DEPARTMENT OF THE NAVY
COMMANDER
NAVY REGION HAWAII
NAVY CLOSURE TASK FORCE-RED HILL
850 TICONDEROGA ST STE 110
JBPHH HI 96860-5101

5740
Ser N00/142
November 27, 2024

Jamie Marincola
Red Hill Enforcement Coordinator
US EPA, Region 9
75 Hawthorne Street
San Francisco, CA 94105

Dear Mr. Marincola:

SUBJECT: REQUESTED REDACTIONS ON U.S. ENVIRONMENTAL PROTECTION AGENCY FIELD SAMPLING AUDIT REPORT

The Navy is in receipt of the Field Sampling Audit Report performed by the U.S. Environmental Protection Agency, Region 9 (EPA) and submitted to the Navy on November 14, 2024. The field audit ensured the Navy's drinking water sampling teams compliance with sampling Standard Operating Procedures (SOPs) and Best Practices while also gathering split samples for analysis at the EPA Region 9 Laboratory.

The EPA requested the Navy to respond within 10 business days of the letter if the Navy identifies any information that may be considered Controlled Unclassified Information. Included with this letter as enclosure (1) is the Redacted Field Sampling Audit Report. The EPA also requested the Navy to respond to the findings in the report within 30 days. The Navy is currently compiling these responses and will submit them prior to the EPA's deadline.

If there are any questions regarding this matter, please contact Commander Benjamin Dunn, Deputy for Environment and Remediation, Navy Closure Task Force – Red Hill by email at benjamin.r.dunn1.mil@us.navy.mil or by phone at (808) 366-9590.

Sincerely,

M. F. WILLIAMS
Rear Admiral, U.S. Navy
Deputy Commander
Navy Closure Task Force - Red Hill

Enclosures: 1. Redacted Field Sampling Audit Report

Copy to: (email only)
Amy Miller, Environmental Protection Agency
Kathleen Ho, Hawaii Department of Health
CAPT Kevin McCormick, Navy Closure Task Force – Red Hill
CDR Benjamin Dunn, Navy Closure Task Force – Red Hill
LCDR Zach Niezgodski, Navy Closure Task Force – Red Hill
Sherri Eng, Navy Closure Task Force – Red Hill
Milton Johnston, Navy Closure Task Force – Red Hill
Joshua Stout, Navy Closure Task Force – Red Hill

Field Sampling Audit

of

Red Hill
Joint Base Pearl Harbor-Hickam, Honolulu, HI

By

Robert Hopeman

U.S. Environmental Protection Agency
Region 9

October 21, 2024

Enclosure (1)

Table of Contents

Introduction:
In 2021, JP-5 jet fuel was inadvertently released from the Red Hill Bulk Fuel Storage Facility into the Red Hill drinking water system shaft. Following the release response and clean-up, the Navy entered a two-year Long-Term Monitoring (LTM) program. Over two years, the Navy's contractor, AECOM, sampled and analyzed more than 8,000 drinking water samples across the distribution system. After ending LTM in March of 2024, the Navy voluntarily continued to sample and analyze drinking water samples in the Extended Drinking Water Monitoring (EDWM) program.

On September 9-13, 2024, Robert Hopeman of the USEPA Region 9 Field Services team performed a field audit of every drinking water sampling team to ensure compliance with sampling Standard Operating Procedures (SOPs) and best practices. Mr. Hopeman observed split sampling for analysis at the EPA Region 9 Laboratory during the field audit. The Field Services team conducted the field audit in accordance with the following documents:

Field SOP for DW Sample Collection Part A_V12_updated_20240808

Field SOP for DW Sample Collection Part B_V10_updated_20240626

Field SOP For Hydrant sampling Part C_V4_updated_20240815

The Field Services team identifies deviations from the project planning documents referenced above as findings in accordance with the following criteria:

1. Appropriate procedures not performed as specified in the SOPs.
2. Inappropriate procedures performed as specified in the SOPs.
3. Appropriate procedures performed; procedures not specified in the SOPs.
4. Inappropriate procedure performed; procedures not specified in the SOPs.

Audit Participants:

Project Manager
(b) (6), G CIV USN NAVFAC PAC PEARL HI

Field Support Personnel, AECOM
(b) (6)

(b) (6)

EPA Auditor
Robert Hopeman – USEPA Region 9 Field Services Branch

The EPA auditor observed sampling procedures at the following locations:

Facility Type	Address	Sample ID
Residence	702 Beard Avenue	D2-TW-0007226-24092-N
Residence	401 Boquet Boulevard	D2-TW-0007670-24092-N
Hydrant ID 436	[redacted]	D2-TW-0007670-24092-N
Residence, WQI	4520 Kobashigawa Street	H1-TW-0013033-24092-A-WQI
YMCA childcare facility	1875A Aliamanu Dr.	H1-TW-0017689-24245-A-1
YMCA childcare facility	1875B Aliamanu Dr	H1-TW-0017689-24245-A-2
Business	201 Ohana Nui Circle	D3-TW-0018379-24092-N-WQI
Residence	4935A Eono Way	A3-TW-0016873-24092-N
Residence	6738B 108th Street	A3-TW-0016185-24092-N
Pre-Waiawa Shaft	(b) (3) (A)	SHAFT-HW-0017916-24245-N
Post-Waiawa Shaft	(b) (3) (A)	SHAFT-HW-0016021-24245-N
Residence	7297 Birch Circle	J1-TW-0018230-24092-N
Residence	7311 Birch Circle	J1-TW-0018236-24092-N

Observations:

1. The exceptionally large scope of the sampling program, with over 12,000 samples collected and a duration of over 2.5 years, has led to a robust, sustainable program. The facilities, organization, and experience of the samplers and support personnel are well-suited for the size and complexity of the sampling program.

2. Although there are specific findings, none of the findings are predicted to have a significant effect on sample integrity. Total Petroleum Hydrocarbons, diesel fraction and lead samples have no

associated findings.

3. At the request of HDOH and EPA, the premise plumbing flushing typically performed before drinking water sampling was omitted so the samples would better represent typical water usage.

Specific Findings:

Criteria: Appropriate procedures not performed as specified in the SOPs.

1. **Sampling container should be tilted while filling.** On 9/12/2024, field personnel repeatedly did not tilt the sampling container when filling it, causing the sample to hit the bottom of the vial instead of the interior wall, as specified in *Field SOP for DW Sample Collection Part B_V10*.

2. **Sampling Point Criteria:** The sampling point at the post-chlorination Waiawa shaft location did not meet the criteria outlined in Field SOP for DW Sample Collection Part A_V12. The flow could not be adjusted to the desired flow rate, and it was impossible to achieve laminar flow.

Criteria: Inappropriate procedures performed as specified in the SOPs.

3. **Samples should be placed in the vials and only opened after analysis.** The field SOP for DW Sample Collection Part B_V10 specified that field personnel fill VOA vials containing dechlorination agent ¾ full of the sample, add three drops of 1:1 HCL, cap the vial, and invert it. They then remove the cap, fill the vial, and cap it again. This process can potentially lose analytes of interests.

Criteria: Appropriate procedures performed; procedures not specified in the SOPs.

4. **The addition of water to make a convex meniscus using the VOA vial cap is expressly forbidden** in *Field SOP for DW Sample Collection Part B_V10*. Field personnel, on 9/12/2024, were observed repeatedly performing this procedure. The SOP should be modified, or the practice should stop.

Criteria: Inappropriate procedure performed; procedures not specified in the SOPs.

5. **Field personnel should add two drops as specified in the method if there is no compelling reason to add three drops.** EPA Method 524.2 section 8.2.1: “Adjust the pH of all samples to < 2 at the time of collection, but after dechlorination, by carefully adding two drops of 1:1 HCl for

each 40 mL of sample." As specified in *Field SOP for DW Sample Collection Part B_V10*, field personnel are adding three drops of 1:1 HCL.

6. **Instruments should be calibrated as they are used at ambient pressure.** Field personnel are using Honeywell MiniRAE 3000 Honeywell Photoionization Detectors (PID). Honeywell Technical Note TN-106 A GUIDELINE FOR PID INSTRUMENT RESPONSE. CALIBRATION CHARACTERISTICS B. Pressure states, "Pressures deviating from atmospheric pressure affect the readings by altering gas concentration and pump characteristics. It is best to calibrate with the instrument and calibration gas at the same pressure as each other and the sample gas." During PID calibration on 9/11/24, field personnel squeezed the Tedlar bag containing the calibration compound isobutylene while it was attached to the PID. Field personnel explained that squeezing the calibration bag helps increase the PID reading so that if the response is low, it falls within the calibration acceptance range.

7. **If a change needs to be made in a logbook, field personnel should draw a line through it, date and initial it, and write the correct entry next to it.** There are several instances of scribbling out documentation in logbooks or overwriting incorrect documentation. Examples are seen on the "QC Form" and the "Colorimeter Calibration Accuracy Check" logbooks.

8. **The turbidity sensor should be challenged with a standard or calibrated to verify its correct operation.** The turbidity sensor is zeroed daily but is not challenged by a standard or calibrated. The International Organization for Standardization (ISO) 7027 Turbidity Technique recommends that turbidity meters be calibrated at least every 90 days and verified at least once a week. Standards for this are readily available from the instrument manufacturer.

9. **A new, unused solution should be used to calibrate the sondes.** After calibrating the multiparameter sondes, field personnel pour the quick calibration standard back into the standard bottle for reuse. This practice may dilute or contaminate the calibration solution, resulting in an inaccurate calibration.

10. **Field Blank Collection:** Field personnel were incorrectly using the trip blank as a field blank. A field blank is a sample of analyte-free water poured into the container in the field, preserved, and shipped to the laboratory with field samples. A trip blank is a clean sample of a matrix that is taken from the laboratory to the sampling site and transported back to the laboratory without having been exposed to sampling procedures. The 525.2 field blanks were being created by taking a trip blank sent from the laboratory and adding the HCL preservative. The trip blank contained water sent from the lab, not water provided by the field personnel; the water was never poured into the sampling container.

Recommendations:

1. Sodium thiosulfate is recommended for Red Hill samples. EPA Method 524.2 "If analytes that are gases at room temperature (such as vinyl chloride), or analytes in Table 7 are not to be determined, sodium thiosulfate is recommended." Red Hill samples meet the above criteria, so following the guidance from 524.2 for the use of sodium thiosulfate is recommended.

2. Field personnel do not add chemical preservation (HCL) to EPA 8015-G samples. SW-846, Chapter Four Table 4-1 recommends adjusting pH to less than 2.

3. SW-846 Chapter 4 recommends using sodium thiosulfate for VOA dechlorination. Consider switching the dechlorination agents for 8260-TPH-G and 8260 PIANO from Ascorbic acid to sodium thiosulfate.

4. Electronically sending field parameters back to the QC department in real time for entry into a spreadsheet is a valuable logistical tool. It is recommended that the electronic chat be archived in case there is ever a discrepancy between the logbook, chain of custody, or tracking spreadsheet.

5. The drinking water samples typically exhibit a conductivity reading of 200-300 µS/cm. The upper limit before the field personnel must call the call center for guidance is 800 µS/cm. Field personnel calibrate at approximately 8,000 µS/cm, temperature dependent. It is recommended that the calibration be performed closer to the expected levels. e.g. 1000 µS/cm.

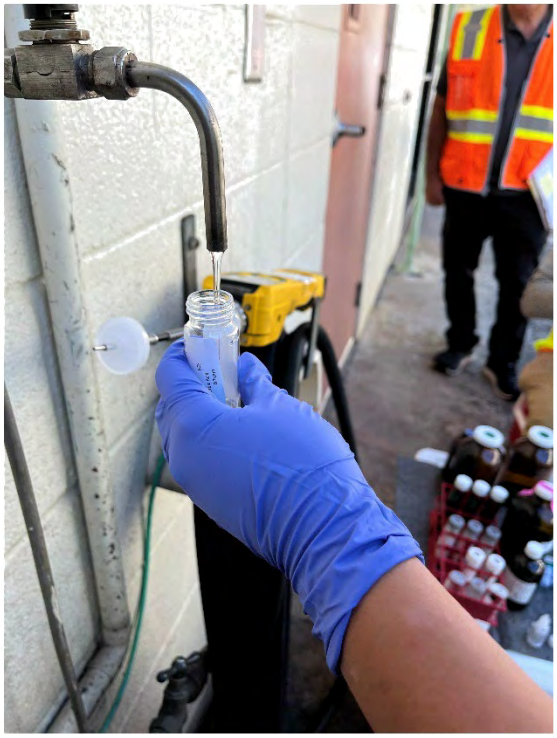
Attachments

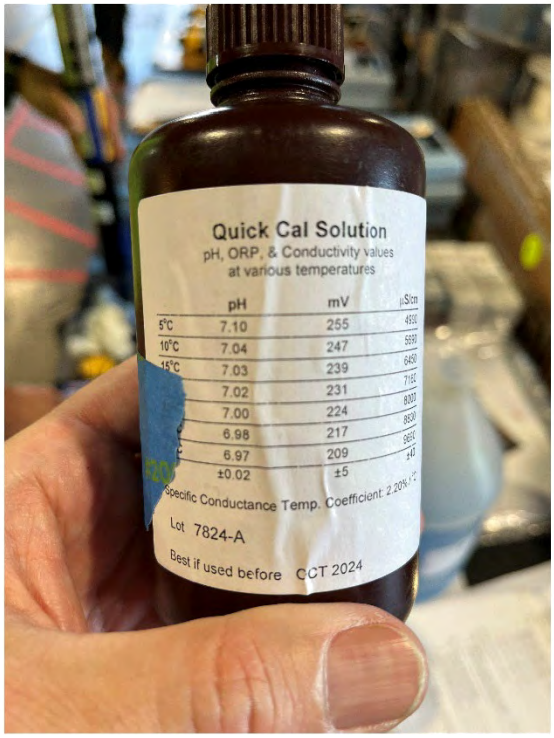
Exhibit A

Photographs

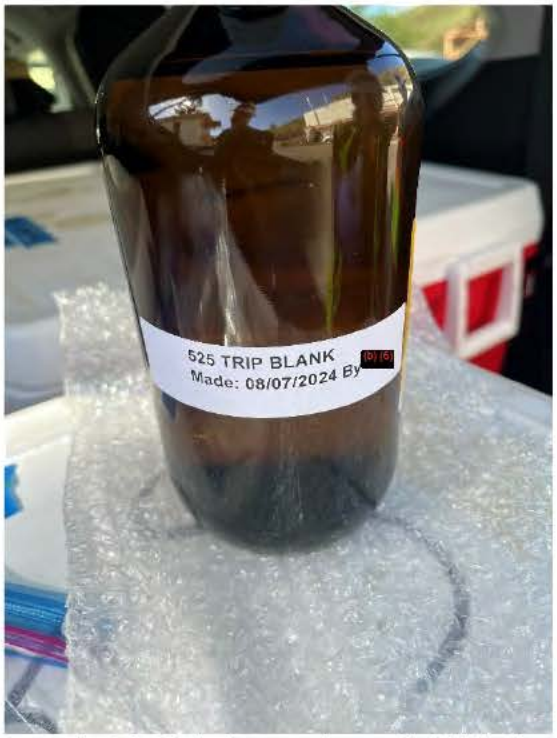
Warehouse, staging location


Warehouse, staging location


Bottle should be tilted during sampling



Quick Cal Solution should not be re-used



525 trip blank being used as a field blank

Waiawa shaft post-chlorination sample location

Photoionization detectors (PID)


Sampling Kit

Exhibit B

Field Logs

US EPA R9 Lab Field and Biology Team Field Oversight Checklist
General Procedures

Project Name: Red Hill
Field Oversight Personnel: Robert Hopeman
Affiliation: EPA R9 LSASD Field Services Branch

Sampling Team A: (b) (6)
Sampling Team A: (b) (6)
Affiliation: AECOM
Date(s) of Oversight: **9/9/2024**

Visit (V):

1. Facility Type, Address, Location, Sample ID:
   RE (resident), 702 Beard Avenue, D2-BEAR0702, D2-TW-0007226-24092-N. Upstairs bathroom sink.

2. Facility Type, Address, Location, Sample ID:
   RE,401 Boquet Boulevard, D2-BOQU0401, D2-TW-0007670-24092-N. Upstairs bathroom sink.

3. Facility Type, Address, Location, Sample ID:
   HY (hydrant), [redacted], D4-HYD2390, D2-TW-0007670-24092-N, Hydrant ID [redacted]

4. Facility Type, Address, Location, Sample ID:
   RE, WQI (water quality investigation), 4520 Kobashigawa Street, H1-KOBA4520, H1-TW-0013033-24092-A-WQI. Kitchen sink.

Beginning of the Day Activities:

PID calibration:

- Make, Model: Honeywell MiniRAE 3000
- Calibration compound and concentration: Isobutylene 100 ppm. Acceptance criteria is 98-102 ppm. They do a "bump check" not a calibration.
- How is Calibration documented: Handwritten logbook, later digitized.

Free chlorine colorimeter calibration:

- Calibration or cal check:

Level nominal mg/L	Acceptance range +/-	Acceptance range
0.0		
0.22	0.09	0.13-0.31
0.92	0.10	0.82-1.02
1.65	0.14	1.51-1.79

- How is Calibration documented: Handwritten logbook, later digitized.

Water Quality Parameters. Aqua Troll 600

- pH calibrated: pH 7 and pH 10
- Conductivity calibrated: 8,000 µs/cm

- Turbidity calibrated: No, just zeroed.
- Temp calibrated: No
- They calibrate for ORP but this parameter is not recorded or required.

At the location, reference the visit # if comment:

Before sampling: (Note any abnormalities)
- Wears gloves
- Checked for inline filters or water heaters.
- Isolate cold water.
- Make sure dishwasher is not running.
- Remove aerator, rubber gaskets laminar flow.
- Adjust the flow rate to approximately 500 mL/minute.
- Samplers know to adjust dechlorination agent if residual chlorine is high

Headspace observation (Note any abnormalities)
- Odor present
- Ambient room reading is ≥ 2.0 ppm.

Sheen observation
- Initial sheen observation
- Final sheen observation

PID readings
- Initial PID
- Readings > 2.0 ppm

Free Chlorine Analysis
- Rinse cell 3X and zero
- Mix 20 sec.
- Chlorine < 0.02 mg/L, repeated
- Chlorine > 2.0 mg/L, diluted

Water quality parameters taken:

- pH
- Conductivity
- Temperature
- Turbidity <5 NTU is in spec. It used to be <1 NTU.

Comments:
- Residual chlorine and water quality parameters are taken two times a visit. The initial, which is cold water, and at the end while taking the hot bio sample.

Sample collection in Order:

Visit 1 and Visit 4

524.2 VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

8260 Piano VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS hold

8260 TPH-g 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

5310 TOC. 1 x 250 mL amber, Sulfuric Acid. SGS

8015 TPH-d/o MEQ. 3 X 60-mL VOA amber, sodium thiosulfate. SGS

525.2 SOCs: 2 x 1L amber, sodium sulfite, 5 mL HCL added. SGS

8015D Saturated Hydrocarbons, 1 x 1L amber, sodium thiosulfate. SGS hold

8270E SIM Parent & Alkylated PAHs, 1 x 1L amber, sodium thiosulfate. SGS hold

SM 2320B Total Alkalinity 1 x 250 mL Unpreserved (Poly). SGS

200.8 Metals \ **245.1** Mercury 1 x 250 mL Nitric Acid (Poly). SGS

SM 9223B Total Coliform\ **SM 9215B** HPC Cold: 1 x 120 mL sterilize plastic. OLT or FQL

SM 9215B Heterotrophic Plate Count Hot: 1 x 120 mL sterilize plastic. OLT or FQL

Visit 2 includes EPA splits.

524.2 VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. EPA R9

8260 Piano VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS hold

8260 TPH-g 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

5310 TOC. 1 x 250 mL amber, Sulfuric Acid. SGS

8015 TPH-d/o MEQ. 3 X 60-mL VOA amber, sodium thiosulfate. SGS

524.2 VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

8015 TPH-g 3 x 40 mL VOA clear, sodium thiosulfate. No HCL. EPA R9

415.3 TOC. 3 x 40 mL VOA clear, HCL pre-preserved. EPA R9

525.2 SOCs: 2 x 1L amber, sodium sulfite, 5 mL HCL added. SGS

8015D Saturated Hydrocarbons, 1 x 1L amber, sodium thiosulfate. SGS hold

8270E SIM Parent & Alkylated PAHs, 1 x 1L amber, sodium thiosulfate. SGS hold

8015D TPH-D/O 2 x 1L amber, sodium thiosulfate. EPA

8270E SIM PAH: 2 x 1L (Amber) sodium thiosulfate. BSK

525.3 2 x 1 L Amber with Ascorbic Acid, EDTA, KH2Ct. BSK

SM 2320B Total Alkalinity 1 x 250 mL Unpreserved (Poly). SGS

SM 2320B Total Alkalinity 2 x 250 mL Unpreserved (Poly). EPA

200.8 Metals \ **245.1** Mercury 1 x 250 mL Nitric Acid (Poly). SGS

200.8 Metals \ **245.1** Mercury 1 x 250 mL Nitric Acid (Poly). EPA

SM 9223B Total Coliform\ **SM 9215B** HPC Cold: 1 x 120 mL sterilize plastic. OLT or FQL

SM 9215B Heterotrophic Plate Count Hot: 1 x 120 mL sterilize plastic. OLT or FQL

Visit 3 Fire Hydrant

524.2 VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. EPA R9

8260 Piano VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS hold

8260 TPH-g 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

504.1 Ethylene Dibromide 3 x 40 mL amber sodium thiosulfate SGS

8015 TPH-d/o MEQ. 3 X 60-mL VOA amber, sodium thiosulfate. SGS

8270SIM: 2 x 40 mL Unpreserved VOAs, 2-(2-Methoxyethoxy)- Ethanol. SGS

5310 TOC. 1 x 250 mL amber, Sulfuric Acid. SGS

525.2 SOCs: 2 x 1L amber, sodium sulfite, 5 mL HCL added. SGS

8015D Saturated Hydrocarbons, 1 x 1L amber, sodium thiosulfate. SGS hold

SM 2320B Total Alkalinity 1 x 250 mL Unpreserved (Poly). SGS

SM 9223B Total Coliform\ **SM 9215B** HPC Cold: 1 x 120 mL sterilize plastic. OLT or FQL

Observations:

- Concerned about VOA sampling. I don't like capping and shaking the VOA and then opening it again.
- What type of HCL are they using for preservation? Straight, 1:1, 6N?
- 524.2 says to add two drops of 1:1 HCL for each 40 mL of sample.

- 524.2 “If analytes that are gases at room temperature (such as vinyl chloride), or analytes in Table 7 are not to be determined, sodium thiosulfate is recommended.” They should be using sodium thiosulfate.
- Sw-846 chapter 4: use sodium thiosulfate for VOA. Should switch 8260-TPH-G, 8260 PIANO from Ascorbic acid to sodium thiosulfate.
- EPA Splits taken at V2.
- They should add HCL to the EPA 8015-G samples.
- Trip blank for 524.2 and 8260-TPHG, field blank for 525.2, 525.3 collected at V4.
- One cooler per sample.
- Wet ice is added after each individual sampling location, at the car.
- After a sampling location is complete, from the car the samplers send some of the parameters back to the QC team via Microsoft Teams to be entered into a spreadsheet. The information is recorded in a field notebook. The notebook, Teams chat, and spreadsheet are all reviewed when the samplers return to the warehouse.
- Samplers always work in pairs. Usually, one does the bottle filling, and the other “runs the book” i.e. labeling, packing samples, recording parameters in a notebook.
- For samples with three VOA vials, the vials are individually labeled and placed into a bubble bag. Custody seal is put over the bubble bag flap. Bubble bag is placed in a labeled ziplock bag.
- Larger sample bottles, e.g., 1 L amber, are labeled, and the custody seal is placed over the lid. The bottle is then placed in a bubble bag and into a labeled Ziplock.
- V3 rinsed the threads on the hydrant sampling port with isopropyl alcohol (IPA) to remove oil and grease. There is still a large amount of grease.
- V3 purged 6 x 5-gallon buckets out of the fire hydrant before sampling.
- V4 WQI. Original sampling location was the upstairs bathroom sink but the resident wanted the kitchen sink tested. Samplers called the call center and checked if this was oaky. The kitchen sink was sampled but the sampling teams labels are tied to the exact sink so they could not use the pre-existing labels. The samples were taken back to the warehouse and labeled there.
- V4 was a WQI on the Aliamanu Military Reservation (AMR). Present at V4 was:
    - Two uniformed navy “Seabees” who took their own quick turn total petroleum hydrocarbon (TPH) samples. Samples run at the NACFAC lab in < 24 hours. The MRLs are:
        - GRO 0.2 ppm
        - DRO 0.1 ppm
    - Three civilian army representatives from the Department of Public Works (DPW), Environmental Safe Drinking Water Program were in attendance.
    - AECOM water quality investigator, (b) (6) .
    - (b) (6) , NAVFAC community public liaison officer.
    - AECOM sampling team A

US EPA R9 Lab Field and Biology Team Field Oversight Checklist

General Procedures

Project Name: Red Hill
Field Oversight Personnel: Robert Hopeman
Affiliation: EPA R9 LSASD Field Services Branch

Sampling Team B: (b) (6)
Sampling Team B: (b) (6)
Affiliation: AECOM
Date(s) of Oversight: **9/10/2024**

Visit:

1. Facility Type, Address, Location, Sample ID:
   Community center, 1875A Aliamanu Dr. YMCA childcare facility on the Aliamanu Military Reservation (AMR), H1-BLDG1875. Sink next to toilet.

2. Facility Type, Address, Location, Sample ID:
   Community center, 1875B Aliamanu Dr. YMCA childcare facility on the Aliamanu Military Reservation (AMR), H1-BLDG1875, Sink next to refrigerator.

Beginning of the Day Activities:

PID calibration:

- Make, Model: Honeywell MiniRAE 3000
- Calibration compound and concentration: Isobutylene 100 ppm Acceptance criteria is 98-102 ppm. They do a "bump check" not a calibration.
- How is Calibration documented: Handwritten logbook, later digitized.

Free chlorine colorimeter calibration:

- Calibration or cal check:

Level nominal mg/L	Acceptance range +/-	Acceptance range
0.0		
0.22	0.09	0.13-0.31
0.92	0.10	0.82-1.02
1.65	0.14	1.51-1.79

- How is Calibration documented: Handwritten logbook, later digitized.

Water Quality Parameters. Aqua Troll 600

- pH calibrated: pH 7 and pH 10
- Conductivity calibrated: 8,000 µs/cm
- Turbidity calibrated: No, just zeroed.
- Temp calibrated: No

At the location, reference the visit # if comment:

Before sampling: (Note any abnormalities)

- Wears gloves
- Checked for inline filters or water heaters.
- Isolate cold water.
- Make sure dishwasher is not running.
- Remove aerator, rubber gaskets laminar flow.
- Adjust the flow rate to approximately 500 mL/minute.
- Samplers know to adjust dechlorination agent if residual chlorine is high

Headspace observation (Note any abnormalities)

- Odor present_____
- Ambient room reading is ≥ 2.0 ppm. _____

Sheen observation

- Initial sheen observation_____
- Final sheen observation_____

Free Chlorine Analysis

- Rinse cell 3X and zero_____
- Mix 20 sec._____
- Chlorine < 0.02 mg/L, repeated_____
- Chlorine > 0.02 mg/L, diluted_____

Water quality parameters taken:

- pH_____
- Conductivity_____
- Temperature_____
- Turbidity_____

Comments:

- During PID calibration observed squeezing the tedlar bag to increase the PID reading so it would fall within the acceptance range. Instruments should be calibrated the same way they are used at ambient pressure. Increasing delivery pressure to increase the concentration is not acceptable.
- Noticed several instances of scribbling out documentation in logbooks or overwriting incorrect documentation. If a change needs to be made in a logbook, they should draw a line through it and date and initial it. Examples seen on the “QC Form” and the “Colorimeter Calibration Accuracy Check” logbook.
- They should analyze a turbidity standard not just a zero. The sensor could be non-responsive and not noticed.
    - InSitu sells a standard: Aqua TROLL Turbidity Standard SKU CFG-ATTS. The NIST-traceable Aqua TROLL Turbidity Standard contains a polymer suspension designed for calibrating the Aqua TROLL 500 and Aqua TROLL 600 turbidity sensor. It is sold in a 500 ml bottle and is available in 10 NTU, 100 NTU, 1000 NTU, 2000 NTU or 4000 NTU.

- After calibration they cover the Aqua Troll sensors with a wet sponge during transport, this is a good practice.
- 32 AECOM employees at the facility. Over 300 people have cycled through over the years.

Sample collection in Order: V1 and V2 identical, but V1 collected duplicates.

524.2 VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

8260 TPH-g 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

8260 Piano VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS hold

8015 TPH-d/o MEQ. 3 X 60-mL VOA amber, sodium thiosulfate. SGS

5310 TOC. 1 x 250 mL amber, Sulfuric Acid. SGS

525.2 SOCs: 2 x 1L amber, sodium sulfite, 5 mL HCL added. SGS

8015D Saturated Hydrocarbons, 1 x 1L amber, sodium thiosulfate. SGS hold

8270E SIM Parent & Alkylated PAHs, 1 x 1L amber, sodium thiosulfate. SGS hold

SM 2320B Total Alkalinity 1 x 250 mL Unpreserved (Poly). SGS

200.8 Metals \ **245.1** Mercury 1 x 250 mL Nitric Acid (Poly). SGS

SM 9223B Total Coliform\ **SM 9215B** HPC Cold: 1 x 120 mL sterilize plastic OLT or FQL

SM 9215B Heterotrophic Plate Count Hot: 1 x 120 mL sterilize plastic. OLT or FQL

Comments:

- Because both visit sites are located on the Aliamanu Military Reservation (AMR) which houses [redacted] personnel, two civilian [redacted] representatives from the Department of Public Works (DPW), Environmental Safe Drinking Water Program, were present.
  - (b) (6) [redacted]
  - (b) (6) [redacted]
- Visit 1, collected duplicate samples. Double the number of containers.

US EPA R9 Lab Field and Biology Team Field Oversight Checklist
General Procedures

Project Name: Red Hill
Field Oversight Personnel: Robert Hopeman
Affiliation: EPA R9 LSASD Field Services Branch

Sampling Team C: (b) (6)
Sampling Team C: (b) (6)
Affiliation: AECOM
Date(s) of Oversight: **9/11/2024**

Visit (V):

1. Facility Type, Address, Location, Sample ID:
   NR (non-resident), 201 Ohana Nui Circle, D3-OHAN201, D3-TW-0018379-24092-N-WQI. Breakroom kitchen sink.

2. Facility Type, Address, Location, Sample ID:
   RE, 4935A Eono Way, A3-EONO4935A, A3-TW-0016873-24092-N.
   Upstairs bathroom sink.

3. Facility Type, Address, Location, Sample ID:
   RE, 6738B 108th Street, A3-108S6738B, A3-TW-0016185-24092-N, Kitchen sink.

Beginning of the Day Activities:

PID calibration:

- Make, Model: Honeywell MiniRAE 3000 S/N 92-911160
- Calibration compound and concentration: Isobutylene 100 ppm Acceptance criteria is 98-102 ppm. They do a "bump check" not a calibration.
- How is Calibration documented: Handwritten logbook, later digitized.

Free chlorine colorimeter calibration: HACH DR300 S/N 24020B000569

- Calibration or cal check:

Level nominal mg/L	Acceptance range +/-	Acceptance range
0.0		
0.22	0.09	0.13-0.31
0.92	0.10	0.82-1.02
1.65	0.14	1.51-1.79

- How is Calibration documented: Handwritten logbook, later digitized.

Water Quality Parameters. Aqua Troll 600 S/N 11023322

- pH calibrated: pH 7 and pH 10
- Conductivity calibrated: 8,000 µs/cm

- Turbidity calibrated: No, just zeroed.
- Temp calibrated: No
- They calibrate for ORP but this parameter is not recorded or required.

At the location, reference the visit # if comment:

Before sampling: (Note any abnormalities)
- Wears gloves
- Checked for inline filters or water heaters.
- Isolate cold water.
- Make sure dishwasher is not running.
- Remove aerator, rubber gaskets laminar flow.
- Adjust the flow rate to approximately 500 mL/minute.
- Samplers know to adjust dechlorination agent if residual chlorine is high

Headspace observation (Note any abnormalities)
- Odor present
- Ambient room reading is ≥ 2.0 ppm.

Sheen observation
- Initial sheen observation
- Final sheen observation

PID readings
- Initial PID
- Readings > 2.0 ppm

Free Chlorine Analysis:
- Rinse cell 3X and zero
- Mix 20 sec.
- Chlorine < 0.02 mg/L, repeated
- Chlorine > 2.0 mg/L, diluted

Water quality parameters taken:

- pH
- Conductivity
- Temperature
- Turbidity <5 NTU is in spec. It used to be <1 NTU.

Comments:

Sample collection in Order:

<u>Visit 1,2,3</u>

524.2 VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

8260 Piano VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS hold

8260 TPH-g 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

5310 TOC. 1 x 250 mL amber, Sulfuric Acid. SGS

8015 TPH-d/o MEQ. 3 X 60-mL VOA amber, sodium thiosulfate. SGS

525.2 SOCs: 2 x 1L amber, sodium sulfite, 5 mL HCL added. SGS

8015D Saturated Hydrocarbons, 1 x 1L amber, sodium thiosulfate. SGS hold

8270E SIM Parent & Alkylated PAHs, 1 x 1L amber, sodium thiosulfate. SGS hold

SM 2320B Total Alkalinity 1 x 250 mL Unpreserved (Poly). SGS

200.8 Metals \ **245.1** Mercury 1 x 250 mL Nitric Acid (Poly). SGS

SM 9223B Total Coliform\ **SM 9215B** HPC Cold: 1 x 120 mL sterilize plastic. OLT or FQL

SM 9215B Heterotrophic Plate Count Hot: 1 x 120 mL sterilize plastic. OLT or FQL

Comments:

- V1 was a WQI at a NR (non-resident) where they do not usually collect Hot Bio samples. The complaint was about the water having a strong sulfur smell and the water being cloudy. The cold water seemed okay, but when the hot water was turned on, it had a strong smell and was cloudy. They measured this water with the turbidity meter, and it was 35 NTU. The water never got hot. They called back to the call center and asked to take a Hot Bio sample, which they did. The business name is Ameresco.
- Because V1 was a WQI, (b) (6) , NAVFAC community public liaison, was present.
- The sample bottles from Oahu Laboratory Testing (OLT) (morning samples) contain a sodium thiosulfate tablet. They are 120 mL clear plastic, also sterile, and have plastic wrap over the cap. The bottles from Food Quality Labs (FQL) (afternoon samples) are 250 mL Nalgene with aluminum foil over the cap. They look like they contain liquid sodium thiosulfate.
- They re-use the AquaTroll 600 quick cal solution. After calibrating they pour it back into the bottle to be used again.
- They should archive their Teams chats.
- They took trip and field blanks at V1: four trip blanks and one field blank.
- The field blank for 525.2 already has water from the lab in the sample container. They just open it, add 5 mL of HCL, and then recap it. I thought they should pour in their own water for a field blank, which is the difference between a field and a trip blank. For the EPA splits 525.3 field blank, they put in their own water.
- The hot residual chlorine results are usually close to zero.
- Sample name deciphering. Example name: H1-TW-0012603-24092-A

    - HI is the zone
    - TW is type of water. TW = tap water, DL = distribution line, etc
    - Six digits is a unique dwelling code from EDMS (environmental data management system)
    - The four digits are the event code. 24 is the year, and the next three digits are the Julian day. 24092 is the day EDWM started. The last letter is either A or N, Army or Navy, whichever owns the property.
- AECOM takes the Aquatroll, Hach, and MiniRae readings and makes an Electronic Data Deliverable (EDD) with the data.
- AECOM also takes the data from the two Bio labs and makes an EDD out of them.
- The scanned logbooks make their way into EDMS, but not the instrument calibrations.

US EPA R9 Lab Field and Biology Team Field Oversight Checklist
General Procedures

Project Name: Red Hill
Field Oversight Personnel: Robert Hopeman
Affiliation: EPA R9 LSASD Field Services Branch

Sampling Team D: (b) (6)
Sampling Team D: (b) (6)
Affiliation: AECOM
Date(s) of Oversight: **9/12/2024**

Visit (V):

1. Facility Type, Address, Location, Sample ID:
   WL, Waiawa Shaft Pre-Chlorination, (b) (3) (A), SHFTWAIA—PR, SHAFT-HW-0017916-24245-N

2. Facility Type, Address, Location, Sample ID:
   WL, Waiawa Shaft Post-Chlorination, (b) (3) (A), SHFTWAIA-CP-PT, SHAFT-HW-0016021-24245-N

3. Facility Type, Address, Location, Sample ID:
   HY, SA-AFH 60, [redacted], A1-HYD2431, A1-DL-0016023-24245-N No samples taken, hydrant is out of commission.

Beginning of the Day Activities:

PID calibration:

- Make, Model: Honeywell MiniRAE 3000 S/N 592-920696
- Calibration compound and concentration: Isobutylene 100 ppm Acceptance criteria is 98-102 ppm. They do a "bump check" not a calibration.
- How is Calibration documented: Handwritten logbook, later digitized.

Free chlorine colorimeter calibration: HACH DR300 S/N 24020B000539

- Calibration or cal check:

Level nominal mg/L	Acceptance range +/-	Acceptance range
0.0	0	0
0.22	0.09	0.13-0.31
0.92	0.10	0.82-1.02
1.65	0.14	1.51-1.79

- How is Calibration documented: Handwritten logbook, later digitized.

Water Quality Parameters. Aqua Troll 600 S/N 920912

- pH calibrated: pH 7 and pH 10
- Conductivity calibrated: 8,000 µs/cm

- Turbidity calibrated: No, just zeroed.
- Temp calibrated: No
- They calibrate for ORP but this parameter is not recorded or required.

At the location, reference the visit # if comment:

Before sampling: (Note any abnormalities)
- Wears gloves
- Checked for inline filters or water heaters.
- Isolate cold water.
- Make sure dishwasher is not running.
- Remove aerator, rubber gaskets laminar flow.
- Adjust the flow rate to approximately 500 mL/minute.
- Samplers know to adjust dechlorination agent if residual chlorine is high

Headspace observation (Note any abnormalities)
- Odor present
- Ambient room reading is ≥ 2.0 ppm.

Sheen observation
- Initial sheen observation
- Final sheen observation

PID readings
- Initial PID
- Readings > 2.0 ppm

Free Chlorine Analysis:
- Rinse cell 3X and zero
- Mix 20 sec.
- Chlorine < 0.02 mg/L, repeated
- Chlorine > 2.0 mg/L, diluted

Water quality parameters taken:

- pH
- Conductivity
- Temperature
- Turbidity <5 NTU is in spec. It used to be <1 NTU.

Comments:
They pour the Aqua Troll calibration solution back into the standard bottle for re-use after they calibrate with it.

Sample collection in Order:

Visit 1,2

524.2 VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

8260 Piano VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS hold

8260 TPH-g 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

8015 TPH-d/o MEQ. 3 X 60-mL VOA amber, sodium thiosulfate. SGS

5310 TOC. 1 x 250 mL amber, Sulfuric Acid. SGS

525.2 SOCs 2 x 1L amber, sodium sulfite, 5 mL HCL added. SGS

8015D Saturated Hydrocarbons, 1 x 1L amber, sodium thiosulfate. SGS hold

8270E SIM Parent & Alkylated PAHs, 1 x 1L amber, sodium thiosulfate. SGS hold

200.7 Cations 1 x 250 mL poly, HNO3

300.1 Anions 1 x 250 mL amber poly, Ethylenediamine (EDA) SGS

300.0 Anions 1 x 250 mL unpreserved (Poly). SGS

200.7 Silica 1 x 250 mL unpreserved (Poly). SGS

SM 2320B Total Alkalinity 1 x 250 mL unpreserved (Poly). SGS

SM 9223B Total Coliform\ **SM 9215B** HPC Cold: 1 x 120 mL sterilize plastic. OLT or FQL

Comments:

- The same samples were taken in the same order for V1 and V2. The 524.2 samples from V2 will additionally be analyzed for THMs.
- The usual drinking water conductivity is around 250 µS/cm, and the upper limit before the samplers call the call center for guidance is 800 µS/cm. They calibrate at around 8,000 µS/cm, temperature dependent. They should calibrate at a level that is closer to the expected levels. E.g., 1000 µS/cm
- [redacted] from the Kinaole company was observing sampling for both shaft samples.
- Visit 3 (V)3 was not sampled because the hydrant was covered in caution tape and there was no flow from it.
- In V2, the sampling location did not have a way to adjust the flow rate. The flow rate was low, approximately 100 mL/min and the water flow was not laminar.
- Trip blanks and field blanks were taken at V1. 2 x VOAs for 524.2 and two VOAs for 8260-G, all in sealed vials with water from the lab. All they do is put a label on the vials and pack them up. The 525.2 bottle is filled with water from the lab and is labeled trip blank. They open the bottle, add 5 mL of HCL cap and pack it up. The label they affix says field blank. They should pour their own water for a field blank. They pour their own water for the 525.3 field blank because the lab does not supply water.

- PID is calibrated, not bumped checked.
- When adding sample, the sampler does not tilt the vial, so the flow hits the bottom of the vial not the interior wall. Against the SOP
- The sampler adds additional water to make a convex meniscus with the VOA vial cap, which is expressly forbidden in the SOP.
- Based on our conversations, AECOM changed the VOA filling practice today. They now fill VOA ¾, cap, invert x3, open, add HCL, fill to top and cap.

US EPA R9 Lab Field and Biology Team Field Oversight Checklist
General Procedures

Project Name: Red Hill
Field Oversight Personnel: Robert Hopeman
Affiliation: EPA R9 LSASD Field Services Branch

Sampling Team E: (b) (6)
Sampling Team E: (b) (6)
Affiliation: AECOM
Date(s) of Oversight: **9/13/2024**

Visit (V):

1. Facility Type, Address, Location, Sample ID:
   RE, 7297 Birch Circle, MN-BIRC7297, J1-TW-0018230-24092-N

2. Facility Type, Address, Location, Sample ID: DID NOT SAMPLE, NO ONE HOME.
   RE, 7301 Birch Circle, MN-BIRC7301, J1-TW-0018230-24092-N

3. Facility Type, Address, Location, Sample ID:
   RE, 7311 Birch Circle, MN-BIRC7311, J1-TW-0018236-24092-N

Beginning of the Day Activities:

PID calibration:

- Make, Model: Honeywell MiniRAE 3000 S/N 592-603275
- Calibration compound and concentration: Isobutylene 100 ppm Acceptance criteria is 98-102 ppm. They do a "bump check" not a calibration.
- How is Calibration documented: Handwritten logbook, later digitized.

Free chlorine colorimeter calibration: HACH DR300 S/N 210108000900

- Calibration or cal check:

Level nominal mg/L	Acceptance range +/-	Acceptance range
0.0	0	0
0.22	0.09	0.13-0.31
0.92	0.10	0.82-1.02
1.65	0.14	1.51-1.79

- How is Calibration documented: Handwritten logbook, later digitized.

Water Quality Parameters. Aqua Troll 600 S/N 690360

- pH calibrated: pH 7 and pH 10
- Conductivity calibrated: 8,000 µs/cm
- Turbidity calibrated: No, just zeroed.
- Temp calibrated: No
- They calibrate for ORP but this parameter is not recorded or required.

At the location, reference the visit # if comment:

Before sampling: (Note any abnormalities)

- Wears gloves
- Checked for inline filters or water heaters.
- Isolate cold water.
- Make sure dishwasher is not running.
- Remove aerator, rubber gaskets laminar flow.
- Adjust the flow rate to approximately 500 mL/minute.
- Samplers know to adjust dechlorination agent if residual chlorine is high

Headspace observation (Note any abnormalities)

- Odor present
- Ambient room reading is ≥ 2.0 ppm.

Sheen observation

- Initial sheen observation
- Final sheen observation

PID readings

- Initial PID
- Readings > 2.0 ppm

Free Chlorine Analysis:

- Rinse cell 3X and zero
- Mix 20 sec.
- Chlorine < 0.02 mg/L, repeated
- Chlorine > 2.0 mg/L, diluted

Water quality parameters taken:

- pH
- Conductivity
- Temperature
- Turbidity <5 NTU is in spec. It used to be <1 NTU.

Comments:
They pour the Aqua Troll calibration solution back into the standard bottle for re-use after they calibrate with it.

Sample collection in Order:

Visit 1,3 Same samples and sample order for V1 and V3.

524.2 VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

8260 Piano VOCs. 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS hold

8260 TPH-g 3 x 40 mL VOA clear, Ascorbic acid + HCl added. SGS

5310 TOC. 1 x 250 mL amber, Sulfuric Acid. SGS

8015 TPH-d/o MEQ. 3 X 60-mL VOA amber, sodium thiosulfate. SGS

525.2 SOCs: 2 x 1L amber, sodium sulfite, 5 mL HCL added. SGS

8015D Saturated Hydrocarbons, 1 x 1L amber, sodium thiosulfate. SGS hold

8270E SIM Parent & Alkylated PAHs, 1 x 1L amber, sodium thiosulfate. SGS hold

SM 2320B Total Alkalinity 1 x 250 mL Unpreserved (Poly). SGS

200.8 Metals \ **245.1** Mercury 1 x 250 mL Nitric Acid (Poly). SGS

SM 9223B Total Coliform\ **SM 9215B** HPC Cold: 1 x 120 mL sterilize plastic. OLT or FQL

SM 9215B Heterotrophic Plate Count Hot: 1 x 120 mL sterilize plastic. OLT or FQL

Comments:

- For the second day in a row, AECOM changed the VOA filling practice based on internal conversations. They now fill VOA ¾, add HCL, fill to the top, and cap. They do not open the VOA after the sample is in it.

Exhibit C

Sampling Standard Operating Procedures (SOP)

Drinking Water Sample Collection SOP, Part A - Headspace, Sheen Observation and Free Chlorine

Scope – The purpose of this SOP is to ensure the sample collection and observation process is performed in a manner consistent with requests made by both EPA and Hawaii State Department of Health.

- **Procedure** – Prior to the collection of drinking water samples, a headspace, sheen observation, free chlorine test, and water quality parameters test (that includes temperature, pH, conductivity, and turbidity) must be taken.
    - Sink choice –
        - Choose the sink that is highest and farthest from the water distribution source (ex: an upstairs sink). If that sink is too shallow, check for other sinks that are far and high from the source. If those are also too shallow, use a lower-level sink (such as the kitchen sink). If all sinks in the house/building are too shallow, go back to the highest and farthest sink and use a 250 mL unpreserved bottle to transfer water from the sink to the large bottles. The 250 mL unpreserved should have never been used for any other sample and should not be used after for any other sample. If the house/building is single story, use any kitchen or bathroom sink. Document the reason behind deviation from the highest and farthest sink in your logbook if applicable.

    - Check for fixture filters as well as inline filters and water heaters –
        - First, check the sample point water fixture for any filters and remove if present.
        - Then, trace the water lines below the sink to ensure the cold-water source is directly connected to the tap, i.e., there is no inline filter or water heater.
        - If filter cannot be removed or bypassed, choose another sink

    - Isolate cold water –
        - Isolate the cold-water source by closing off the hot water valve. If the sink is not a mixer, the cold-water is already isolated.
        - If unable to isolate the cold-water source, move to a new sample location.
        - If no other sample location is viable, monitor water temperature while taking the sample. Note this in the logbook as “cold water monitored”. If water is not cold and cannot be isolated, contact team support for next steps.

    - If sampling from a kitchen sink, check that the dishwasher is not running. If it is running, ask the resident to turn it off for the sample collection.

- Pre-sampling preparation –
    - Clear sampling area of any potential volatile sources (hand soaps, dishwashing soap, air fresheners, etc.) within the immediate vicinity of the tap/spigot and sample bottle staging area. Don a new pair of gloves if they become contaminated.
    - Place several sheets of paper towels or an absorbent pad on a suitable flat surface such as a counter-top or the floor.
    - Place the sample containers on the paper towels/absorbent pad.

- Remove aerator and achieve laminar flow –
- Remove any aerator, spray nozzle, or detachable parts from the sample faucet.
    - To remove simple screen aerators from faucets, begin by twisting off by hand. If the aerator is lodged, protect the aerator from damage by covering it with a paper towel or glove, and use the sample kit pipe wrench to twist off aerator.
    - If a key is required, use the removal tool in the sampling kit. Invert the tool to face the aerator, align the notches, and twist while applying upwards pressure.
    - If the faucet has a sprayer or removable head, pull the hose from the sink and tie a glove around the hose or use a clamp to prevent it from retracting back into the sink. Twist off the head or sprayer.
- Ensure there are no rubber gaskets or pieces left behind. **Note**: The rubber gasket will sometimes stick to the faucet. Remove this before turning water on to prevent it falling down the drain. ‘
- Adjust the flow rate to approximately 500 mL/minute (approximately 1/8th inch diameter stream or the width of a pencil). Adjust the faucet stream until the flow is smooth and uniform, with a glassy appearance. The flow should be laminar and should not appear agitated or white with air bubbles.

- Headspace observation –
- Using a calibrated PID, take a PID reading in the vicinity of the drinking water sampling point (within 2 feet) and record the results in the logbook. Record any presence of odor and note any potential sources of the odor. **Consult with a project manager prior to sampling if ambient room reading is ≥ 2.0 ppm.**
- Proceed to Sheen observation.
- Sheen observation –
    - Rinse unpreserved 40-milliliter (mL) VOA vial with water from the drinking water sampling point 3 times.
- After rinsing, fill the VOA vial half-way, avoiding agitating the water inside the vial, and close the vial tightly.
- Lay the VOA vial horizontally on a paper towel and observe the surface of the water. Record sheen and odor observations under “I*nitial Observations*” in the logbook— photograph the vial if sheen is present.

- Let the VOA vial rest undisturbed for at least 1 minute before re-observing. Observe the surface of the water, noting sheen or discoloration and record your observations in the logbook under "*Final Observations*". If a sheen or film is observed, photograph observations and notify the project manager and field manager. Also, in the *"Final Observations"* section, note whether there was an odor or not after letting the vial rest.
- Once the analysis is concluded, the water can be discarded into the sink. If no sheen is observed, the empty VOA vial can be reused at the next location. If a sheen is observed, dispose of the VOA vial with the discarded PPE.
- Headspace observation –
- Quality control for Headspace and Sheen – In order to have consistency in the headspace and sheen analysis, it is critical to let the sheen VOA vial rest for a minimum of 1 minute. This gives time for any chemicals dissolved in the water to migrate out and float to the surface.

    - Free Chlorine Analysis –
        - Review the Safety Data Sheet for the DPD Free Chlorine Reagent Powder Pillows and ensure the proper PPE is in use. Review the colorimeter operator's manual.
        - Power on the colorimeter.
        - Set the instrument to low range by pressing the up arrow (triangle) button so the triangle is under **LR** on the instrument screen (Low Range).
        - Zero the colorimeter
            - Prior to collecting the Free Chlorine sample, rinse the sample cell and cap 3 times with water from the drinking water sampling point. Discard water into sink each time.
            - Fill the cell to the 10 mL mark and cap the sample cell. Clean and dry the outside of the sample cell with a lint free cloth.
            - Insert the sample into the cell holder ensuring the diamond mark on the cell is lined up with the triangle mark on the meter (facing the meter).
            - Insert the instrument cap over the cell holder.
            - Push **ZERO** (Blue button on the left of the meter), the display should show 0.00.
        - Take the chlorine measurement
            - Remove the sample cell from the meter and place on a flat surface. Remove the cap. Carefully open the DPD Free Chlorine Reagent Powder Pillow and add the entire contents to the sample and close the sample cell with the cap.
            - Invert the sample cell several times for 20 seconds to mix, a pink color will develop if chlorine is present.
            - Take a reading within 1 minute.
            - While timing the mixture, clean the cell with a lint free cloth and place the cell in the meter making sure the diamond on the cell is lined up with the triangle on the meter.

        - Press the green button with the check mark on the righthand side of the meter and record the results in the logbook in mg/L.
    - If the chlorine measurement is less than 0.02 mg/L, repeat free chlorine analysis after the 5-minute flush required prior to bacterial (total coliform/heterotrophic plate count) sample collection (see field SOP part B).
    - If the screen on the meter is blinking, that is an indication the Free Chlorine concentration is greater than 2.0 mg/L and a dilution of the sample is required.
        - Immediately decant the contents of the sample cell and rinse the sample cell and cap 3 times with the water to be analyzed and 2 times with deionized water.
        - Prepare a 1:1 dilution of the sample by decanting 50 mL of sample into a 100 mL beaker and add 50 mL of distilled water, swirl the mixture and decant into the 10 mL cell to the 10 mL mark and repeat the analysis.
        - Take the reading from the meter and multiply the result by 2 and record on the field form.
        - If the analysis is still over range, prepare a 1:4 dilution by adding 25 mL of sample to the beaker and 75 mL of distilled water. Multiply the results by 4 and record on the field form.

    - After taking the Free Chlorine Analysis, dispose of solution in sink. Be sure to rinse the bottom of the sink to avoid pink staining. Rinse the sample cell 3 times before stowing as residue can discolor the sample cells.

- Water Quality Parameters Test -
    - Ensure the proper PPE is in use and review the Aqua TROLL 600 Multiparameter Sonde operator's manual.
    - Decontamination
        - Prior to collecting Water Quality Parameters, rinse a 250 ml amber transfer bottle 3 times using tap water from the sample point
        - Unscrew the black cap from the AT600 and remove the sponge, or dump out left over calibration water, from sample cell.
        - Rinse the sample cell 3 times using the 250 ml bottle that was decontaminated in the first step discarding water from cell into the sink after each rinse.
        - After rinsing, double check no debris is present (ex. sponge particles).
    - Power on and Pair the AT600
        - Power on the AT600 either by slightly unscrewing the black portion of the body from the center or by turning it upside down with metal hanger facing up.

        - The screen will turn blue when the device is on, and it is ready to be paired to a smart phone via Bluetooth using the Vu-Situ App.
        - Select the appropriate AT600 serial number prompted in the Vu-Situ App for pairing.
    - Take the Water Quality Parameters Measurement
        - In the Vu-Situ app select the "*Live Readings*" option.
        - Once on the *"Live Readings"* page, change the recording mode by selecting the camera image in the bottom left corner—the yellow toggle button on the bottom right corner should read *"Save Single Reading"*.
        - Above the parameters, click on "*Change Location"* and input the sample ID as the name.
        - Set "*Refresh Rate"* to 1 second
- On the parameter screen, check the following measurements and adjust units as needed such that parameters reflect the following:
- PH
- Range: 6.5-8.5
- Specific Conductivity (µS/cm)
- Range: 50-50,000 µS/cm
- Turbidity (NTU)
- Range: <5NTU
- Temperature (°C)
- Fill the sample cell until the brush is fully submerged.
- After filling the sample cell, let 30 seconds elapse before collecting "stabilized parameters"
- If parameters fall outside of the range listed above, rinse your sample cell three times and let the Aquatroll parameters restabilize.
    - If restabilized parameters remain outside of the range listed above, recalibrate Aquatroll sensors as needed. Note in logbooks that the Aquatroll was recalibrated and record new stabilized parameters.
- Once parameters have stabilized, click on the "S*ave Single Reading"* button on the bottom right corner. If measurements are outside of the expected range, note this in your logbook.
- Double check parameters have been recorded by clicking on the upper left 3 bars and selecting data files. Parameters should be saved in the Snapshot file associate with the sample date (ex. TeamA_Snapshot – 04/12/2024)
    - At the end of the day, you will save this file and send it to the QC/Intake team. The title will include your team name and date (ex. Team A_20240412)

You are now prepared for sample collection. Refer to Drinking Water Sample Collection SOP, Part B – Sample Collection

Drinking Water Sample Collection SOP, Part B – Sample Collection

Scope – The purpose of this SOP is to ensure the sample collection process is performed in a manner consistent with requests made by both EPA and Hawaii State Department of Health.

Procedure – Once the headspace/sheen observations and free chlorine tests have been performed and recorded according to Part A, samples can be collected for shipment to the designated analytical laboratory. Samples should be collected in the order listed below referencing the required bottleware chart on the last page.

- Pre-sampling preparation – Place the sample containers to be filled on the towel used in Part A. Check to ensure all required sample preservatives are available for each container. See Bottle Container Checklist (Part B). The 250 ml plastic bottle for metals contains the 1:1 nitric acid preservative, handle with caution. Do not rinse any of the bottles.

- Collect the samples for EPA Methods **524.2 VOCs** and **524.2 Total Trihalomethanes**
  - Remove cap and tilt the vial so the flow falls on the interior surface of the vial, do not shake or agitate. Fill to the neck of the vial.
  - Add 3 drops of HCl. Place cap on the vial, tighten, and gently invert several times to dissolve the preservative.
  - Remove the cap. Add more sample until a convex meniscus is formed, but do not overfill. Cap the vial. Do not use the cap to add additional water to the vial.
  - Once the vial has been sealed, turn the vial upside down and look for the presence of bubbles. If any bubbles are present greater than half the size on a pea, re-collect the sample. DO NOT add additional sample. If there are no bubbles, repeat the process until all the vials have been filled.

- Collect the sample for EPA Method **504.1 Ethylene Dibromide**
  - Remove cap and tilt the bottle so the flow falls on the interior surface of the bottle, do not shake or agitate.
  - Fill the bottle to the neck of the bottle. Replace the cap and tilt the bottle several times to mix the preservative.

- Collect the samples for EPA Methods **8260 TPH-g**
  - Remove cap and tilt the vial so the flow falls on the interior surface of the vial, do not shake or agitate.
  - Fill the vial until a convex meniscus is formed, but do not overfill. Place cap on the vial, tighten, and gently invert the vial several times to mix the preservative.

  - Once the vial has been sealed, turn the vial upside down and look for the presence of bubbles, if any bubbles are present greater than half the size on a pea, re-collect the sample. DO NOT add additional sample. If there are no bubbles repeat the process until all the vials have been filled.

- Collect the samples for EPA Method **SM 5310B TOC**
  - Remove cap and tilt the bottle so the flow falls on the interior surface of the bottle, do not shake or agitate.
  - Fill to the neck of the bottle. Place cap on the bottle, tighten, and gently invert several times to mix the preservative.

- Collect the samples for EPA Method **8015 TPH-d/o**
  - Remove cap and tilt the vial so the flow falls on the interior surface of the bottle, do not shake or agitate.
  - Fill the vial to the bottle lip, but do not overfill. Place cap on the vial and tighten.
  - Zero headspace is not required due to the hard plastic cap.

- Collect the samples for EPA Method **525.2 SOCs**
  - Remove cap and tilt the bottle so the flow falls on the interior surface of the bottle, do not shake or agitate.
  - Fill the bottle within 1 or 2 inches of the top (just below the neck of the bottle). Add 5 mL of 1:1 HCL, place the cap on the bottle, tighten and gently tip the bottle to mix the preservative.
  - Fill the bottle to the neck of the bottle. Replace the cap and tilt the bottle several times to mix the preservative.

- Collect the sample for EPA Method **8270SIM 2-(2-Methoxyethoxy)- Ethanol**
  - Remove cap and tilt the bottle so the flow falls on the interior surface of the bottle, do not shake or agitate.
  - Fill the bottle to the neck of the bottle. Replace the cap.

- Collect the sample for EPA Method **SM 2320B Total Alkalinity**
  - Remove cap and tilt the bottle so the flow falls on the interior surface of the bottle, do not shake or agitate.
  - Fill the bottle to the neck of the bottle. Replace the cap.

- Collect the sample for EPA Method **300.1 Anions**
  - Remove cap and tilt the bottle so the flow falls on the interior surface of the bottle, do not shake or agitate.
  - Fill the bottle to the neck of the bottle. Replace the cap.

- Collect the sample for EPA Method **200.8/245.1 Metals/Mercury** and **200.7 Cations & Silica**

- This bottle contains 1:1 HNO3, a corrosive acid that can cause serious injury, therefore when filling the bottle point the opening away from you prior to and during sampling.
- Remove the cap pointing the open end away from you. Place the bottle under the sample point so the sample runs down the inside the wall of the bottle.
- Fill the bottle to the neck of the bottle. Replace the cap and tilt the bottle several times to mix the preservative.

- Collect the sample for EPA Methods **SM 9223B Total Coliform** and **SM 9215B Heterotrophic Plate Count**
  - Put on a new pair of gloves prior to handling bottleware.
  - Purge the sample location for at least 5 minutes by increasing the flow rate to a maximum flow
  - After the 5 minute purge, reduce the flow rate to 500 mL/minute (approximately 1/8th inch diameter stream or the width of a pencil)
  - Remove cap and tilt the bottle so leaving at least 2.5cm of headspace the flow falls on the interior surface of the bottle, do not shake or agitate.
  - Fill the bottle leaving at least 2.5cm of headspace. Replace the cap and tilt the bottle several times to mix the preservative. Do not place the cap down while filling the bottle.

- Collect the sample for EPA Methods **SM 9215 Heterotrophic Plate Count (HOT)**
  - Close the cold water valve and open the hot water valve.
  - Purge the sample location for at least 5 minutes by increasing the flow rate to a maximum flow
  - After the 5 minute purge, reduce the flow rate to 500 mL/minute (approximately 1/8th inch diameter stream or the width of a pencil)
  - Take a **hot** free chlorine analysis and water quality parameter measurements following steps from Drinking Water Field SOP Part A
  - Put on a new pair of gloves prior to handling bottleware.
  - Remove cap and tilt the bottle so the flow falls on the interior surface of the bottle, do not shake or agitate.
  - Fill the bottle leaving at least 2.5cm of headspace. Replace the cap and tilt the bottle several times to mix the preservative.

Take note of any color or odor associated with the sample and document. Complete the COC. Record the date as MM/DD/YYYY and time universal (military) time. Affix the sample label to the bottles/vials, affix the custody seal to the bottles/vials, place the bottles/vials in the laboratory provided bubble wrap or equivalent and then place in a zip lock bag. Place the samples into a cooler with ice.

Analysis	RE/Priority Buildings	Resident Requests	Hydrants (Monthly)	Hydrants (Quarterly)	Waiawa Shaft pre and post-chlorination (Monthly)	Waiawa Shaft pre and post-chlorination (Quarterly)	NAH Shaft pre-chlorination (Quarterly)	Red Hill Shaft pre-chlorination (Quarterly)
VOC's (EPA 524.2) + 15 mL HCL Dropper	x	x	x	x	x/x	x/x		
Collected In VOC's Bottle - Total Trihalomethanes (EPA 524.2)	x				/x	/x		
Ethylene Dibromide (EPA 504.1)				x		x		
TPH-G (EPA 8260)	x	x	x	x	x/x	x/x		
TOC (SM 5310B)	x	x	x	x	x/x	x/x		
TPH d/o (EPA 8015)	x	x	x	x	x/x	x/x		
SOC's (EPA 525.2) + 5 mL HCL Vial	x	x	x	x	x/x	x/x		
2-(2-Methoxyethoxy)-Ethanol (EPA 8270SIM)				x		x		
2-(2-Methoxyethoxy)-Ethanol (EPA 8270SIM)				x		x		
Total Alkalinity (SM 2320B)	x	x	x	x	x/x	x/x	x	x
Total Coliform (SM 9223B) / Heterotrophic Plate Count (SM 9215B)	x	x	x	x	x/x	x/x	x	x
Hot Sample Heterotrophic Plate Count (SM 9215B)		x						
Anions (EPA 300.1)					x/x	x/x	x	x
Metals (EPA 200.8 & EPA 245.1)	x	x						
Collected In Metals Bottle - Cations & Silica (EPA 200.7)					x/x	x/x	x	x

Drinking Water Sample Collection SOP, Part C – Hydrant Sampling

Scope – The purpose of this SOP is to ensure the sample collection process is performed in a manner consistent with requests made by both EPA and Hawaii State Department of Health. The option to collect a sample from the first flush of water from a tap is a deviation of typical State and Federal requirements for the collection of drinking water samples for the generation of definitive-level analytical data.

Procedure –

1. Approach hydrant and ensure safe parking is available near hydrant. If not, park in a safe area away from traffic and walk equipment to the hydrant. When working along the street, place cones to demarcate the work zone and use the vehicle as a barrier between traffic and staff.

2. Decontaminate the hydrant spigot fitting using isopropyl alcohol. Take special care to rinse the grooves of the fitting. Use distilled water to thoroughly rinse the fitting. After thorough decontamination, change gloves.

3. Prepare for hydrant purge by staging two five-gallon buckets underneath the top hydrant outlet port, where water is discharged from. One bucket is needed to measure flow volume and to capture any water discharged during sampling. The purge requirements are 30 gallons over a 10-minute period. This means that a flow rate of roughly 3 gal/min is optimal to achieve the required purge.

4. After buckets are positioned correctly, use the hydrant wrench to remove the cover fitting over the top discharge port. Screw the hydrant spigot fitting onto the discharge port. This fitting allows for the flow to be controlled.

5. Use the hydrant wrench to slowly open the valve that is opposite the top discharge port. Turning the wrench counterclockwise will open the valve allowing the flow of water to begin. Adjust the flow at either the hydrant valve or the valve on the attached hydrant spigot fitting to achieve roughly 3 gal/min for the purge. Wait until the 5-gallon bucket is full and then switch out the second empty bucket to begin filling. While the second bucket is filling, the first can be dumped onto the ground. Repeat this process until 30 gallons is achieved. Make sure water is not discharged into a storm drain or sewer manhole. Discharge water onto a grassy area.

6. Perform and record headspace/sheen observations and free chlorine tests according to Part A – Headspace, Sheen Observation and Free Chlorine.

7. Collect samples according to Part B – Sample Collection.

8. Upon sampling completion, affix the hydrant wrench to the valve opposite of the top discharge port, and turn clockwise to tighten the valve, stopping the flow of water. Remove the hydrant spigot fitting and place in the hydrant kit along with the hydrant wrench and decontamination supplies. Affix the cover fitting over the discharge port and tighten until snug.