RHS PFAS UFP-QAPP

Review Questions
