Drinking Water Sampling Plan
JBPHH, O'ahu, Hawai'i

December 2021

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This Sampling Plan was prepared by the Navy, Army, State of Hawaii Department of Health, and the United States Environmental Protection Agency.

N62742-17-D-1800
CTO N6274218F0126
N00362

Exhibit N-3D

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Acronyms and Abbreviations

°C	degree Celsius
µg/L	micrograms per liter
COC	chain of custody
CTO	contract task order
DOH	State of Hawai‘i Department of Health
EAL	Environmental Action Level
EPA	United States Environmental Protection Agency
HCl	hydrochloric acid
HNO_3	nitric acid
JBPHH	Joint Base Pearl Harbor-Hickam
MCL	Maximum Contaminant Level
MDL	method detection limit
mg	milligram
mL	milliliter
NAVFAC	Naval Facilities Engineering Systems Command
QC	quality control
RL	reporting limit
SDWB	Safe Drinking Water Branch, State of Hawai‘i Department of Health
SGC	silica gel cleanup
SO_3	sulfur trioxide
SOP	standard operating procedure
TBD	to be determined
TPH	total petroleum hydrocarbons
VOA	volatile organic analysis

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1.0 Introduction and Purpose

This Preliminary Sampling Plan is provided to support the sampling of the Joint Base Pearl Harbor-Hickam (JBPHH) drinking water system (System) for analyses of petroleum hydrocarbons impacts from the Red Hill Shaft (one of the three water sources for JBPHH) that began on November 20, 2021. The purpose of this sampling is to support the effort to determine if the drinking water within the areas impacted by the release comply with State of Hawaii/United States Environmental Protection Agency Drinking Water standards. Multiple efforts (e.g., the hydraulic capture zone analysis, water-line flushing) are currently underway and this sampling effort is one of multiple lines of evidence that will be used to determine when it is appropriate for residents to return home. This Sampling Plan is prepared under Contract N62742-17-D-1800, Contract Task Order (CTO) N6274218F0126.

This plan was developed in conjunction with the Navy, Army, Hawaii Department of Health, and United States Environmental Protection Agency (i.e., JBPHH DOD/Regulatory Agency Focus Group) and reflects the consensus approach (that was developed during Face-to-Face meetings between all parties on 12/10/21, 12/11/21, and 12/13/21) for collecting and analyzing drinking water samples in response to the release at the Red Hill Shaft with the overarching goal of returning residents to their homes and/or workplaces SAFELY and as quickly as possible.

It should be noted that this SAP is evergreen – Meaning that it may/will be updated/revised as analytical data (and/or) other information are obtained that indicate that it should be adjusted to ensure protection of human health.

1.1 Sampling Plan Overview

This section provides an overview of the primary steps that comprise this SAP and reflects the multiple lines of evidence approach that will be used to evaluate the data obtained from samples collected using this plan to make health-protective decisions regarding drinking water and the ability of families to return to their homes. The significant steps of the plan are outlined below (and are discussed in detail in Section 2):

- **Step 0** – Collect Shaft water samples from the Waiawa Shaft, Halawa Shaft, and Red Hill Shaft to characterize concentrations of constituents in the source water.

- **Step 1** – Identify and Prioritize Contaminated Locations (Flush Zones) in the DOD Water Distribution System.

- **Step 2a** – Collect screening water samples from locations where flushing has been tentatively completed and; therefore, requires confirmation sampling. Note: These samples will be directly from the flushing point without any treatment/modification (e.g., GAC filtration will not be performed). The samples will be analyzed for EPA Methods 8260 (VOCs), 8270 (SVOCs), 8015 (TPH-G, TPH-D, TPH-O).
- **Step 2b** – Collect screening water samples from locations where flushing has been tentatively completed; therefore, requires confirmation sampling. Note: These samples will be directly from the flushing point without any treatment/modification (e.g., GAC

filtration will not be performed). The samples will be analyzed for EPA Methods 524.2, 524.3, 524.2M, 525.2, 200.8/245.1, supplemented with 8015 (TPH-G, TPH-D, TPH-O).

- **Step 3** – Perform House/Building Specific Flushing for all structures located down gradient of the Node(s) that were flushed in Step 2. This approach will follow the House/Building Flushing Plan that is currently under development by the Navy Team.
- **Step 4 –** Collect drinking water samples from the taps in 10% of the homes in a Flushing Zone will be sampled, with a minimum of 15 homes sampled in each Flushing Zone. of homes/building located down gradient of the Flushing Station. These homes/buildings will be geographically distributed throughout the area to provide spatial coverage along the water supply line. In addition, the list of homes may be augmented based on additional information (e.g., homes that reported specific health impacts, homes that are referred to the team by medical providers) may also be sampled.
- **Step 5 –** Long term drinking water monitoring:
    - **0 to 3 months after initial drinking water sampling**. Long-Term Monitoring drinking water samples will be collected every month from 5% of the LTM homes in a Flushing Zone, with a minimum of 5 homes sampled in each Flushing Zone.
    - **4 to 24 months after initial drinking water sampling**. Long-Term Monitoring drinking water samples will be collected every six months from 10% of the LTM homes in a Flushing Zone, with a minimum of 15 homes sampled in each Flushing Zone.

2.0 Sampling Locations and Schedules

2.1 Return to Home/Normal Drinking Water Use Sampling Plan

This section discusses the primary steps that comprise this SAP and reflects the multiple lines of evidence approach that will be used to evaluate the data obtained from samples collected using this plan to make health-protective decisions regarding drinking water and the ability of families to return to their homes. The significant steps of the plan are outlined below (see Flow-Chart 1 for more detail):

- **Step 0** – Collect Shaft water samples from the Waiawa Shaft, Halawa Shaft, and Red Hill Shaft to characterize concentrations of constituents in the source water. These samples will be analyzed via EPA Methods 8260 (VOCs), 8270 (SVOCs), 8015 (TPH-G, TPH-D, TPH-O) – plus Tentatively Identified Compounds (TICs).

- **Purpose and Use of this information:** This information will be used to identify/isolate constituents of potential concern (COPCs) that will be used in subsequent sampling and analyses. COPCs in the source water will be the focus of the subsequent screening/investigation steps that are summarized below.

- **Step 1** – Identify and Prioritize Contaminated Locations (Flush Zones) in the DOD Water Distribution System.
    - This will incorporate information from:
        - Wide-spread, rapid Total Organic Carbon Testing Results
        - Results of phone calls/complaints of odors and other health related issues
        - Evaluating hydraulic transport information (Modeling) of the JPBHH water system to determine areas/locations of concern based on the location of the release and probable transport and ultimate fate in the water system.

- **Purpose and Use of this information:** This information will be used to identify the primary sample locations on the JBPHH water system (i.e., sample locations located off of specific water distribution lines that have been identified as potential concern (more details presented later in this SAP regarding these locations) and where line flushing will be performed.

- **Step 2a** – Collect screening water samples from Node(s) where flushing has been tentatively completed and; therefore, requires confirmation sampling. Note: These samples will be collected directly from the flushing point without any treatment/modification (i.e., GAC filtration will not be performed). Generally, a minimum of 1 to 3 volumes of water will be flushed with clean water from the Waiawa Shaft in a designated Flushing Zone prior to collecting screening samples (however, some areas may be flushed with more volumes of water). One screening sample will be collected, post-flushing and will be analyzed for:

- EPA Methods 8260 (VOCs), 8270 (SVOCs), 8015 (TPH-G, TPH-D, TPH-O).[1]

- **Purpose and Use of this information:** This information will be screened against USEPA MCLs, HDOH Tier 1 EALs, HDOH Aquatic Ecological Screening Levels (Flush Water Screening Levels [FWSLs]). If the results of the sample comply with the FWSLs then this location will proceed to Step 3. If the results do not comply with the FWSLs then additional flushing will be performed and the site will be re-tested.

- **Step 2b** – Collect screening water samples from Node(s) where flushing has been tentatively completed; therefore, requires confirmation sampling. Note: These samples will be directly from the flushing point without any treatment/modification (e.g., GAC filtration will not be performed). Generally, a minimum of 1 to 3 volumes of water will be flushed with clean water from the Waiawa Shaft in a designated Flushing Zone prior to collecting screening samples. One screening sample will be collected, post-flushing and will be analyzed for:

  - EPA Methods 524.2, 524.3, 524.2M, 525.2, 200.8/245.1, supplemented with 8015 (TPH-G, TPH-D, TPH-O).[1]

- **Purpose and Use of this information:** This information will be screened against USEPA MCLs, HDOH Tier 1 EALs, HDOH Aquatic Ecological Screening Levels (Flush Water Screening Levels [FWSLs]). If the results of the sample comply with the FWSLs then this location will proceed to Step 3. If the results do not comply with the FWSLs then additional flushing will be performed and the site will be re-tested.

- **Step 3** – Perform House/Building Specific Flushing for all structures located down gradient of the point that was flushed in Step 1. This approach will follow the House/Building Flushing Plan that is currently under development by the Navy Team.

- **Purpose of this information:** The purpose of this step is to ensure that all water stored in pipes, tanks, appliances, et cetera, have been thoroughly flushed with clean water from the Waiawa Shaft prior to collecting drinking water samples in Step 5.

- **Step 4 –** Collect drinking water samples from the taps in 10% of the homes in a Flushing Zone will be sampled, with a minimum of 15 homes sampled in each Flushing Zone. of homes/building located down gradient of the Flushing Station and analyze for (Methods 524.2, 524.3, 524.2M, 525.2, 200.8/245.1, supplemented with 8015 (TPH-G, TPH-D, TPH-O).[1] These homes/buildings will be geographically distributed throughout the area to provide spatial coverage along the water supply line. In addition, the list of homes may be augmented based on additional information (e.g., homes that reported specific health impacts, homes that are referred to the team by medical providers) may also be sampled.

- **Purpose and Use of this information:** The purpose of this step is to confirm that the water in the homes located in this area is safe to drink and that residents/occupants may

[1] This list will be modified/adjusted based on the results of the Shaft Samples.

return home (if they left) and the drinking water if fit for human consumption as defined by EPA. A single drinking water sample will be collected from each of the homes selected for sampling in this area. If the drinking water results collected from all of the representative homes that were sampled comply with MCLs and Tier 1 EALs, then all residents/occupants within this designated area may return home and the drinking water if fit for human consumption. If the drinking water results collected from all of representative homes that were sampled does not comply with MCLs and Tier 1 EALs, then the residents/occupants will not be allowed to return home and/or use the drinking water in their house (in instances where they have not left home). In addition, the Navy, Army, HDOH, and EPA will determine next steps for this Flushing Zone (e.g., performing additional flushing, performing targeted/flushing at specific homes). The houses would be tested again after remedial actions have been implemented.

- **Step 5 –** Long term drinking water monitoring:
    - **0 to 3 months after initial drinking water sampling**. Long-Term Monitoring drinking water samples will be collected every month from 5% of the LTM homes in a Flushing Zone, with a minimum of 5 homes sampled in each Flushing Zone. New homes should be sampled, if possible – to achieve more robust spatial/geographic coverage. Drinking water samples will be collected from the taps in these homes/structures and analyzed for (Methods 524.2, 524.3, 524.2M, 525.2, 200.8/245.1, supplemented with 8015 (TPH-G, TPH-D, TPH-O).[1] These homes/buildings will be geographically distributed throughout the area to provide spatial coverage along the water supply line and may or may not be the same homes that were sampled in Step 4.
    - **4 to 24 months after initial drinking water sampling**. Long-Term Monitoring drinking water samples will be collected every six months from 10% of the LTM homes in a Flushing Zone, with a minimum of 15 homes sampled in each Flushing Zone. New homes should be sampled, if possible – to achieve more robust spatial/geographic coverage. Drinking water samples will be collected from the taps in these homes/structures and analyzed for (Methods 524.2, 524.3, 524.2M, 525.2, 200.8/245.1, supplemented with 8015 (TPH-G, TPH-D, TPH-O).[1] These homes/buildings will be geographically distributed throughout the area to provide spatial coverage along the water supply line and may or may not be the same homes that were sampled in Step 4.
- **Purpose and Use of this information:** The purpose of this step is to confirm that the water in the homes located in this Flushing Zone continues to be FFHC. A single tap water sample will be collected from each of the homes selected for sampling in this Flushing Zone. If the tap water results collected from all of the representative homes that were sampled comply with MCLs and Tier 1 EALs, then then it will be confirmed that the drinking water this area remains FFHC. If the drinking water results collected from all of representative homes that were sampled does not comply with MCLs and Tier 1 EALs,

then the residents/occupants will not be allowed to return home and/or use the drinking water in their house (in instances where they have not left home). In addition, the Navy, Army, HDOH, and EPA will determine next steps for this Flushing Zone (e.g., performing additional flushing, performing targeted/flushing at specific homes). The houses would be tested again after remedial actions have been implemented.

Flow-Chart 1: JBPHH Drinking Water Investigation/Decision Flow-Chart <<See PDF>>

2.2 Continuity Sampling Plan

This section presents the Continuity Sampling plan that has been in place since approximately, December 10 2021. The purpose of this sampling was to provide an initial indication of the concentrations of constituents in the JBPHH water distribution system prior to implementing the 2.1 Return to Home/Normal Drinking Water Use Sampling Plan that is presented in Section 2.1. The Continuity Sampling Plan may be discontinued and/or modified after implementation of the Return to Home/Normal Drinking Water Use Sampling Plan begins. Table 1 and Figure 1 present sampling locations, including spigots, faucets, or other sampling ports within the drinking water system that will be sampled on a regular schedule. Drinking water sampling locations have been divided into Group A and Group B for Navy specific sampling in addition to the Hawai'i Department of Health (DOH). These locations are representative of the water system network and residential areas that may have been impacted by the November 20, 2021 release. Drinking water samples will be collected daily beginning with Sample Group A on Day 1 and Sample Group B on Day 2; sampling will continue with samples collected from each group on alternating days. Sampling will follow a tiered approach following the full-spectrum testing of the three Navy water shafts. After the first week of sampling, Navy will evaluate data and determine if the sampling locations need to be modified. Otherwise, sampling at these locations will continue for another 2 to 3 weeks until further assessments can be made. Based on the initial tier, additional sampling may follow with a more JP-5-focused[2] analyte list in locations to be determined.

This sampling plan also incorporates the initial 59 sampling 59 locations proposed by State of Hawaii Drinking Water Branch (Appendix A) to mimic their approach in evaluating the water quality of their locations. This list does not include all State of Hawai'i locations in or around JBPHH; additional sampling locations will be identified prior to the completion of sampling of currently identified locations.

In addition to the Group A, Group B, and DOH sampling locations, the localized sampling points may be identified to follow the Navy's phased flushing plan. These additional sampling locations

[2] Sampling that was performed by Hawai'i Department of Health (DOH) and the Navy. The results demonstrated that JP-5 was the petroleum hydrocarbon that was responsible for the impacts to Red Hill Shaft in November 2021.

will help the Navy target identified sections of the distribution system that may require further flushing.

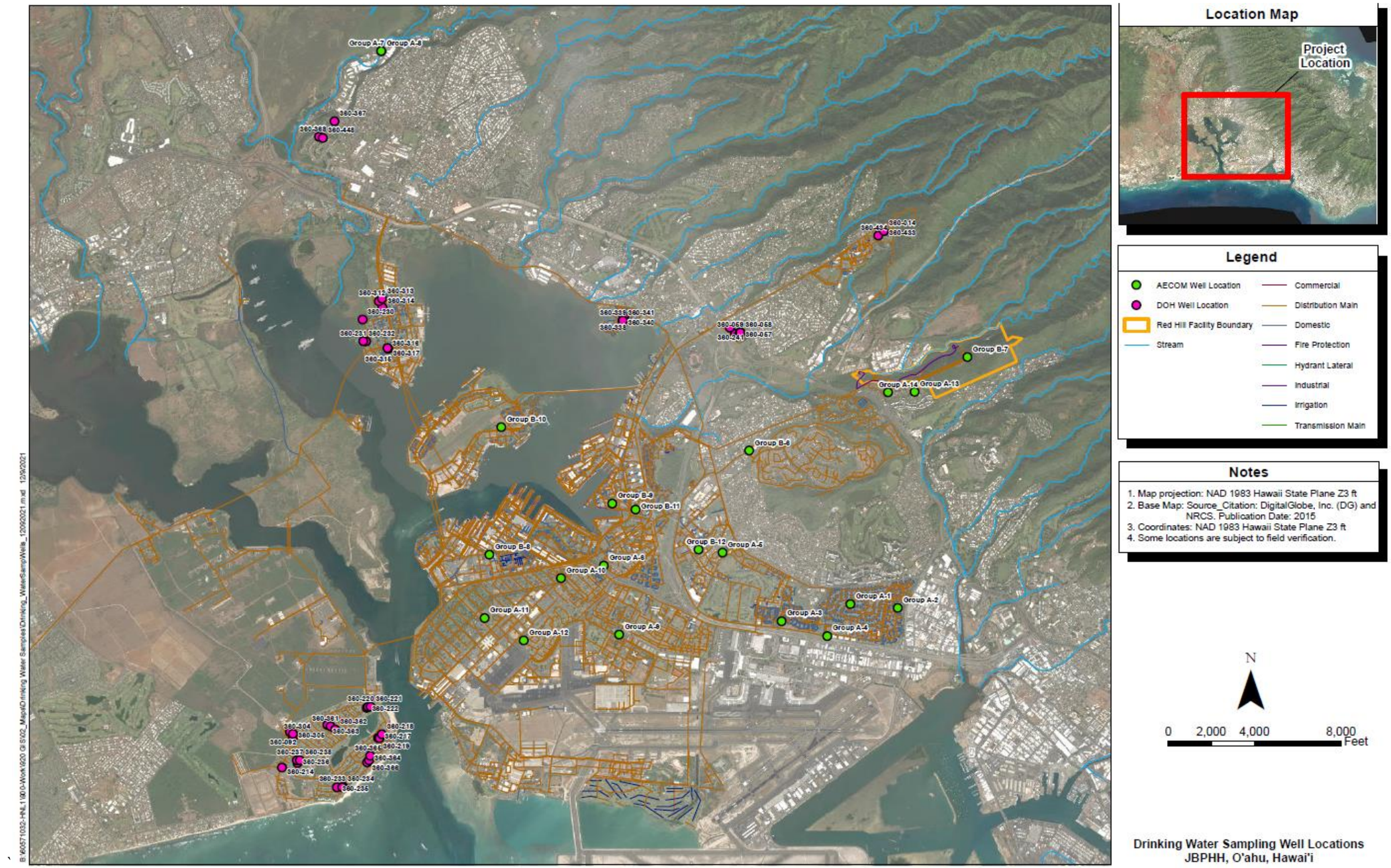
For scheduling purposes, Day 1 is assumed to be December 2, 2021; the start date can be adjusted as appropriate. The proposed project schedule is presented in Appendix A.

For scheduling purposes, Day 1 is assumed to be December 2, 2021; the start date can be adjusted as appropriate. The proposed project schedule is presented in Appendix B.

Table 1: Sample Locations by Grouping, Navy Sampling Points

Location	Coordinates	Testing Method
Group A Recurring:		
1. Halsey Terrace	21°20'28.89"N, 157°54'31.36"W	
2. Radford Terrace	21°20'27.09"N, 157°54'8.20"W	
3. Catlin Park	21°20'21.03"N, 157°55'5.03"W	
4. Doris Miller Park	21°20'14.16"N, 157°54'42.65"W	
5. Moanalua Terrace	21°20'52.75"N, 157°55'33.93"W	
6. Hale Moku / Hokulani	21°20'46.73"N, 157°56'31.99"W	
7. Waiawa PS Pre-Chlorination	Not Applicable	
8. Waiawa PS Post-Chlorination	Not Applicable	
9. Earhart (Hickam Community)	21°20'14.86"N, 157°56'24.42"W	
10. Hale Nakoa (Hickam Community)	21°20'40.93"N, 157°56'52.88"W	
11. Officer Field (Hickam Community)	21°20'22.53"N, 157°57'30.25"W	
12. Onizuka (Hickam Community)	21°20'12.25"N, 157°57'11.08"W	
13. Red Hill Elementary (Cafeteria)	21°22'6.78"N, 157°53'59.86"W	
14. Red Hill Elementary (Girl’s Restroom at Cafeteria Building)	21°22'6.78"N, 157°53'59.86"W	
Group B Recurring:		
1. Aliamanu MR	21°21'40.39"N, 157°55'1.99"W	
2. Red Hill Housing	21°22'8.64"N, 157°54'17.85"W	
3. Halawa PS Pre-Chlorination	Not Applicable	
4. Halawa PS Post-Chlorination	Not Applicable	
5. Red Hill PS Pre-Chlorination/Aquifer	Not Applicable	
6. S1/S2 Tank	21°21'39.73"N, 157°55'20.83"W	

Location	Coordinates	Testing Method
7. Red Hill HSG Storage Tank	21°22'23.31"N, 157°53'33.86"W	
8. Shipyard Clinic	21°20'51.73"N, 157°57'28.02"W	
9. SUBASE Lockwood Hall	21°21'15.34"N, 157°56'27.85"W	
10. Ford Island CDC	21°21'50.59"N, 157°57'22.05"W	
11. Makalapa Clinic	21°21'12.02"N, 157°56'15.96"W	
12. NEX Commissary	21°20'54.10"N, 157°55'45.62"W	
13. Pearl City – PCP Mini NEX	To be updated	
14. Iroquois Point Pre-School	To be updated	
15. Manana - Birch Circle	To be updated	
16. McGrew Point Community Center	To be updated	
17. TBD Phased Flushing Targeted Locations	To be updated	
Group C Recurring:		
1. AMR	To be updated	
2. Red Hill	To be updated	
3. Additional Sites	To be updated	
Standalone Sample:		
Waiawa Water Shaft		
Halawa Water Shaft		
Red Hill Water Shaft		



Location Map

Legend

- AECOM Well Location
- DOH Well Location
- Red Hill Facility Boundary
- Stream
- Commercial
- Distribution Main
- Domestic
- Fire Protection
- Hydrant Lateral
- Industrial
- Irrigation
- Transmission Main

Notes

1. Map projection: NAD 1983 Hawaii State Plane Z3 ft
2. Base Map: Source_Citation: DigitalGlobe, Inc. (DG) and NRCS. Publication Date: 2015
3. Coordinates: NAD 1983 Hawaii State Plane Z3 ft
4. Some locations are subject to field verification.

N

0 2,000 4,000 8,000 Feet

Drinking Water Sampling Well Locations
JBPHH, O'ahu, Hawai'i

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Figure 1: Sampling Location Map

3.0 Sample Control Procedures

Prior to sampling, the field team will inspect all supplies and consumables to ensure that they are acceptable for use. Table 2 and Table 3 lists, for each analyte group for Tier I and Tier II sampling respectively, the sample containers, preservatives, and applicable hold times as required by SW-846 and applicable state and federal drinking water methods. The analytical laboratories selected for the site characterization will provide the required sample containers. Chain-of-custody (COC) documentation will be maintained for samples during all phases of sample collection, transport, and receipt and internal transfer within the laboratory.

Table 2: Sample Containers, Preservatives, and Holding Times – Tier I System Flushing Sampling

Parameter	Analytical Method	Container	Preservative	Holding Time
Analytical Methods				
Benzene Ethylbenzene Toluene Xylenes	524.2	3 x 40 mL Glass VOA	0.5 mL HCl (Unchlorinated); 25 mg Ascorbic / 3 drops HCl (Chlorinated)	14 days
Naphthalene 1-Methylnaphthalene 2-Methylnaphthalene Phenol 2-(2-methoxyethoxy) ethanol	525.2	2 x 1 L Amber Glass	2 mL HCl (unchlorinated); 45 mg Sodium Sulfite / 2 mL HCl (chlorinated)	14 days
TPH-Gasoline (C6–C10)	8260C	3 x 40 mL VOA	100 µl HCl	14 days
TPH-Diesel/Oil	8015	2 x 250 mL Amber Glass	0.5 mL HCl	7 days
Lead	200.8	250 mL Poly	Nitric acid, pH <2	6 months

Note:
All samples will be chilled to < 6°C.
This list may be modified/adjusted based on the results of the Shaft Samples.

Table 3: Sample Containers, Preservatives, and Holding Times- Tier II Compliance Sampling

Parameter	Analytical Method	Container	Preservative	Holding Time
Hawaii Department of Health Safe Drinking Water Branch Compliance Methods				
Volatile Organic Chemicals	524.2	3 x 40 mL Glass VOA	0.5 mL HCl (Unchlorinated); 25 mg Ascorbic / 3 drops HCl (Chlorinated)	14 days
EDB and DBCP	524.3	3 x 40 ml Amber Glass VOA	25 mg Ascorbic / 25 mg Maleic	14 days
1,2,3-Trichloropropane (TCP)	524.2M	3 x 40 mL VOA	25 mg Ascorbic	14 days
Synthetic Organic Chemicals	525.2	2 x 1 L Amber Glass	2 mL HCl (unchlorinated); 45 mg Sodium Sulfite / 2 mL HCl (chlorinated)	14 days
Metals/Mercury	200.8/245.1	250 mL Poly	1 mL HNO_3, pH<2	6 months /28 days

Note:
All samples will be chilled to < 6°C.
This list may be modified/adjusted based on the results of the Shaft Samples.

4.0 Laboratory Analytical Methods

Analytical activities will be separated into two phases 1) system flushing assessment phase and 2) drinking water compliance phase.

1) System flushing will be performed in a phased approach moving from west to east across JBPHH progressing through the primary impacted areas. Analytical samples will be collected during the system flushing to assess progress towards clearing the system of residual JP-5. These samples will be analyzed for a JP-5-focused analyte list via SW-846 analytical methods for rapid assessment of the how the flush program is progressing. In general, an impacted area will move to the compliance phase after a minimum of three volumes[3] of water has been flushed through the specific impacted area.

[3] The flushing volume may be adjusted up or down based on site-specific information. For example, potentially impacted areas located more westerly in the system will generally require less flushing than potentially impacted areas located in the eastern area of the system.

2) During the compliance portion of the assessment (i.e., following System flushing and purification/decontamination of system piping and appurtenances), drinking water samples will be analyzed by United States Environmental Protection Agency (EPA) drinking water compliance methods and will include SW-846 methods for total petroleum hydrocarbons (TPH).
3) Will need to identify the different flushing requirements between plumbing materials, residential/office/industrial systems and equipment. May need to expand to include estimated times.

Table 4 and Table 5 present the analytical methods and associated analytes, reporting limits (RLs), and method detection limits (MDLs) along with regulatory standards, including the Federal and State of Hawaii Maximum Contaminant Levels (MCLs) and the State of Hawaii Environmental Action Levels (EALs), for drinking water and SW-846 analytical methods, respectively.

Weck Laboratories Inc. (Weck) is the primary laboratory providing analytical services for this drinking water effort. Weck is certified by the State of Hawai‘i to analyze drinking water samples for EPA Methods 524.2, 525.2, 200.8 and 245.1. While Weck does not hold drinking water certification in Hawai‘i for Method 524.2M, they are accredited for this method in the State of California (CA). Weck is a Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) accredited laboratory, however they are not accredited for TPH-g by 8260 and TPH-d/o by 8015 by this program. The laboratory maintains CA ELAP accreditation for those methods. The laboratory address is:

Weck Laboratories Inc.
14895 Clark Ave.
Industry, CA 91745
POC - Agustin Pierri, Technical Director 626.336.2139x128

All analytical required supplies, sample containers and preservatives and shipping supplies shall be provided by the analytical laboratory.

Table 4: Summary of Drinking Water Analytical Methods, Analytes, Action Levels, and Detection Limits

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Project Screening Level (µg/L)	Weck RL (TBD) (µg/L)	Weck MDL (TBD) (µg/L)
524.2	Benzene	71-43-2	5/5	5	5	TBD	TBD
524.2	Ethylbenzene	100-41-4	700/700	7.3	7.3	TBD	TBD
524.2	Toluene	108-88-3	1000/1000	9.8	9.8	TBD	TBD
524.2	m,p-Xylenes	1330-20-7	10000/10000	13	13	TBD	TBD
524.2	o-Xylenes	95-47-6	10000/10000	13	13	TBD	TBD
525.2	1-Methylnaphthaele	90-12-0	—	10	10	TBD	TBD
525.2	2-Methylnaphthaele	91-57-6	—	10	10	TBD	TBD

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Project Screening Level (µg/L)	Weck RL (TBD) (µg/L)	Weck MDL (TBD) (µg/L)
525.2	Naphthalene	91-20-3	—	17	17	TBD	TBD
200.8	Lead	7439-92-1	15	5.6	5.6	TBD	TBD
TBD	2-(2-methoxyethoxy) ethanol	111-77-3	80[a]	—	80	TBD	TBD
8260	TPH-Gasoline	Gas	—	300	300	TBD	TBD
8015	TPH-Diesel	Diesel	—	400	400	TBD	TBD
8015	TPH-Oil	Oil	—	500	500	TBD	TBD

Notes:

[a.] 2-(2-methoxyethoxy) ethanol does not have an MCL or EAL, the value provided is the USEPA Regional Screening Level

MCLs: DOH Safe Drinking Water Branch (SDWB) regulatory constituents

DOH EALs: Table D-1a (Drinking Water, Surface Water <150 meters) (DOH 2017)

This list may be modified/adjusted based on the results of the Shaft Samples.

Table 5: Summary Drinking Water Analytical Methods, Analytes, Action Levels, and Detection Limits

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Project Screening Level (µg/L)	Weck MDL (TBD)	Weck RL (TBD)
More information to be provided when it becomes available.							
524.3	Dibromochloropropane (DBCP)	96-12-8	0.2/0.2	0.04	0.04	TBD	TBD
524.3	Ethylene dibromide (EDB)	106-93-4	0.05/NA	0.04	0.04	0.0029	0.02
524M	1,2,3-Trichloropropane (TCP)	96-18-4	0.6/NA	0.6	0.6	0.0012	0.005
524.2	1,1,1-Trichloroethane	71-55-6	200/200	11	11	0.26	0.5
524.2	1,1,2-Trichloroethane	79-00-5	5/3	5	5	0.19	0.5
524.2	1,1-Dichloroethylene	75-35-4	7/7	7	7	0.27	0.5
524.2	1,2,4-Trichlorobenzene	120-82-1	70/70	70	70	0.17	0.5
524.2	1,2-Dichlorobenzene	95-50-1	600/600	10	10	TBD	TBD
524.2	1,2-Dichloroethane	107-06-2	5/5	5	5	0.24	0.5
524.2	1,2-Dichloropropane	78-87-5	5/5	5	5	0.13	0.5
524.2	1,4-Dichlorobenzene	106-46-7	75/NA	5	5	TBD	TBD
524.2	Benzene	71-43-2	5/5	5	5	0.15	0.5
524.2	Carbon tetrachloride	56-23-5	5/5	5	5	0.27	0.5
524.2	Chlorobenzene	108-90-7	100/100	25	25	0.15	0.5
524.2	cis-Dichloroethylene	156-59-2	70/70	70	70	0.25	0.5
524.2	Dichloromethane	75-09-2	5/5	5	5	0.3	0.5
524.2	Ethylbenzene	100-41-4	700/700	7.3	7.3	0.21	0.5
524.2	Styrene	100-42-5	100/100	10	10	0.19	0.5
524.2	Tetrachloroethylene	127-18-4	5/5	5	5	0.18	0.5
524.2	Toluene	108-88-3	1000/1000	9.8	9.8	0.29	0.5
524.2	trans-Dichloroethylene	156-60-5	100/100	100	100	0.26	0.5
524.2	Trichloroethylene	79-01-6	5/5	5	5	0.18	0.5
524.2	Vinyl chloride	75-01-4	2/2	2	2	0.18	0.5
524.2	m,p-Xylenes	1330-20-7	10000/10000	13	13	0.33	0.52
524.2	o-Xylenes	95-47-6	10000/10000	13	13	0.2	0.52
525.2	Alachlor	15972-60-8	2/2	—	2	TBD	TBD
525.2	Atrazine	1912-24-9	3/3	3	3	TBD	TBD
525.2	Benzo[a]pyrene	50-32-8	0.2/0.2	0.06	0.06	TBD	TBD
525.2	Chlordane	12789-03-6	2/2	0.004	0.004	TBD	TBD
525.2	Di(2-ethylhexyl)adipate	103-23-1	400/400	—	400	TBD	TBD
525.2	Di(2-ethylhexyl)phthalate	117-81-7	6/6	3	3	TBD	TBD
525.2	Endrin	72-20-8	2/2	0.0023	0.0023	TBD	TBD
525.2	Heptachlor	76-44-8	0.4/0.4	0.0036	0.0036	TBD	TBD

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Project Screening Level (µg/L)	Weck MDL (TBD)	Weck RL (TBD)
More information to be provided when it becomes available.							
525.2	Heptachlor Epoxide	1024-57-3	0.2/0.2	0.0036	0.0036	TBD	TBD
525.2	Hexachlorobenzene	118-74-1	1/1	0.0003	0.0003	TBD	TBD
525.2	Hexachlorocyclopentadiene	77-47-4	50/50	—	50	TBD	TBD
525.2	Lindane	58-89-9	0.2/0.2	0.063	0.063	TBD	TBD
525.2	Methoxychlor	72-43-5	40/40	0.03	0.03	TBD	TBD
525.2	PCBs (as Aroclors)	1336-36-3	0.5/0.5	—	0.5	TBD	TBD
525.2	Pentachlorophenol	87-86-5	1/1	1	1	TBD	TBD
525.2	Simazine	122-34-9	4/4	4	4	TBD	TBD
200.8	Antimony	7440-36-0	6	6	6	0.09	0.5
200.8	Arsenic	7440-38-2	10	10	10	0.07	0.4
200.8	Barium	7440-39-3	2000	220	220	0.14	1
200.8	Beryllium	7440-41-7	4	0.66	0.66	0.06	0.1
200.8	Cadmium	7440-43-9	5	3	3	0.04	0.2
200.8	Chromium	7440-47-3	100	11	11	TBD	TBD
200.8	Copper	7440-50-8	1300	2.9	2.9	0.23	0.5
200.8	Lead	7439-92-1	15	5.6	5.6	0.8	0.2
245.1	Mercury	7487-94-7	2	0.025	0.025Met	TBD	TBD
200.8	Selenium	7782-49-2	50	5	5	0.07	0.4
200.8	Thallium	7440-28-0	2	2	2	0.02	0.2

Notes:
This list may be modified/adjusted based on the results of the Shaft Samples.

Table 6: Summary SW-846: 8260 Analytical Methods, Analytes, Action Levels, and Detection Limits

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Project Screening Level (µg/L)	Limit of Detection (µg/L)	Limit of Quantification (µg/L)
8260	Acetone	67-64-1					
8260	Benzene	71-43-2					
8260	Bromodichloromethane	75-27-4					
8260	Bromoform	75-25-2					
8260	Bromomethane	74-83-9					

8260	Carbon Disulfide	75-15-0					
8260	Carbon Tetrachloride	56-23-5					
8260	Chlorobenzene	108-90-7					
8260	Chloroform	67-66-3					
8260	Chloromethane	74-87-3					
8260	Dibromochloromethane	124-48-1					
8260	Dichloroethane, 1,1-	75-34-3					
8260	Dichloroethane, 1,2-	107-06-2					
8260	Dichloroethene, 1,1-	75-35-4					
8260	Dichloroethylene, 1,2- (Mixed Isomers)	540-59-0					
8260	Dichloromethane	75-09-2					
8260	Dichloropropane, 1,2-	78-87-5					
8260	Dichloropropene, Cis-1,3-	10061-01-5					
8260	Dichloropropene, Trans-1,3-	10061-02-6					
8260	Ethyl Benzene	100-41-4					
8260	Ethyl Chloride	75-00-3					
8260	Hexanone, 2-	591-78-6					
8260	Methyl Ethyl Ketone	78-93-3					
8260	Methyl Isobutyl Ketone	108-10-1					
8260	Styrene	100-42-5					
8260	Tetrachloroethane, 1,1,2,2-	79-34-5					
8260	Tetrachloroethylene	127-18-4					
8260	Toluene	108-88-3					
8260	Trichloroethane, 1,1,1-	71-55-6					
8260	Trichloroethane, 1,1,2-	79-00-5					
8260	Trichloroethylene	79-01-6					
8260	Vinyl Chloride	75-01-4					
8260	Xylenes	1330-20-7					

Notes:
This list may be modified/adjusted based on the results of the Shaft Samples.

Table 7: Summary SW-846: 8270 Analytical Methods, Analytes, Action Levels, and Detection Limits

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Project Screening Level (µg/L)	Limit of Detection (µg/L)	Limit of Quantification (µg/L)
8270	Acenaphthene	83-32-9					
8270	Acenaphthylene	208-96-8					
8270	Anthracene	120-12-7					
8270	Benzo(a)anthracene	56-55-3					
8270	Benzo(a)pyrene	50-32-8					
8270	Benzo(b)fluoranthene	205-99-2					
8270	Benzo(g,h,i)perylene	191-24-2					
8270	Benzo(k)fluoranthene	207-08-9					
8270	Bis(2-Chloroethoxy)methane	111-91-1					
8270	Bis(2-ethylhexyl)Phthalate (DEHP)	117-81-7					
8270	Bis(Chloroethyl)ether	111-44-4					
8270	Bromodiphenyl ether, 4-	101-55-3					
8270	Butyl Benzyl Phthalate, N-	85-68-7					
8270	Carbazole	86-74-8					
8270	Chloro-3-methylphenol, 4-	59-50-7					
8270	Chloroaniline, 4-	106-47-8					
8270	Chloronaphthalene, 2-	91-58-7					
8270	Chlorophenol, 2-	95-57-8					
8270	Chlorophenyl-phenyl ether, 4-	7005-72-3					
8270	Chrysene	218-01-9					
8270	Dibenz(a,h)anthracene	53-70-3					
8270	Dibenzofuran	132-64-9					
8270	Dibutyl Phthalate	84-74-2					
8270	Dichlorobenzene, 1,2-	95-50-1					
8270	Dichlorobenzene, 1,3-	541-73-1					
8270	Dichlorobenzene, 1,4-	106-46-7					
8270	Dichlorobenzidine, 3,3'	91-94-1					

8270	Dichlorophenol, 2,4-	120-83-2					
8270	Diethyl Phthalate	84-66-2					
8270	Dimethyl Phthalate	131-11-3					
8270	Dimethylphenol, 2,4-	105-67-9					
8270	Dinitro-o-Cresol, 4,6-	534-52-1					
8270	Dinitrophenol, 2,4-	51-28-5					
8270	Dinitrotoluene, 2,4-	121-14-2					
8270	Dinitrotoluene, 2,6-	606-20-2					
8270	Di-n-Octylphthalate	117-84-0					
8270	Fluoranthene	206-44-0					
8270	Fluorene	86-73-7					
8270	Hexachlorobenzene	118-74-1					
8270	Hexachlorobutadiene	87-68-3					
8270	Hexachlorocyclopentadiene	77-47-4					
8270	Hexachloroethane	67-72-1					
8270	Indeno(1,2,3-cd)pyrene	193-39-5					
8270	Isophorone	78-59-1					
8270	Methylphenol, 2-	95-48-7					
8270	Methylphenol, 4-	106-44-5					
8270	Naphthalene	91-20-3					
8270	Nitroaniline, 2-	88-74-4					
8270	Nitroaniline, 3-	99-09-2					
8270	Nitroaniline, 4-	100-01-6					
8270	Nitrobenzene	98-95-3					
8270	Nitrophenol, 4-	100-02-7					
8270	Nitrosodi-N-propylamine, N-	621-64-7					
8270	Nitrosodiphenylamine, N-	86-30-6					
8270	Pentachlorophenol	87-86-5					
8270	Phenanthrene	85-01-8					
8270	Phenol	108-95-2					
8270	Pyrene	129-00-0					
8270	Trichlorobenzene, 1,2,4-	120-82-1					

8270	Trichlorophenol, 2,4,5-	95-95-4					
8270	Trichlorophenol, 2,4,6-	88-06-2					

Notes:
This list may be modified/adjusted based on the results of the Shaft Samples.

5.0 Field Sampling Standard Operating Procedures

These sampling activities shall be conducted in accordance with standard operating procedures (SOPs) presented in Appendix C.

6.0 Data Quality

Field quality control (QC) samples will be collected during each sampling event to include field duplicates, field reagent blanks, and trip blanks. Field duplicates will be collected at a frequency of 10 percent the number of the normal samples and field reagent blanks, and trip blanks will be collected for daily for each sampling event in accordance to the procedures described in NAVFAC Pacific Environmental Restoration Program Project Procedure III-B, *Field QC Samples* (Water, Soil) (DON 2015) and as specified in the respective Drinking Water methods.

The analytical laboratory will report non-detected results to the method reporting limit and detections down to the method detection limit.

Level 4 data validation packages will be provided by the laboratory for all samples that are collected. Ten (10%) of the Drinking Water Compliance samples will undergo Level 4 data validation by an independent validated (i.e., the validator will be independent of the laboratory who performed the analyses). This percentage of samples requiring Level 4 validation may be increased if depending on the number, type, and severity of corrective actions that are identified by the data validator.

7.0 References

Department of Health, State of Hawaii (DOH). 2017. *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater, Hawai‘i Edition*. Hazard Evaluation and Emergency Response. Revised 2017. Fall.

Department of the Navy (DON). 2015. *Final Project Procedures Manual, U.S. Navy Environmental Restoration Program, NAVFAC Pacific*. JBPHH HI: Naval Facilities Engineering Command, Pacific. May.

Appendix A - Sampling Locations

Sampling Locations

NAVFAC HI SITE NO.	STATE ID NO.	SDWIS Sample Pt ID	Address, location	Area	SAMPLE DATES	DAY OF THE WEEK
A200	360-336	TC336	1191 Honu Loop	McGrew Point	12/09/21	Thursday
A200D	360-338	TC338	1207 Honu Loop	McGrew Point	12/09/21	Thursday
A200U	360-337	TC337	1177 Honu Loop	McGrew Point	12/09/21	Thursday
A201	360-339	TC339	657 McGrew Loop	McGrew Point	12/09/21	Thursday
A201D	360-341	TC341	679 McGrew Loop	McGrew Point	12/09/21	Thursday
A201U	360-340	TC340	635 McGrew Loop	McGrew Point	12/09/21	Thursday
A101	360-304	TC304	6181 Ibis Ave	Iroquois Point	12/10/21	Friday
A101D	360-305	TC305	5019 Iroquois Pt	Iroquois Point	12/10/21	Friday
A104	360-361	TC361	6666B 106th Street	Iroquois Point	12/10/21	Friday
A104D	360-363	TC363	6660B 106th Street	Iroquois Point	12/10/21	Friday
A104U	360-362	TC362	6674 106th Street	Iroquois Point	12/10/21	Friday
A107D	360-235	TC235	5534 Bittern Avenue	Iroquois Point	12/10/21	Friday
A109	360-364	TC364	5673 Dovekie Avenue	Iroquois Point	12/10/21	Friday
A109D	360-366	TC366	5669A Dovekie Avenue	Iroquois Point	12/10/21	Friday
A109U	360-365	TC365	5682 Dovekie Avenue	Iroquois Point	12/10/21	Friday
A101U	360-092	TC092	5012A Iroquois Ave	Iroquois Point	12/13/21	Monday
A102	360-217	TC217	5861 Fulmar Avenue	Iroquois Point	12/13/21	Monday
A102D	360-219	TC219	5856B Fulmar Avenue	Iroquois Point	12/13/21	Monday
A102U	360-218	TC218	5869 Fulmar Avenue	Iroquois Point	12/13/21	Monday
A103	360-220	TC220	6176 Heron Avenue	Iroquois Point	12/13/21	Monday
A103D	360-222	TC222	6168 Heron Avenue	Iroquois Point	12/13/21	Monday
A103U	360-221	TC221	6365 Ibis Avenue	Iroquois Point	12/13/21	Monday
A107	360-233	TC233	5537 Bittern Avenue	Iroquois Point	12/13/21	Monday
A107U	360-234	TC234	5548 Bittern Avenue	Iroquois Point	12/13/21	Monday
A100	360-171	TC171	Bldg. 300, Block-A, BEQ	Puuloa	12/14/21	Tuesday
A100D	360-215	TC215	Bldg 303, BEQ	Puuloa	12/14/21	Tuesday
A100U	360-214	TC214	4755D East Ekahi Way	Puuloa	12/14/21	Tuesday
A108	360-236	TC236	4973B Kela Place	Puuloa	12/14/21	Tuesday
A108D	360-238	TC238	4976D Kela Place	Puuloa	12/14/21	Tuesday
A108U	360-237	TC237	4974D Kela Place	Puuloa	12/14/21	Tuesday
A150	360-368	TC368	7377 Birch Circle	Manana	12/15/21	Wednesday
A150D	360-367	TC367	7370 Birch Circle	Manana	12/15/21	Wednesday
A150U	360-448	TC448	7384 Birch Circle Bldg	Manana	12/15/21	Wednesday
A352D	360-449	TC449	444 Kuahua Avenue	Manana	12/15/21	Wednesday
A400U	360-450	TC450	Building 1338 Fitness Center	Manana	12/15/21	Wednesday
A154	360-230	TC230	1402 Laniwai Avenue	Pearl City	12/16/21	Thursday
A154D	360-232	TC232	1619 Aloha Avenue	Pearl City	12/16/21	Thursday
A154U	360-231	TC231	1406 Laniwai Avenue	Pearl City	12/16/21	Thursday
A155	360-312	TC312	1824 Palm Avenue	Pearl City	12/16/21	Thursday
A155D	360-314	TC314	1813 Palm Avenue	Pearl City	12/16/21	Thursday
A155U	360-313	TC313	1838 Palm Avenue	Pearl City	12/16/21	Thursday

A156	360-315	TC315	128 Ley Court	Pearl City	12/16/21	Thursday
A156D	360-317	TC317	134 Ley Court	Pearl City	12/16/21	Thursday
A156U	360-316	TC316	148 Ley Court	Pearl City	12/16/21	Thursday
A202	360-240	TC240	2891D Makuu Loop	Halawa Hsg	12/17/21	Friday
A202D	360-242	TC242	2899C Makuu Loop	Halawa Hsg	12/17/21	Friday
A202U	360-241	TC241	2879A Hapue Loop	Halawa Hsg	12/17/21	Friday
A203	360-057	TC057	2856A Kokio Loop	Halawa Hsg	12/17/21	Friday
A203D	360-059	TC059	2862A Kokio Loop	Halawa Hsg	12/17/21	Friday
A203U	360-058	TC058	2850A Kokio Loop	Halawa Hsg	12/17/21	Friday
A304	360-433	TC433	2165 Baugh Road	Camp Smith	12/18/21	Monday
A304D	360-434	TC434	739 Anderson Road	Camp Smith	12/18/21	Monday
A304U	360-014	TC014	2173 Baugh Road	Camp Smith	12/18/21	Monday
A305	360-252	TC252	Bldg 1B	Camp Smith	12/18/21	Monday
A305D	360-374	TC374	Bldg 612, Fire Station	Camp Smith	12/18/21	Monday
A305U	360-373	TC373	Bldg 4	Camp Smith	12/18/21	Monday
A306	360-254	TC254	Bldg 20	Camp Smith	12/18/21	Monday
A306D	360-255	TC255	Across Bldg 2C	Camp Smith	12/18/21	Monday
A306U	360-011	TC011	Bldg. 601 (PMO) Elrod Road	Camp Smith	12/18/21	Monday

Appendix B – Project Schedule

12/9/2021
Team 1
6181 Ibis Ave
5019 Iroquois Point
6666B 106th Street
6660B 106th Street
5424 Edgewater Drive

Team 2
6674 106th Street
5534 Bittern Avenue
5673 Dovekie Avenue
4908 Mokupea Place Apt. B

Team 3
Aiea Halawa Shaft
Storage Tank #1
Storage Tank #2

Team 4
Halawa Correctional Facility

12/10/2021
Team 1
5682 Dovekie Avenue
5012A Iroquois Avenue
5861 Fulmar Avenue
5869 Fulmar Avenue
4976 Kela Place Apt B

Team 2
7273 Elm Place
3763 Elm Drive
5321 Cedar Drive
7257 Birch Circle
7236 Birch Circle

12/11/2021
Team 1
6176 Heron Avenue
6168 Heron Avenue
6365 Ibis Avenue
5537 Bittern Avenue
5548 Bittern Avenue

Team 2
4906 Wasp Boulevard
4682 Oklahoma Avenue
2031 Fox Boulevard
4623 Scott Loop
732 Sibley Street
767 Sibley Street

12/12/2021
Team 1
Bldg. 300, Block-A, BEQ
4755D East Ekahi Way
4973B Kela Place
4975D Kela Place
4974D Kela Place

Team 2
7377 Birch Circle
7370 Birch Circle
7384 Birch Circle
444 Kuahau Avenue
Bldg. 1338 Fitness Center

Appendix C - Standard Operating Procedures

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1.0 TITLE: SOP 016 – Sampling Drinking Water for Volatile Organic Compounds (VOCs) and Total Trihalomethanes (TTHMs)

2.0 REFERENCE MATERIALS:

2.1 "DoD Environmental Field Sampling Handbook." Revision 1.0. April 2013.

2.2 40 CFR 141, National Primary Drinking Water Regulations

2.3 U.S. EPA. 2016. "Quick Guide to Drinking Water Sample Collection," 2nd Edition, Update. Golden, CO.

2.4 U.S. EPA. 1995. "Method 524.2: Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry." Revision 4.1. Cincinnati, OH.

3.0 SCOPE:

This procedure describes the sampling procedure for the analysis of drinking water by EPA Method 524.2, revision 4.1, for volatile organic compounds (VOCs) and total trihalomethanes (TTHMs). If other analytical methods are to be used by a laboratory, sampling requirements such as bottle type, preservation, and hold time must be verified with the laboratory. This procedure is written to the most stringent sampling requirements as a precaution.

4.0 PRESERVATION AND HOLDING TIME:

Samples must be collected in three 40 mL amber volatile organic analysis (VOA) glass vials with Teflon®-coated septum-caps. Vials received from the laboratory must contain ascorbic acid to dechlorinate the sample. DO NOT rinse the bottles prior to sample collection. A small bottle or vial containing hydrochloric acid (HCl) must accompany the sample bottle to the field so the pH can be adjusted to < 2 immediately following collection of the sample and dissolution of the ascorbic acid. Collected samples must contain no headspace prior to shipping. Samples must be protected from light and chilled to 4 °C prior to shipping. If properly preserved, the sample holding time is 14 days from the time of sampling to analysis.

5.0 SHIPPING:

Samples must be chilled during shipment to maintain a temperature of 4 °C during transit. Ensure the chain of custody is properly filled out, sealed in a sealable bag, and taped to the inside of the cooler with the samples. Coolers should be lined generously with packing materials. All sample bottles should have an affixed label and wrapped in bubble wrap for shipping. After samples are placed in the cooler, pack all remaining space inside the cooler with ice to maintain temperature. Prior to sampling, coordinate with the laboratory to verify hours of operations to ensure compliance with holding times once shipped. DO NOT sample if the laboratory is unable to receive sample shipment. Notify the laboratory to confirm shipment. For internal use, maintain tracking numbers to verify shipment arrival and compliance with the holding time. Samples should not be frozen at any point during sampling, shipment, and storage at the laboratory.

6.0 EQUIPMENT AND SUPPLIES:

6.1 Sample vials – three 40 mL amber VOA glass vials with Teflon®-coated septum-caps, containing ascorbic acid with an affixed label

6.2 Small bottles/vials containing 1:1 HCl

NOTE: HCl is an acid and should be handled with extreme care and using personal protective equipment. Consult the MSDS for additional handling information.

6.3 Indelible Ink Pen

6.4 Disposable Pipets

6.5 Field Logbook

6.6 Clipboard

6.7 Gloves

6.8 Safety Glasses

6.9 Chain of Custody

6.10 Chain of Custody Seals

6.11 Bubble Wrap

6.12 Packing Tape

6.13 Cooler

6.14 Frozen Ice Packs, frozen for two days prior to use

6.15 Paper Towels

6.16 Sealable Bags – i.e., Ziploc®

7.0 PROCEDURE:

7.1 Prior to the Day of Sampling:

7.1.1 At least two days prior to sample collection, place the ice packs in the freezer.

7.1.2 Ensure that all items in Section 6.0 have been obtained and are ready for transport into the field. Verify the number of vials available is equal to the number of samples to be collected x3, plus six additional vials for quality control samples. Additionally, extra sample vials should be included to account for sampling errors that may occur in the field.

7.1.3 Confirm that the sample vials contain ascorbic acid.

7.1.4 Ensure there are equal numbers of bottles/vials of HCl for each sample bottle to be collected.

7.1.5 Verify that all sample coolers are lined generously with packing material.

7.1.6 Coordinate with the laboratory to verify hours of operation to ensure compliance with holding times once shipped. Notify the laboratory to confirm shipment.

7.1.7 Verify there is a packet of bubble wrapped triplicate blanks in the cooler in which these samples will be sent. DO NOT OPEN THIS PACKET.

7.2 Day of Sampling:

7.2.1 Sampling personnel must wear safety glasses and gloves during the sampling process.

7.2.2 Remove the faucet aerator, strainer, or hose prior to turning on the faucet for sampling. Before collecting the sample, purge the faucet using the cold water spigot for a minimum of 10 minutes to allow the temperature to stabilize.

7.2.3 Adjust the flow rate to approximately 500 mL/minute (approximately 1/8th inch diameter stream or the width of a pencil). Do not change the water flow once sample collection has begun.

7.2.4 Collection of VOC Samples:

7.2.4.1 Select the sample vials identified for "VOC" on the affixed label. These are three 40 mL amber VOA glass vials with Teflon®-coated septum-caps containing ascorbic acid. Each sample is collected in triplicate.

7.2.4.2 Do not remove the septum-cap until immediately before sampling. Remove the septum-cap avoiding contact with the rim or inside of the vial. Do not set the septum-cap, open side down, on any surface or put it in a pocket. It is best to hold the cap in a gloved hand while sampling. DO NOT RINSE THE SAMPLE VIAL PRIOR TO USE.

7.2.4.3 Hold the open end of the vial away from you and place the vial under the spigot tilted so that the sample runs down the inside of the vial. Fill the vial to the top, but with a concave meniscus, NOT CONVEX. Do not allow the vial to overflow or spill over and do not agitate. Be aware of any unusual odor or physical characteristics (e.g., particulate, color) associated with the water coming from the spigot.

7.2.4.4 Replace the septum-cap securely on the vial and gently tip the vial several times to dissolve the ascorbic acid in the sample. Ensure the ascorbic acid is completely dissolved and the sample is thoroughly mixed before continuing.

7.2.4.5 Using a disposable pipet, add two drops of 1:1 HCl to the vial. If the meniscus is not convex, add more sample to create a convex meniscus, but do not overflow the sample.

7.2.4.6 If the sample foams vigorously after adding HCl, discard that sample and collect three new samples without adding the HCl. Notate this on the chain of custody form and the affixed label.

7.2.4.7 Immediately cap the vial so that the Teflon®-coated septum-cap contacts the sample. Some samples may overflow while tightening the cap. Tip the vial gently two or three times to distribute the HCl.

7.2.4.8 Turn the vial over and tap it to check for the presence of bubbles (headspace).

7.2.4.8.1 If bubbles are present, and the total volume of the bubbles is < 5 mm in diameter (roughly the size of a pea), the sample may be submitted.

7.2.4.8.2 If the total volume of the bubbles is > 5 mm in diameter, discard the vial and repeat steps 7.2.4.1 to 7.2.4.8.

7.2.4.9 Repeat Steps 7.2.4.1 through 7.2.4.8 two more times, resulting in a total of three 40 mL vials for one sample.

7.2.4.10 Rubber band the three vials together for each location. For each set of three vials, label the vials 1 of 3, 2 of 3, and 3 of 3. This set of three vials is one sample.

7.2.5 Collection of TTHM Samples:

7.2.5.1 Select the sample vials identified for "TTHM" on the affixed label. These are three 40 mL amber VOA glass vials with Teflon®-coated septum-caps containing ascorbic acid. Each sample is collected in triplicate.

7.2.5.2 Follow steps 7.2.4.2 through 7.2.4.10 for the collection of TTHM samples.

7.2.6 Dry the exterior surface of the collected sample using a clean paper towel.

7.2.7 Fill out the vial labels with the sample ID (limited to 20 characters including dashes and spaces), sample location, sampler's initials, and date and time of collection. Record the collection date as Day/Month (three letter abbreviation)/Year (four digits) (e.g., 01 Jan 2020). Time must be recorded as coordinated universal time (UTC) ± *x* hours depending on the time zone. Record all of this information in the field logbook as well.

7.2.8 Complete the chain of custody form. It is recommended, but not required, that a chain of custody seal is affixed to the vials and caps. This is required only if

samples are sent via commercial carrier without being accompanied by a formal chain of custody form. Note any observations on the chain of custody form and field logbook such as any unusual odors or physical characteristics of the sample.

7.2.9 Wrap the sample with bubble wrap and tape. Place each sample in its own sealable bag. Immediately place the collected sample into a cooler that has been adequately lined with packing material and contains ice. Close cooler to ensure temperature stability. Keep the cooler closed at all times when samples are not being added.

Repeat Steps 7.2.4 through 7.2.9 for any additional samples or quality control samples. At a minimum, one location per sampling event will be designated as the location for an additional six samples to be collected. These are quality control samples and are taken in exactly the same manner as the other samples.

1.0 TITLE: SOP 006 – Sampling Drinking Water for Semi-volatiles

2.0 REFERENCE MATERIALS:

2.1 DoD Environmental Field Sampling Handbook

2.2 40 CFR 141, National Primary Drinking Water Regulations

2.3 U.S. EPA. 1995. "Method 525.2: Determination of Organic Compounds in Drinking Water by Liquid-Solid Extraction and Capillary Column Gas Chromatography/Mass Spectrometry," Revision 2.0. Cincinnati, OH.

3.0 SCOPE:

This procedure describes the sampling procedure for the analysis of drinking water by EPA Method 525.2, Revision 2.0, for semi-volatiles. If other analytical methods are to be used by a laboratory, sampling requirements such as bottle type, preservation, and hold time must be verified with the laboratory. This procedure is written to the most stringent sampling requirements as a precaution.

4.0 PRESERVATION AND HOLDING TIME:

Samples must be collected in 1 L amber glass bottles fitted with Teflon®-lined caps. Bottles received from the laboratory must contain sodium sulfite to dechlorinate the sample. DO NOT rinse the bottles prior to sample collection. A small bottle or vial containing 5 mL of 6 N hydrochloric acid (HCl) must accompany the sample bottle to the field so the pH can be adjusted to <2 immediately following collection of the sample and dissolution of the sodium sulfite. Samples must be protected from light and chilled to 4 °C prior to shipping. If properly preserved, the sample holding time is 14 days from the time of sampling to analysis with the exception of the following analytes: carboxin, diazinon, disulfoton, disulfoton sulfoxide, fenamiphos, and terbufos. If the sample is to be analyzed for any of the analytes previously listed, the sample must be extracted immediately after collection and preservation.

If the sample is to be analyzed for cyanazine, a separate sample must be collected. Samples for cyanazine analysis must be collected in 1 L amber glass bottles fitted with Teflon®-lined caps that DO NOT contain sodium sulfite and are not preserved with HCl. The cyanazine sample must be protected from light and chilled to 4 °C prior to shipping. The sample holding time is 14 days from the time of sampling to analysis.

If the sample is to be analyzed for atraton and/or prometon, a separate sample must be collected. Samples for atraton and/or prometon analysis must be collected in 1 L amber glass bottles fitted with Teflon®-lined caps that contain sodium sulfite but are NOT preserved with HCl. The atraton and/or prometon sample must be protected from light and chilled to 4 °C prior to shipping. The sample holding time is 14 days from the time of sampling to analysis.

5.0 SHIPPING:

Samples must be chilled during shipment to maintain a temperature of 4 °C during transit. Ensure the chain of custody is properly filled out, sealed in a sealable bag, and taped to the inside of the cooler with the samples. Coolers should be lined generously with packing materials. All sample bottles should have an affixed label and wrapped in bubble wrap for shipping. After samples are placed in the cooler, pack all remaining space inside the cooler with ice to maintain temperature. Prior to sampling, coordinate with the laboratory to verify hours of operations to ensure compliance with holding times once shipped. DO NOT sample if the laboratory is unable to receive sample shipment. Notify the laboratory to confirm shipment. For internal use, maintain tracking numbers to verify shipment arrival and compliance with the holding time. Samples should not be frozen at any point during sampling, shipment, and storage at the laboratory.

6.0 EQUIPMENT AND SUPPLIES:

6.1 Samples for cyanazine analysis: 1 L amber glass bottles fitted with Teflon®-lined caps that have an affixed label and DO NOT contain sodium sulfite

6.2 Samples for all other semi-volatiles: 1 L amber glass bottles fitted with Teflon®-lined caps that contain sodium sulfite and an affixed label

6.3 Small bottles/vials containing 5 mL of 6 N hydrochloric acid (HCl)

6.4 Indelible Ink Pen

6.5 Field Logbook

6.6 Clipboard

6.7 Gloves

6.8 Safety Glasses

6.9 Chain of Custody

6.10 Chain of Custody Seals

6.11 Bubble Wrap

6.12 Packing Tape

6.13 Cooler

6.14 Frozen Ice Packs, frozen for two days prior to use

6.15 Paper Towels

6.16 Sealable Bags – i.e., Ziploc®

7.0 PROCEDURE:

7.1 Prior to the day of sampling:

7.1.1 At least two days prior to sample collection, place the ice packs in the freezer.

7.1.2 Ensure that all items in Section 6.0 have been obtained and are ready for transport into the field. Verify the number of bottles available is equal to the number of samples to be collected x2, plus four additional bottles for quality control samples. Additionally, extra sample bottles should be included to account for sampling errors that may occur in the field.

7.1.3 Confirm that the sample bottles contain sodium sulfite. If sampling for cyanazine, be sure to take samples bottles that DO NOT contain sodium sulfite.

7.1.4 Ensure there are equal numbers of bottles of HCl for each sample bottle to be collected.

7.1.5 Verify that all sample coolers are lined generously with packing material.

7.1.6 Coordinate with the laboratory to verify hours of operation to ensure compliance with holding times once shipped. Notify the laboratory to confirm shipment.

7.2 Day of sampling:

7.2.1 Sampling personnel must wear safety glasses and gloves during the sampling process.

7.2.2 Remove the faucet aerator, strainer, or hose prior to turning on the faucet for sampling. Before collecting the sample, purge the faucet using the cold water spigot for a minimum of 5 minutes to allow the temperature to stabilize.

7.2.3 Adjust the flow rate to approximately 500 mL/minute (approximately 1/8th inch diameter stream). Do not change the water flow once sample collection has begun.

7.2.4 Select the appropriate sample bottle identified by the affixed label. This is a 1 L amber glass bottle with a Teflon®-lined screw cap containing sodium sulfite (with the exception of samples collected for cyanazine, see Section 6.1).

7.2.5 Do not remove the screw cap until immediately before sampling. Remove the bottle cap avoiding contact with the rim or inside of the bottle. Do not set the cap, open side down, on any surface or put it in a pocket. It is best to hold the cap in gloved hand while sampling. DO NOT RINSE THE SAMPLE BOTTLE PRIOR TO USE.

7.2.6 Hold the open end of the bottle away from you and place the bottle under the spigot tilted so that the sample runs down the inside wall of the bottle. Fill the bottle to within one to two inches from the top (typically this is to the bottom of the bottle neck). Do not allow the bottle to overflow or spill over and do not agitate. Be aware of any odor or physical characteristics (e.g., particulate, color) associated with the water coming from the spigot.

7.2.7 Replace the screw cap securely on the bottle. If sodium sulfite is in the sample bottle, gently tip the bottle several times to dissolve the sodium sulfite in the

sample. Ensure the sodium sulfite is completely dissolved and the sample is thoroughly mixed before continuing.

7.2.8 Dry the exterior surface of the bottle using a clean paper towel.

7.2.9 Fill out the bottle labels with the sample ID (limited to 20 characters including dashes and spaces), sample location, sampler's initials, and date and time of collection. Record the collection date as Day/Month (three letter abbreviation)/Year (four digits) (e.g., 01 Jan 2020). Time must be recorded as coordinated universal time (UTC) ± *x* hours depending on the time zone. Record all of this information in the field logbook as well.

7.2.10 If the collected sample is for cyanazine, atraton, and/or prometon analysis, skip this step and move on to 7.2.11. Otherwise, remove the cap from the sample bottle and pour the entire contents of the small vial containing 5 mL of 6 N hydrochloric acid into the sample. Record the amount added in the field logbook and on the chain of custody form. Cap tightly and invert several times.

7.2.11 Complete the chain of custody form. It is recommended, but not required, that a chain of custody seal is affixed to the bottles and lids. This is required only if samples are sent via commercial carrier without being accompanied by a formal chain of custody form. Note any observations on the chain of custody form and field logbook such as any unusual odors or physical characteristics of the sample.

7.2.12 Wrap sample with bubble wrap and tape. Place each sample in its own zip lock bag. Immediately place collected sample into cooler that has been adequately lined with packing material and contains ice. Close cooler to ensure temperature stability. Keep the cooler closed at all times when samples are not being added.

7.2.13 Repeat Steps 7.2.4 through 7.2.12 for any additional samples or Quality Control samples. At a minimum, one location per sampling event will be designated as the location for an additional two samples to be collected. These

are quality control samples and are taken in exactly the same manner as the other samples.

1.0 TITLE: SOP 001 – Sampling Drinking Water for Metals and Hardness

2.0 REFERENCE MATERIALS:

2.1 "DoD Environmental Field Sampling Handbook." Revision 1.0. April 2013.

2.2 40 CFR 141, National Primary Drinking Water Regulations

2.3 U.S. EPA. 1994. "Method 200.8: Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry," Revision 5.4. Cincinnati, OH. EPA/600/R-94/111.

2.4 U.S. EPA. 1994. "Method 200.7: Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry," Revision 4.4. Cincinnati, OH

2.5 U.S. EPA. 1982. "Method 130.2: Hardness, Total (mg/L as $CaCO_3$) (Titrimetric, EDTA)," Editorial Revision. Cincinnati, OH.

3.0 SCOPE:

This SOP describes the sampling procedure for drinking water samples that will be analyzed by EPA Method 200.8, revision 5.4, for aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, iron, manganese, nickel, selenium, silver, sodium, thallium, and zinc, EPA Method 200.7 for boron, and EPA Method 130.2, editorial revision, for hardness. If other analytical methods are to be used by a laboratory, sampling requirements such as bottle type, preservation, and hold time, must be verified with the laboratory. This method is not to be used for samples that contain lead or copper. This procedure is written to the most stringent sampling requirements as a precaution.

4.0 PRESERVATION AND HOLDING TIME:

Samples must be collected in a 1 L polyethylene (PE) bottle with PE screw caps. Bottles received from the laboratory for sampling will contain nitric acid (HNO_3) to preserve the sample at a pH of < 2. DO NOT rinse the bottles prior to sample collection. If properly acid preserved, samples for metals analysis can be held up to 6 months, at room temperature, before analysis. Samples for metals analysis are not required to be chilled prior to shipping but the

laboratory may require this. Please verify with the laboratory prior to sample collection. If samples require total hardness analysis, then samples must be stored at 4 ℃ following collection.

5.0 SHIPPING:

Samples should be chilled during shipment to maintain a temperature of 1-4 ℃ during transit (omit if not required by the laboratory). Ensure the chain of custody is properly filled out, sealed in a sealable bag, and taped to the inside of the cooler with the samples. Coolers should be lined generously with packing materials. All sample bottles should have an affixed label and wrapped in bubble wrap for shipping. After samples are placed in the cooler, pack all remaining space inside the cooler with ice to maintain temperature (omit if not required by the laboratory). Prior to sampling, coordinate with the laboratory to verify hours of operations to ensure compliance with holding times once shipped. DO NOT sample if the laboratory is unable to receive sample shipment. Notify the laboratory to confirm shipment. For internal use, maintain tracking numbers to verify shipment arrival and compliance with the holding time.

6.0 EQUIPMENT AND SUPPLIES:

6.1 1 L PE bottles with PE screw caps, containing HNO_3 and an affixed label
6.2 Indelible Ink Pen
6.3 Field Logbook
6.4 Clipboard
6.5 Gloves
6.6 Safety Glasses
6.7 Chain of Custody
6.8 Chain of Custody Seals
6.9 Bubble Wrap
6.10 Packing Tape
6.11 Frozen Ice Packs, frozen for two days prior to use
6.12 Cooler
6.13 Sealable Bags – i.e., Ziploc®

6.14 Paper Towels

7.0 PROCEDURE:

7.1 Prior to the day of sampling:

7.1.1 At least two days prior to sample collection, place the ice packs in the freezer.

7.1.2 Ensure that all items in Section 6.0 have been obtained and are ready for transport into the field. Verify the number of bottles available is equal to or greater than the number of samples to be collected plus two additional bottles for quality control samples. Additionally, extra sample bottles should be included to account for sampling errors that may occur in the field.

7.1.3 Confirm that the sample bottles to be used contain preservative and the affixed labels indicate that 5 mL HNO_3 has been added to the bottle.

7.1.4 Verify that all sample coolers are lined generously with packing material.

7.1.5 Coordinate with the laboratory to verify hours of operation to ensure compliance with holding times once shipped. Notify the laboratory to confirm shipment.

7.2 Day of sampling:

7.2.1 Sampling personnel must wear safety glasses and gloves during the sampling process.

7.2.2 Remove the faucet aerator, strainer, or hose prior to turning on the faucet for sampling. Before collecting the sample, purge the faucet using the cold-water spigot for a minimum of 5 minutes to allow the temperature to stabilize.

7.2.3 Adjust the flow rate to approximately 500 mL/minute (approximately $1/8^{th}$ inch diameter stream or the width of a pencil). Do not change the water flow once sample collection has begun.

7.2.4 Select the appropriate sample bottle identified by the affixed label. This bottle is a 1 L PE bottle with a PE screw cap containing HNO_3.

NOTE: The bottle contains acid which is corrosive and can burn; therefore, when filling the bottle, hold the opening of the bottle away from you prior to and during sampling.

7.2.5 Remove the bottle cap while avoiding all contact with the rim or inside of the bottle. Do not set the cap, open side down, on any surface or put it in a pocket. It is best to hold the cap in a gloved hand while sampling. DO NOT RINSE SAMPLE BOTTLES.

7.2.6 Hold the open end of the bottle away from you and place the bottle under the spigot tilted so that the sample runs down the inside wall of the bottle. Fill the bottle to within one to two inches from the top (typically this is to the bottom of the bottle neck). Do not allow the bottle to overflow or spill over and do not agitate. Be aware of any odor or physical characteristics (e.g., particulate, color) associated with the water coming from the spigot.

7.2.7 Replace the screw cap securely on the bottle and gently tip the bottle several times to mix the preservative with the sample.

7.2.8 Dry the exterior surface of the bottle using a clean paper towel.

7.2.9 Fill out the bottle labels with the sample ID (limited to 20 characters including dashes and spaces), sample location, sampler's initials, and date and time of collection. Record the collection date as Day/Month (three letter abbreviation)/Year (four digits) (e.g., 01 Jan 2020). Time must be recorded as coordinated universal time (UTC) ± *x* hours depending on the time zone. Record all of this information in the field logbook as well.

7.2.10 Complete the chain of custody form. It is recommended, but not required, that a chain of custody seal is affixed to the bottles and lids. This is required only if samples are sent via commercial carrier without being accompanied by a formal chain of custody form. Note any observations on the chain of custody and field logbook such as any unusual odors or physical characteristics of the sample.

7.2.11 Wrap the sample with bubble wrap and tape. Place each sample in its own sealable bag. Immediately place collected sample into cooler that has been adequately lined with packing material and contains ice (omit if not required by the laboratory). Close cooler to ensure temperature stability. Keep the cooler closed at all times when samples are not being added.

7.2.12 Repeat Steps 7.2.4 through 7.2.11 for any additional samples or quality control samples. At a minimum, one location per sampling event will be designated as the location for an additional two samples to be collected. These are quality control samples and are taken in exactly the same manner as the other samples.