

Sampling and Analysis Plan for Navy Aiea Halawa Shaft Treatment System Pilot Study

**HAWAII STATE WELL NO. 3-2255-032 JOINT BASE PEARL
HARBOR-HICKAM PUBLIC WATER SYSTEM (#HI0000360)**

March 2025

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Acronyms and Abbreviations

AWWA	American Water Works Association
DOH	State of Hawaii, Department of Health
EBCT	Empty bed contact time
EPA	United States Environmental Protection Agency
GAC	Granular activated carbon
gpm	Gallons per minute
IX	Ion exchange
JBPHH	Joint Base Pearl Harbor-Hickam
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
mg	Milligram
mgd	Million gallons per day
MRL	Method Reporting Limit
NAHS	Navy Aiea Halawa Shaft (well)
NSF	National Sanitation Foundation
NPDWS	National Primary Drinking Water Standards
PAH	Polycyclic Aromatic Hydrocarbon
PFAS	per- and polyfluoroalkyl substances
PWS	Public Water System
SAP	Sampling and Analysis Plan
TPH	Total Petroleum Hydrocarbons
WUP	Water Use Permit

(b) (2) (B)

NAHS is a vital Navy resiliency measure providing an alternative water source to supplement the Waiawa shaft and maintain a continual safe water supply to JBPHH PWS customers.

To pursue reactivating the NAHS, the Navy submitted the NAHS Reactivation Plan (Navy 2024) to Hawaii Department of Health (DOH) in October 2024. The reactivation plan outlines Navy's intention to conduct a pilot study of a recently installed granular activated carbon (GAC) and ion exchange (IX) resin treatment system to demonstrate its functionality and treatment efficacy. The primary purpose of the pilot study is to demonstrate the efficacy of the treatment system at reducing PFAS. The treatment system is designed to treat an instantaneous flow of up to 5 million gallons per day (mgd) and reduce levels of PFAS, Total Petroleum Hydrocarbons (TPH), and polycyclic aromatic hydrocarbons (PAH).

This SAP outlines the operational procedures and monitoring strategy for conducting the pilot study to evaluate the efficacy of the treatment system. The sampling and testing procedures conform with United States Environmental Protection Agency's (EPA) Online Water Quality Monitoring in Distribution Systems for Water Quality Surveillance and Response Systems (EPA 2018) ensuring data collection and laboratory analyses follow proper scientific protocols and practices.

Following successful completion of the treatment system pilot study, a technical memorandum documenting the testing results and system efficacy shall be submitted to DOH satisfying a conditional approval requirement to reactivate the shaft.

Status of NAH Shaft and Pump Station

The NAHS (Well Number 3-2255-032) is permitted under the State of Hawaii Commission on Water Resource Management under Water Use Permit (WUP) No. 00086 with a total annual average allocation of 0.697 mgd. Prior to its precautionary deactivation on December 3, 2021, the NAHS water supply supplemented the JBPHH-PWS supply by feeding nearby housing areas and offered a contingent source of water should there be an interruption to service.

The NAHS pump station contains two Vertical Turbine Pumps. The largest pump has a rated capacity of (b) (3) (B) gallons per minute (gpm), and the smaller pump undergoing replacement is rated at (b) (3) (B) gpm. The NAHS pump is capable of feeding water from the shaft through the treatment system to the booster tanks. Since the treatment system is not connected to the shaft yet, the operational shaft pump will feed NAHS supply water through a temporary pipe to the influent line of the treatment system enabling fresh shaft water to be treated and tested during the pilot study. Upon receiving approval from DOH to reactivate NAHS, the shaft pump flow will be directed to the influent line of the treatment system and the effluent of the treatment system will be tied into the JBPHH PWS. Chlorine and fluoride will be added after treatment and before the PWS reconnection point.

Granular Activated Carbon/Ion Exchange (GAC/IX) Treatment System

Prior to its shutdown, NAHS supply water complied with DOH drinking water regulatory requirements. Although NAHS remains offline, it continues to be flushed and sampled quarterly under Navy's Extended Drinking Water Monitoring programs. Monitoring results of the shaft water supply are provided in Appendix 1.

Since November 2020, analytical results of samples from the NAHS raw water reported several PFAS compounds at concentrations below the EPA health advisory levels. The origin or source of PFAS in the raw water is unknown. Since July 2024, samples for PFAS analysis have been collected from NAHS every

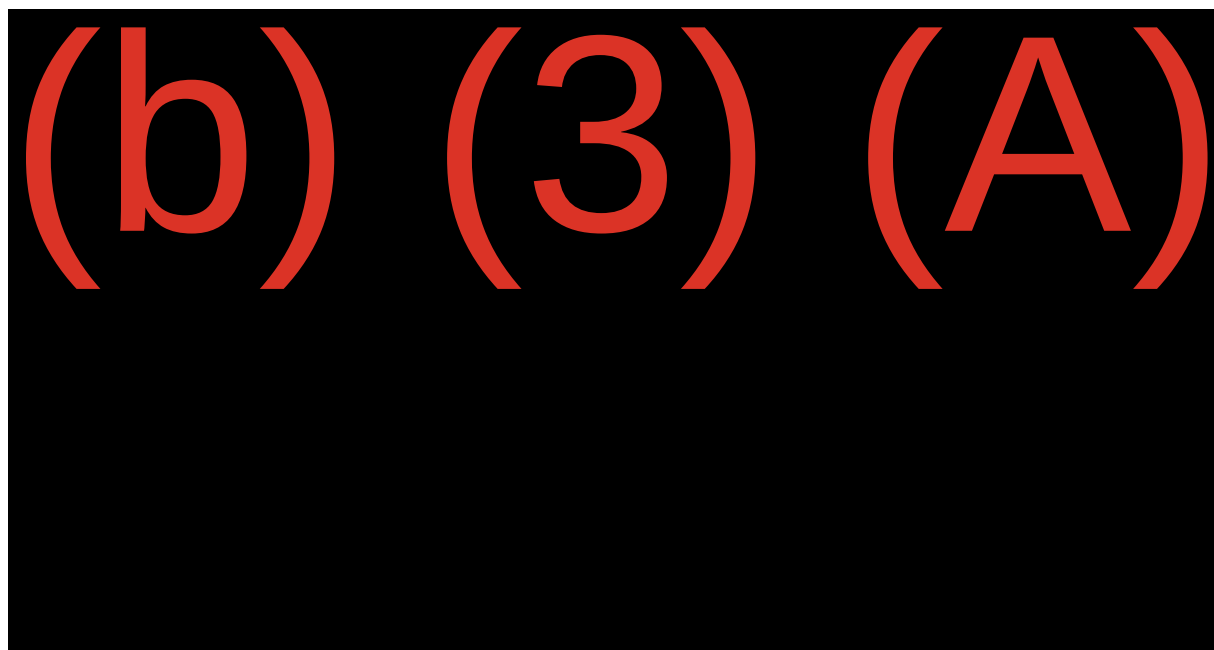
Navy Aiea Halawa Shaft Treatment System Pilot Study
Sampling and Analysis Plan

two months. Analytical results from recurring sampling events report concentrations of Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) above the April 2024 EPA National Primary Drinking Water Standards (NPDWS) maximum contaminant level (MCLs) for PFAS (Appendix 2). The primary objective of the treatment system is to proactively reduce PFAS levels to comply with the 2029 EPA NPDWS MCLs for PFAS. Table 1 summarizes recent sampling events that reported PFAS results above the EPA MCL.

Table 1 Summary of Chemistry Results PFAS Sampling, Aiea Halawa, JBPHH							
Location ID:				SHFTA IEA- CP-PR	SHFTAIEA-PR-FW2		
Location Type:				Well	Faucet/Tap		
Field Sample ID:				SHAFT -HW- 0017491 -24183- N	SHAFT -HW- 0018384 -24245- N	SHAFT -HW- 0018384 -24306- N	SHAFT -HW- 0018384 -25001- N
Sample Date:				2024- 07-24	2024- 09-27	2024- 11-07	2025- 01-08
Method Group	Analyte	EPA RSL	EPA MCL				
Per- and Polyfluoroalkyl Substances (EPA 533) (ppt)	Perfluorooctanesulfonic acid (PFOS)	4	4	6.80 §	11.5 §	13.9 §	10.3 §
	Perfluorooctanoic acid (PFOA)	6	4	3.50	7.40 §	7.50 §	7.20 §
Per- and Polyfluoroalkyl Substances (EPA 537.1) (ppt)	Perfluorooctanesulfonic acid (PFOS)	4	4	7.10 §	8.50 §	8.50 §	7.40 §
	Perfluorooctanoic acid (PFOA)	6	4	3.60	6.30 §	6.80 §	5.70 §
§ - Exceeds Screening Level RSL-Regional Screening Level MCL-Maximum Contaminant Level							

The large-scale GAC/IX treatment system is situated approximately 1,800 feet from the NAHS Pump Station within Navy property on a level and accessible area adjacent to the Navy Halawa Housing Area (Figure 2).

FIGURE 2: GAC and IX Treatment System Layout (CUI)



The treatment system consists of four (4) individual trains, with each train having two (2) GAC vessels per train assembled in a lead/lag configuration and followed by a final IX contact vessel. The total number of contact tanks for the system is twelve (12), with eight (8) GAC and four (4) IX vessels. The system is designed to remove potential PFAS, TPH, and PAH impacts. The treatment system is designed to operate with three (3) trains running at a time with one redundant train available. The piping to and from the treatment system is National Sanitation Foundation (NSF) certified (b) (3) (A) Standard Dimension Ratio 11 High Density Polyethylene piping. The three booster tanks and two associated pumps (primary and alternate) will pump the treated water into the JBPHH distribution system after treatment. Appendix 3 presents a Process Flow Diagram of the GAC/IX treatment system and piping.

The treatment system is designed to treat an instantaneous flow rate of up to (b) (3) (A) mgd; however, Navy must remain within its WUP withdrawal total annual average flow rate of 0.697 mgd. Treatment system valving allows 1, 2, 3, or all 4 trains to be operational offering flexibility in adjusting the empty bed contact time (EBCT) and in servicing the vessels within the trains.

The recommended EBCT to treat TPH is approximately 7.5 minutes at a maximum flow of approximately 1400 gpm per train. The EBCT for PFAS is 28-30 minutes for the GAC media. However, the addition of IX vessel reduces the EBCT for PFAS to 14-15 minutes. The combination of GAC media and IX resin will allow sufficient contact time to remove PFAS.

Materials, equipment, and configuration of the entire GAC/IX treatment system adhere to applicable

potable water codes, regulations, and industry standards to include:

- Safe Drinking Water Act of 1974, including its subsequent amendments
- Hawaii Administrative Rules, Title 11, Chapters 20, 25, and 30
- Unified Facilities Criteria (UFC) 3-230-01 and 3-230-03.
- NSF 60 – Drinking Water Treatment Chemicals – Health Effects
- NSF 61 – Drinking Water System Components
- American Water Works Association (AWWA) B604 – Granular Activated Carbon
- AWWA standards

Treatment System Operation During Pilot Study

The treatment system will be operated under the supervision of a qualified and certified Grade 1 Water Treatment Plant Operator, independent of the consultant conducting the sampling. The treatment system operator will closely coordinate with JBPHH Utilities personnel to synchronize NAHS pump activation with planned treatment system operational periods. The pilot study will utilize only the first train of the four-train treatment system.

The primary intent of the pilot study is to determine the efficacy of the GAC/IX treatment system to remove PFAS. Groundwater from the shaft shall be pumped through a temporary line into the influent pipe of the treatment system. Flow will be directed into only the initial train of the treatment system by closing the entry valves to the other three trains (see Process Flow Diagram in Appendix 3).

The planned flow rate through the single train will be approximately 1400 gpm for 4-6 hours every 2-3 days. The flow meter installed at the (b) (3) (B) -foot mark on the influent line of the Process Flow Diagram (Appendix 3; Sheet 3 of 3) will measure flow into the treatment system. Flow rates to the single train will be adjusted to align with the planned flow rates under full NAHS and treatment system operation. Pumping frequency and flow rates will be optimized to remain within WUP withdrawal limits reducing salinity intrusion concerns, maintain the integrity of the media, and reduce stagnation.

To prevent backpressure to the NAHS pump while feeding the treatment system, the Navy may need to release excess raw water through accessory outlets at the Pump Station to the nearby grassy areas and the drainage swale that flows to Halawa Stream. After treatment, treated potable water will be discharged through the treatment system flushing ports to a nearby drainage swale that connects to a Department of Transportation storm drainage culvert and channel directing flow to Halawa Stream.

The booster tanks/pumps and chlorination/fluoridation systems will not be utilized during the pilot study phase and will remain physically disconnected from the JBPHH-PWS until DOH approves NAHS reactivation.

Pilot Study Assumptions

Per the October 2024 submittal of the NAHS Reactivation Plan to DOH (Navy 2024), Navy intends to conduct a Pilot Study of the GAC/IX treatment system to demonstrate its efficacy at reducing PFAS prior to formally requesting DOH approval to fully reactivate the shaft. The following assumptions are made in planning this pilot study:

- Pilot Study period of performance will be 30 days.
- Field activities will take place during normal daylight working hours. A sampling event on Saturday may be necessary to operate the treatment system every 2-3 days. No field activities will occur on Sundays.
- Prior to initiating field work, JBPHH Utilities, Contractor and Consultant personnel will coordinate to review safety concerns, equipment operation, and worker responsibilities.
- Work will be performed in Level D personal protective equipment, consisting of hard hat, safety glasses, safety-toed boots, and hearing protection.
- The pilot study will utilize only the initial train of the four-train treatment system.
- Consultant sampling technicians shall be trained on the intricacies of collecting samples for PFAS analyses. Samplers will not don clothing and personal hygiene products that may contain PFAS (e.g., sunblock, lotion, deodorant) to avoid the potential of cross-contamination to samples.
- Field notes will be captured on loose-leaf paper/forms or electronic devices each day. Paper and pens must be PFAS Free, per Standard Operating Procedures.
- One-week in advance of testing, the Navy will provide DOH a tentative schedule for the 30-day pilot study sampling schedule so they can be present to observe and collect split samples with the consultant, if desired.
- Adjustments to the schedule for rain events may occur to avoid overtaxing stormwater drainage channels, to the extent practicable.
- Collection of samples will occur from sampling taps prior to the GAC (raw water), between GAC and IX vessels (midline), and directly after IX treatment (effluent).
- The piping from the treatment system effluent flushing ports to the booster tanks/pump is not required for the pilot study since treated water is discharged to a storm drain directly after testing.
- Injection of chlorine and fluoride are not included in the pilot study.
- A waste determination of the IDW generated will be completed prior to disposal.

Sampling & Monitoring

The planned duration of the Pilot Study is a total of 30 days with sampling occurring every 2-3 days. The schedule will avoid field activities on Federal holidays and Sundays. Adjustments to the schedule for rain events may occur to avoid overtaxing stormwater drainage channels, to the extent practicable.

The Navy will contract an independent environmental consultant to provide all necessary personnel, equipment and materials to collect water samples. At a minimum, the consultant requirements shall include but shall not be limited to, the following tasks and/or deliverables:

- Field testing, sample collection, and sample transport under proper chain of custody protocols.
- Reporting of analytical results by a certified EPA/DOH laboratory.
- Project Management.
- Technical Memorandum preparation documenting outcomes.

The monitoring requires the environmental consultant to closely coordinate the sampling schedule with JBPHH Utilities personnel and the treatment system operator to synchronize treatment system operation with the sample collection. Samples will be collected during each activation period from NSF 61 certified spigots located prior to the GAC (raw water), between GAC and IX vessels (midline), and directly after IX treatment.

Over the 30-day pilot study period, a total of 42 water samples will be collected from each of the 3 locations during 14 sampling events occurring every 2-3 days. An additional four (4) Quality Control samples will be collected during the pilot study totaling 46 sample sets in all. DOH will be informed of the sampling schedule and invited to collect split samples for further assurances of the reliability of pilot study results.

Experienced sample technicians will collect the raw water sample directly after shaft start up to capture the water with the expected higher PFAS concentration. Samples after GAC and IX treatment will be collected later in the event's operation cycle. To verify adequate system flushing prior to after GAC and IX treatment sample collection, samplers will obtain 3 consecutive pH, conductivity, and temperature field instrument readings within 10% of each other over a 5-minute testing period from the water sampling spigot after IX treatment.

To evaluate each phase of the treatment process, representative samples shall be collected in the following order during each operational event (every 2-3 days) from the following locations:

1. prior to the GAC treatment (raw water)
2. between the GAC lag vessel and IX vessel (midline)
3. after the IX vessel

Sample locations are presented on the flow diagram of the treatment system provided in Appendix 3. Collecting samples from these locations enables calculation of removal efficiency for each phase of treatment and the overall effectiveness of the train at treating the water.

At each of the 3 sampling locations, experienced sampling technicians utilizing calibrated field instruments will measure and record temperature, pH, Free Chlorine, conductivity, and turbidity. Samples requiring shipment to a DOH/EPA certified laboratory for analyses will be collected in appropriately preserved containers and promptly shipped in coolers following chain of custody protocol.

In addition to the field testing parameters, Appendix 4 lists the analytes selected for analyses by a certified DOH/EPA laboratory. The certified laboratory will provide coolers with the sample containers and preservatives required to collect the samples. Appendix 5 identifies for each parameter the analytical method, container type, preservation method, and holding times as required by state and federal drinking water regulations. Chain of custody documentation will be maintained for samples during all phases of sample collection, transport, receipt, and internal transfer within the laboratory.

Field Blank, Trip Blank, Laboratory Control Sample, and Laboratory Control Sample Duplicate samples shall be included for additional Quality Control purposes during each sampling event. Turnaround time for analytical data is expected from the laboratory within one month of sample collection. Validated analytical results will be included in the Technical Memorandum prepared to document the outcomes of the Pilot Study sampling.

Data Objectives

Evaluation of analytical results will determine the overall effect of the treatment system on water chemistry and its efficacy at primarily reducing PFAS, as well as TPH, and PAH.

The primary objective of conducting the pilot study is to demonstrate to DOH that the treatment system is effective at reducing PFAS concentrations to below the April 2024 EPA NPDWS MCLs. Table 2 summarizes the EPA regulatory levels for PFAS.

Table 2: USEPA Summary of PFAS Regulatory levels		
Compound	Final MCLG	Final MCL (enforceable levels)¹
PFOA	Zero	4.0 parts per trillion (ppt) (also expressed as ng/L)
PFOS	Zero	4.0 ppt
PFHxS	10 ppt	10 ppt
PFNA	10 ppt	10 ppt
HFPO-DA (commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1 (unitless)	1 (unitless)
	Hazard Index	Hazard Index
¹ Compliance with MCLs is determined by running annual averages at the sampling point.	ppt-parts per trillion	MCL-maximum contaminant level

PFAS testing results per EPA Methods 533 and 537.1 from all three sample locations during each sampling event will be evaluated to determine the treatment system efficacy at reducing PFAS concentrations to below the EPA NPDWS regulatory levels.

Although pre-Pilot Study evaluations indicate the IX treatment system can reduce PFAS to below both 533 and 537.1 EPA method detection levels (MDLs) over an extended period, Navy will seek to optimize the treatment processes and/or flow rates to improve overall system efficacy.

The analyte list includes testing for multiple fuel related compounds to assess treatment system performance at reducing Total Petroleum Hydrocarbon (TPH) and polycyclic aromatic hydrocarbon (PAH) concentrations in the water. The GAC treatment vessels are rated to be capable of reducing petrogenic compounds over an extended operational period. Based on testing results, the Navy may consider selectively investigating samples further by conducting forensic analysis using Gas Chromatography/Mass Spectroscopy (GC/MS) to identify and quantify the concentrations of Paraffins (P), Iso-paraffins (I), Aromatics (A), Naphthenes (N) and Olefins (O) often referred to by their PIANO acronym.

Technical Memorandum

Upon completion of the pilot study, a technical memorandum will be prepared to summarize the operation, sampling, and interpretation of results. The report shall present calculations of removal efficiency for each phase of treatment and the overall effectiveness of the treatment train at removing PFAS, TPH and PAH. The PFAS removal efficacy of the lead/lag GAC and IX treatment vessels shall be evaluated to estimate media and resin usage and the duration until vessel breakthrough. Treatment system effluent results shall be compared against the April 2024 NPDWR to ensure water destined for entry into the PWS after reactivation complies with the 2029 EPA enforceable MCL compliance criteria for PFAS. Testing results will be compared to DOH screening levels for TPH and PAH compounds.

The results of the single train shall be extrapolated to estimate treatment system efficacy under full operational conditions (i.e., flow through three trains). The report shall include refined estimates of EBCT, media/resin usage, and breakthrough periods.

Raw water sample results for chloride shall also be evaluated for upward trends indicating over pumping and potential for salinity intrusion. Results of other analytes will be evaluated to ensure the effect of the treatment system on supply water does not negatively impact water chemistry.

Navy will submit the Technical Memorandum to DOH with a formal request to reactivate the NAHS at least ten days in advance of a proposed source reactivation date per DOH letter dated February 7, 2025 and in accordance with Hawaii Administrative Rules Section 11-20-30 for new and modified PWS.

References

- a. Navy, 2004. NAHS Reactivation Plan; Navy Closure Task Force Environmental & Remediation. October.
- b. EPA, 2018. Online Water Quality Monitoring in Distribution Systems for Water Quality Surveillance and Response Systems, Environmental Protection Agency, United States (EPA). EPA 817-B-18-001. Office of Water. April.
- c. State of Hawaii DOH Letter, “Public Water System No. 360, JBPHH Revised Conditional Approval to Use Halawa Shaft (Navy) State Well No. 3-2255-32, Halawa, Oahu, HI; 7 February 2024.

Appendix 1: NAHS Extended Drinking Water Monitoring Results

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb), with the exception of Field and Bacterial Test results
Parts per Million (ppm)
Parts per Thousand (ppth)
§ - Exceeds Screening Level
-- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample
MPN/mL = Most probable number per milliliter

				Location ID:	SHFTAIEA-CP-PR			SHFTAIEA-PR-FW2	
				Location Type:	Well			Faucet/Tap	
				Address:	Aiea-Halawa Shaft Pre-Chlorination			Aiea-Halawa Shaft Pre-Chlorination	
				Field Sample ID:	SHAFT-HW-0017491-24122-N	SHAFT-HW-0017491-24122-N-R1	SHAFT-HW-0017491-24183-N	SHAFT-HW-0018384-24275-N	SHAFT-HW-0018384-25001-N
				Sample Date:	2024-05-10	2024-05-30	2024-07-24	2024-10-22	2025-01-08
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	DOH Project Screening Level	Basis of Project Screening Level						
Bacterial Test (in 100 mL)	Coliform	--	--	Absent	--	Absent	--	--	
	E. coli	--	--	Absent	--	Absent	--	--	
Bacterial Test (MPN/mL)	Heterotrophic Plate Count	--	--	43.0	--	80.0	132	--	
Field Test (ppb)	Free Chlorine	4000	MCL	40.0	20.0	20.0	--	--	
Field Test (pH)	pH	--	--	7.00	7.04	7.04	7.16	7.01	
Field Test (ms/cm)	Specific Conductivity	--	--	0.700	0.710	0.670	0.960	0.890	
Field Test (degrees Celcuis)	Temperature	--	--	24.5	25.1	25.9	26.2	25.5	
Field Test (nephelometric turbidity unit)	Turbidity	5	MCL	0.160	0.130	0.110	0.560	3.74	
General Chemistry (ppb)	Alkalinity, Total (as CaCO3)	--	--	137000	--	170000	163000	164000	
	Bromate	--	--	--	ND	ND	ND	ND	
	Bromide	--	--	350	--	420	83.0	600	
	Chlorate	--	--	8.80	ND	30.0	ND	ND	
	Chloride	--	--	87700	--	114000	149000	145000	
	Chlorite	--	--	ND	ND	ND	ND	ND	
	Fluoride	--	--	84.0	--	ND	ND	76.0	
	Phosphorus, Total Orthophosphate (as P)	--	--	480	--	220	180	170	
	Sulfate	--	--	25500	--	31300	42800	40900	
	Total Organic Carbon	--	--	--	--	--	250	--	
Hydrocarbons (ppb)	Petroleum Hydrocarbons (as Diesel)	--	--	--	--	--	ND	--	
	Petroleum Hydrocarbons (as Gasoline)	--	--	--	--	--	ND	--	
	Petroleum Hydrocarbons (as Oil)	--	--	--	--	--	ND	--	
	Petroleum Hydrocarbons, Total	--	--	--	--	--	ND	--	

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				Location ID:	SHFTAIEA-CP-PR			SHFTAIEA-PR-FW2	
				Location Type:	Well			Faucet/Tap	
				Address:	Aiea-Halawa Shaft Pre-Chlorination			Aiea-Halawa Shaft Pre-Chlorination	
				Field Sample ID:	SHAFT-HW-0017491-24122-N	SHAFT-HW-0017491-24122-N-R1	SHAFT-HW-0017491-24183-N	SHAFT-HW-0018384-24275-N	SHAFT-HW-0018384-25001-N
				Sample Date:	2024-05-10	2024-05-30	2024-07-24	2024-10-22	2025-01-08
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	DOH Project Screening Level	Basis of Project Screening Level						
Metals (ppb)	Beryllium	4	MCL	--	--	--		ND	--
	Calcium	--	--	17200	--	19300		25500	26800
	Copper	1300	MCL	--	--	--		6.00	--
	Iron	--	--	ND	--	56.0		140	770
	Lead	15	MCL	--	--	--		0.580	--
	Magnesium	--	--	17000	--	19300		24500	24300
	Manganese	--	--	ND	--	2.80		1.40	8.80
	Mercury	2	MCL	--	--	--		ND	--
	Potassium	--	--	3600	--	3900		4400	4300
	Silica	--	--	67600	--	68700		67600	66100
	Sodium	--	--	89500	--	96000		104000	105000
Synthetic Organic Compounds (ppb)	1-Methylnaphthalene	--	--	--	--	--		ND	--
	2-Methylnaphthalene	--	--	--	--	--		ND	--
	Acenaphthylene	--	--	--	--	--		ND	--
	Anthracene	--	--	--	--	--		ND	--
	Benzo(a)pyrene	0.2	MCL	--	--	--		ND	--
	Benzo(b)fluoranthene	--	--	--	--	--		ND	--
	Benzo(g,h,i)perylene	--	--	--	--	--		ND	--
	Benzo(k)fluoranthene	--	--	--	--	--		ND	--
	Chrysene	--	--	--	--	--		ND	--
	Dibenz(a,h)anthracene	--	--	--	--	--		ND	--
	Fluorene	--	--	--	--	--		ND	--

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Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

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		Location ID:	SHFTAIEA-CP-PR			SHFTAIEA-PR-FW2	
		Location Type:	Well			Faucet/Tap	
		Address:	Aiea-Halawa Shaft Pre-Chlorination			Aiea-Halawa Shaft Pre-Chlorination	
		Field Sample ID:	SHAFT-HW-0017491-24122-N	SHAFT-HW-0017491-24122-N-R1	SHAFT-HW-0017491-24183-N	SHAFT-HW-0018384-24275-N	SHAFT-HW-0018384-25001-N
		Sample Date:	2024-05-10	2024-05-30	2024-07-24	2024-10-22	2025-01-08
		Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	DOH Project Screening Level	Basis of Project Screening Level				
Synthetic Organic Compounds (ppb)	Indeno(1,2,3-c,d)pyrene	--	--	--	--	--	ND
	Naphthalene	--	--	--	--	--	ND
	Phenanthrene	--	--	--	--	--	ND
	Pyrene	--	--	--	--	--	ND
Volatile Organic Compounds (ppb)	1,2,4-Trimethylbenzene	--	--	--	--	--	ND
	1,2-Dibromoethane (EDB)	--	--	--	--	--	ND
	1,3,5-Trimethylbenzene	--	--	--	--	--	ND
	Benzene	5	MCL	--	--	--	ND
	Cumene	--	--	--	--	--	ND
	Ethylbenzene	700	MCL	--	--	--	ND
	m,p-Xylene	--	--	--	--	--	ND
	n-Butylbenzene	--	--	--	--	--	ND
	n-Propylbenzene	--	--	--	--	--	ND
	o-Xylene	--	--	--	--	--	ND
	sec-Butylbenzene	--	--	--	--	--	ND
	tert-Butylbenzene	--	--	--	--	--	ND
	Toluene	1000	MCL	--	--	--	ND
	Xylenes, Total	10000	MCL	--	--	--	ND
Trihalomethanes (ppb)	Bromodichloromethane	--	--	--	--	--	ND
	Bromoform	--	--	--	--	--	ND
	Chloroform	--	--	--	--	--	ND
	Dibromochloromethane	--	--	--	--	--	ND

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb), with the exception of Field and Bacterial Test results
Parts per Million (ppm)
Parts per Thousand (ppth)
§ - Exceeds Screening Level
-- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample
MPN/mL = Most probable number per milliliter

				Location ID:	SHFTAIEA-CP-PR			SHFTAIEA-PR-FW2	
				Location Type:	Well			Faucet/Tap	
				Address:	Aiea-Halawa Shaft Pre-Chlorination			Aiea-Halawa Shaft Pre-Chlorination	
				Field Sample ID:	SHAFT-HW-0017491-24122-N	SHAFT-HW-0017491-24122-N-R1	SHAFT-HW-0017491-24183-N	SHAFT-HW-0018384-24275-N	SHAFT-HW-0018384-25001-N
				Sample Date:	2024-05-10	2024-05-30	2024-07-24	2024-10-22	2025-01-08
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	DOH Project Screening Level	Basis of Project Screening Level						
Trihalomethanes (ppb)	Total Trihalomethanes	80	MCL	--	--	--	ND	--	

Appendix 2: NAHS Bimonthly PFAS Monitoring Results

Summary of Chemistry Results
PFAS Sampling, Red Hill, JBPHH

Notes:
ND = Not Detected
PPT = Parts per Trillion
PPB = Parts per Billion
PPM = Parts per Million
§ - Exceeds Screening Level
-- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample
Results are screened to the November 2023 EPA RSLs in accordance with Update to Assistant Secretary of Defense for Energy, Installations, and Environment Memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" dated August 24, 2023.

				Location ID:	SHFTAIEA-CP-PR	SHFTAIEA-PR-FW2				SHFTWAIA-CP-PR			SHFTWAIA-CP-PT
				Location Type:	Well	Faucet/Tap				Well			Well
				Field Sample ID:	SHAFT-HW-0017491-24183-N	SHAFT-HW-0018384-24245-N	SHAFT-HW-0018384-24306-N	SHAFT-HW-0018384-25001-N		SHAFT-HW-0017916-24245-N-R1	SHAFT-HW-0017916-24306-N	SHAFT-HW-0017916-25001-N	SHAFT-HW-0016021-24183-N-R1
				Sample Date:	2024-07-24	2024-09-27	2024-11-07	2025-01-08		2024-09-18	2024-11-07	2025-01-07	2024-07-17
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)		N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	EPA RSL	EPA MCL										
Field Test (ppb)	Free Chlorine	--	--		20.0	--	--	--		30.0	--	ND	820
Field Test (pH)	pH	--	--		7.04	6.99	7.47	7.01		7.27	7.34	7.34	7.30
Field Test (ms/cm)	Specific Conductivity	--	--		0.670	0.900	0.920	0.890		0.250	0.290	0.280	0.260
Field Test (degrees Celcuis)	Temperature	--	--		25.9	25.9	25.5	25.5		27.6	26.0	29.0	24.8
Field Test (nephelometric turbidity unit)	Turbidity	--	--		0.110	0.720	0.330	3.74		0.630	ND	0.650	0.610
Per- and Polyfluoroalkyl Substances (EPA 533) (ppt)	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	Hexafluoropropylene oxide dimer acid (HFPO-DA)	1.5	10		ND	ND	ND	ND		ND	ND	ND	ND
	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	Perfluorobutanesulfonic acid (PFBS)	600	--		1.80	4.20	4.10	3.70		ND	ND	ND	ND
	Perfluorobutanoic acid (PFBA)	1800	--		2.00	2.70	2.80	2.50		ND	ND	ND	ND
	Perfluorodecanoic acid (PFDA)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	Perfluorododecanoic acid (PFDoA)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	Perfluoroheptanesulfonic acid (PFHpS)	--	--		ND	ND	ND	ND		ND	ND	ND	ND
	Perfluoroheptanoic acid (PFHpA)	--	--		1.90	3.30	3.30	3.00		ND	ND	ND	ND
	Perfluorohexanesulfonic acid (PFHxS)	39	10		2.60	6.10	6.30	6.00		ND	ND	ND	ND

Summary of Chemistry Results
PFAS Sampling, Red Hill, JBPHH

Notes:
ND = Not Detected
PPT = Parts per Trillion
PPB = Parts per Billion
PPM = Parts per Million
§ - Exceeds Screening Level
-- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample
Results are screened to the November 2023 EPA RSLs in accordance with Update to Assistant Secretary of Defense for Energy, Installations, and Environment Memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" dated August 24, 2023.

				Location ID:	SHFTAIEA-CP-PR	SHFTAIEA-PR-FW2				SHFTWAIA-CP-PR			SHFTWAIA-CP-PT
				Location Type:	Well	Faucet/Tap				Well			Well
				Field Sample ID:	SHAFT-HW-0017491-24183-N	SHAFT-HW-0018384-24245-N	SHAFT-HW-0018384-24306-N	SHAFT-HW-0018384-25001-N		SHAFT-HW-0017916-24245-N-R1	SHAFT-HW-0017916-24306-N	SHAFT-HW-0017916-25001-N	SHAFT-HW-0016021-24183-N-R1
				Sample Date:	2024-07-24	2024-09-27	2024-11-07	2025-01-08		2024-09-18	2024-11-07	2025-01-07	2024-07-17
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)		N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	EPA RSL	EPA MCL										
Per- and Polyfluoroalkyl Substances (EPA 533) (ppt)	Perfluorohexanoic acid (PFHxA)	990	--	2.70	5.60	5.80	5.40	ND	ND	ND	ND	ND	ND
	Perfluorononanoic acid (PFNA)	5.9	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Perfluorooctanesulfonic acid (PFOS)	4	4	6.80 §	11.5 §	13.9 §	10.3 §	ND	ND	ND	ND	ND	ND
	Perfluorooctanoic acid (PFOA)	6	4	3.50	7.40 §	7.50 §	7.20 §	ND	ND	ND	ND	ND	ND
	Perfluoropentanesulfonic acid (PFPeS)	--	--	ND	0.990	0.880	0.900	ND	ND	ND	ND	ND	ND
	Perfluoropentanoic acid (PFPeA)	--	--	3.50	7.10	6.90	6.20	ND	ND	ND	ND	ND	ND
	Perfluoroundecanoic acid (PFUnA)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Per- and Polyfluoroalkyl Substances (EPA 537.1) (ppt)	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hexafluoropropylene oxide dimer acid (HFPO-DA)	1.5	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Perfluorobutanesulfonic acid (PFBS)	600	--	1.80	3.80	4.20	3.20	ND	ND	ND	ND	ND	ND
	Perfluorodecanoic acid (PFDA)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Perfluorododecanoic acid (PFDoA)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Perfluoroheptanoic acid (PFHpA)	--	--	1.50	2.80	3.10	2.20	ND	ND	ND	ND	ND	ND
	Perfluorohexanesulfonic acid (PFHxS)	39	10	2.60	5.20	5.70	5.00	ND	ND	ND	ND	ND	ND
	Perfluorohexanoic acid (PFHxA)	990	--	2.40	4.50	5.40	3.80	ND	ND	ND	ND	ND	ND
	Perfluorononanoic acid (PFNA)	5.9	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Perfluorooctanesulfonic acid (PFOS)	4	4	7.10 §	8.50 §	8.50 §	7.40 §	ND	ND	ND	ND	ND	ND
	Perfluorooctanoic acid (PFOA)	6	4	3.60	6.30 §	6.80 §	5.70 §	ND	ND	ND	ND	ND	ND

Summary of Chemistry Results
PFAS Sampling, Red Hill, JBPHH

Notes:
ND = Not Detected
PPT = Parts per Trillion
PPB = Parts per Billion
PPM = Parts per Million
§ - Exceeds Screening Level
-- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample
Results are screened to the November 2023 EPA RSLs in accordance with Update to Assistant Secretary of Defense for Energy, Installations, and Environment Memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" dated August 24, 2023.

				Location ID:	SHFTAIEA-CP-PR	SHFTAIEA-PR-FW2				SHFTWAIA-CP-PR			SHFTWAIA-CP-PT
				Location Type:	Well	Faucet/Tap				Well			Well
				Field Sample ID:	SHAFT-HW-0017491-24183-N	SHAFT-HW-0018384-24245-N	SHAFT-HW-0018384-24306-N	SHAFT-HW-0018384-25001-N		SHAFT-HW-0017916-24245-N-R1	SHAFT-HW-0017916-24306-N	SHAFT-HW-0017916-25001-N	SHAFT-HW-0016021-24183-N-R1
				Sample Date:	2024-07-24	2024-09-27	2024-11-07	2025-01-08		2024-09-18	2024-11-07	2025-01-07	2024-07-17
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)		N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	EPA RSL	EPA MCL										
Per- and Polyfluoroalkyl Substances (EPA 537.1) (ppt)	Perfluorotetradecanoic acid (PFTeDA)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Perfluorotridecanoic acid (PFTrDA)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Perfluoroundecanoic acid (PFUnA)	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Summary of Chemistry Results
PFAS Sampling, Red Hill, JBPHH

Notes:
ND = Not Detected
PPT = Parts per Trillion
PPB = Parts per Billion
PPM = Parts per Million
§ - Exceeds Screening Level
-- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample
Results are screened to the November 2023 EPA RSLs in accordance with Update to Assistant Secretary of Defense for Energy, Installations, and Environment Memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" dated August 24, 2023.

				Location ID:	SHFTWAIA-CP-PT		
				Location Type:	Well		
				Field Sample ID:	SHAFT-HW-0016021-24245-N-R1	SHAFT-HW-0016021-24306-N	SHAFT-HW-0016021-25001-N
				Sample Date:	2024-09-18	2024-11-07	2025-01-07
				Sample Type:	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	EPA RSL	EPA MCL				
Field Test (ppb)	Free Chlorine	--	--	790	450	440	
Field Test (pH)	pH	--	--	7.45	7.32	7.40	
Field Test (ms/cm)	Specific Conductivity	--	--	0.260	0.250	0.250	
Field Test (degrees Celcuis)	Temperature	--	--	26.9	25.9	25.9	
Field Test (nephelometric turbidity unit)	Turbidity	--	--	0.620	0.0440	0.540	
Per- and Polyfluoroalkyl Substances (EPA 533) (ppt)	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	--	--	ND	ND	ND	
	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	ND	ND	ND	
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	--	--	ND	ND	ND	
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	--	--	ND	ND	ND	
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	--	--	ND	ND	ND	
	9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	--	--	ND	ND	ND	
	Hexafluoropropylene oxide dimer acid (HFPO-DA)	1.5	10	ND	ND	ND	
	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	ND	ND	ND	
	Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	ND	ND	ND	
	Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	ND	ND	ND	
	Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	ND	ND	ND	
	Perfluorobutanesulfonic acid (PFBS)	600	--	ND	ND	ND	
	Perfluorobutanoic acid (PFBA)	1800	--	ND	ND	ND	
	Perfluorodecanoic acid (PFDA)	--	--	ND	ND	ND	
	Perfluorododecanoic acid (PFDoA)	--	--	ND	ND	ND	
	Perfluoroheptanesulfonic acid (PFHpS)	--	--	ND	ND	ND	
	Perfluoroheptanoic acid (PFHpA)	--	--	ND	ND	ND	
	Perfluorohexanesulfonic acid (PFHxS)	39	10	ND	ND	ND	

Summary of Chemistry Results
PFAS Sampling, Red Hill, JBP HH

Notes:
ND = Not Detected
PPT = Parts per Trillion
PPB = Parts per Billion
PPM = Parts per Million
§ - Exceeds Screening Level
-- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample
Results are screened to the November 2023 EPA RSLs in accordance with Update to Assistant Secretary of Defense for Energy, Installations, and Environment Memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" dated August 24, 2023.

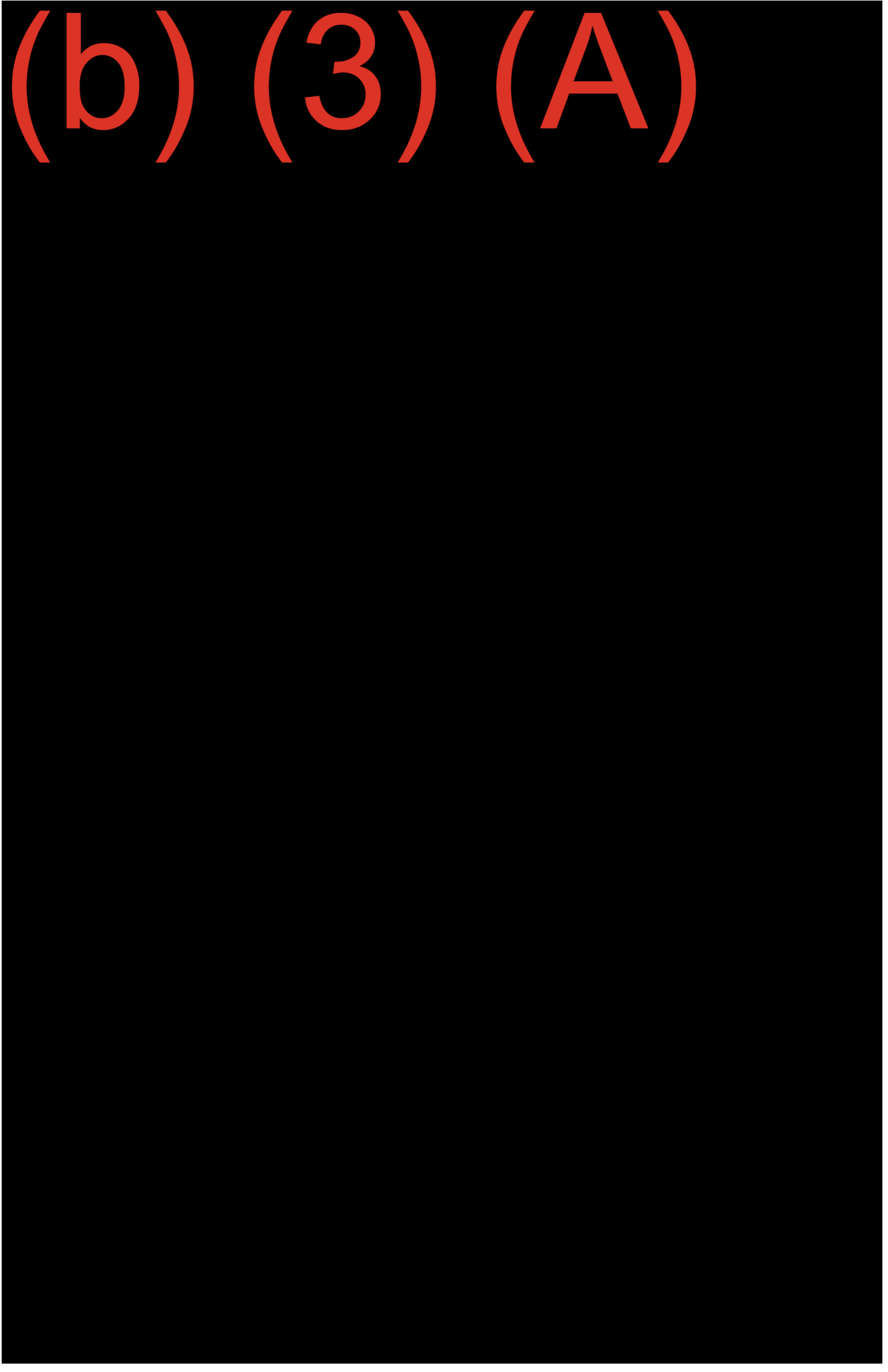
				Location ID:	SHFTWAIA-CP-PT		
				Location Type:	Well		
				Field Sample ID:	SHAFT-HW-0016021-24245-N-R1	SHAFT-HW-0016021-24306-N	SHAFT-HW-0016021-25001-N
				Sample Date:	2024-09-18	2024-11-07	2025-01-07
				Sample Type:	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	EPA RSL	EPA MCL				
Per- and Polyfluoroalkyl Substances (EPA 533) (ppt)	Perfluorohexanoic acid (PFHxA)	990	--	ND	ND	ND	
	Perfluorononanoic acid (PFNA)	5.9	10	ND	ND	ND	
	Perfluorooctanesulfonic acid (PFOS)	4	4	ND	ND	ND	
	Perfluorooctanoic acid (PFOA)	6	4	ND	ND	ND	
	Perfluoropentanesulfonic acid (PFPeS)	--	--	ND	ND	ND	
	Perfluoropentanoic acid (PFPeA)	--	--	ND	ND	ND	
	Perfluoroundecanoic acid (PFUnA)	--	--	ND	ND	ND	
Per- and Polyfluoroalkyl Substances (EPA 537.1) (ppt)	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	--	--	ND	ND	ND	
	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	ND	ND	ND	
	9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	--	--	ND	ND	ND	
	Hexafluoropropylene oxide dimer acid (HFPO-DA)	1.5	10	ND	ND	ND	
	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	--	--	ND	ND	ND	
	N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	--	--	ND	ND	ND	
	Perfluorobutanesulfonic acid (PFBS)	600	--	ND	ND	ND	
	Perfluorodecanoic acid (PFDA)	--	--	ND	ND	ND	
	Perfluorododecanoic acid (PFDoA)	--	--	ND	ND	ND	
	Perfluoroheptanoic acid (PFHpA)	--	--	ND	ND	ND	
	Perfluorohexanesulfonic acid (PFHxS)	39	10	ND	ND	ND	
	Perfluorohexanoic acid (PFHxA)	990	--	ND	ND	ND	
	Perfluorononanoic acid (PFNA)	5.9	10	ND	ND	ND	
	Perfluorooctanesulfonic acid (PFOS)	4	4	ND	ND	ND	
	Perfluorooctanoic acid (PFOA)	6	4	ND	ND	ND	

Summary of Chemistry Results
PFAS Sampling, Red Hill, JBPHH

Notes:
ND = Not Detected
PPT = Parts per Trillion
PPB = Parts per Billion
PPM = Parts per Million
§ - Exceeds Screening Level
-- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample
Results are screened to the November 2023 EPA RSLs in accordance with Update to Assistant Secretary of Defense for Energy, Installations, and Environment Memorandum, "Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program" dated August 24, 2023.

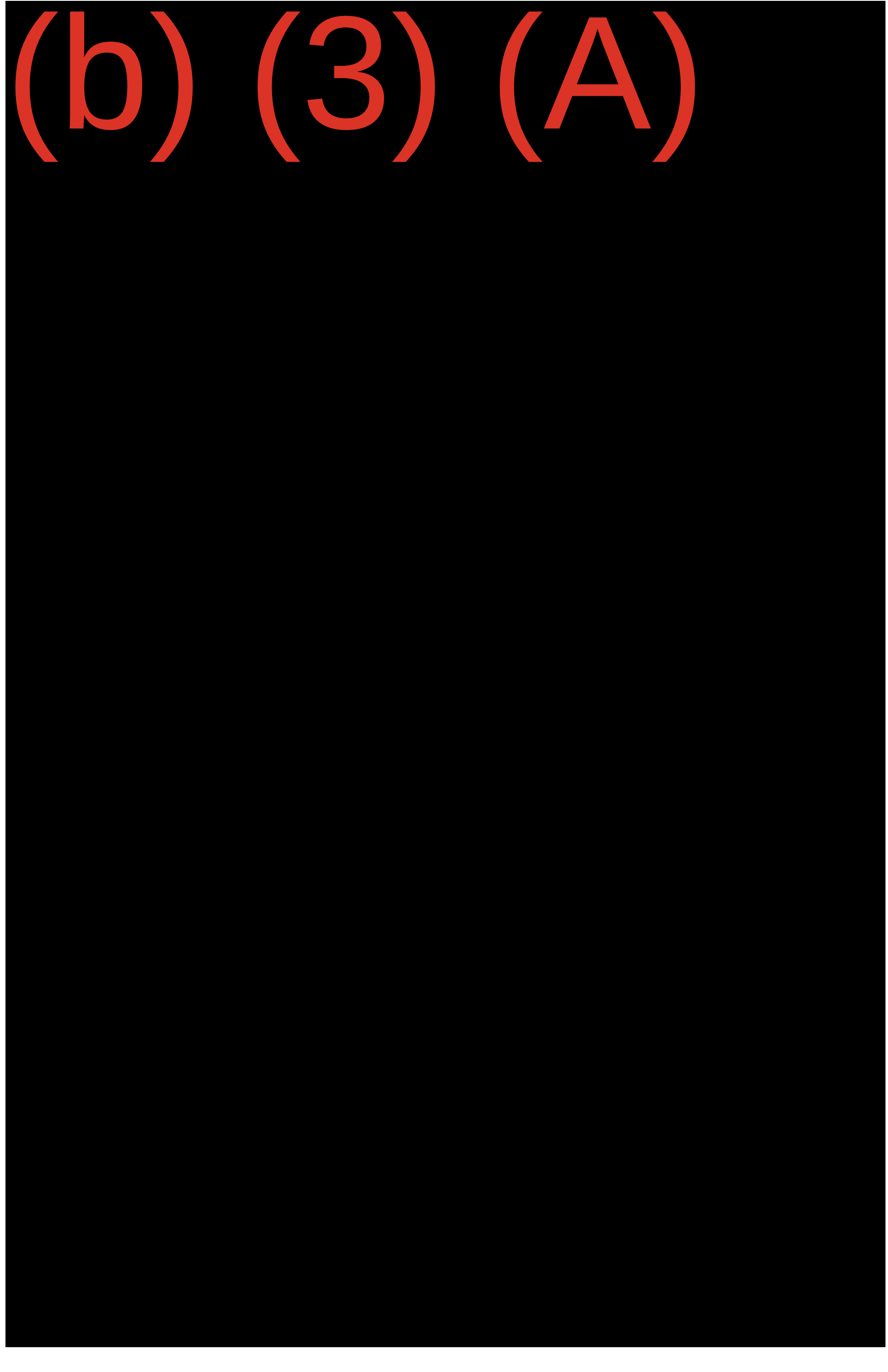
				Location ID:	SHFTWAIA-CP-PT		
				Location Type:	Well		
				Field Sample ID:	SHAFT-HW-0016021-24245-N-R1	SHAFT-HW-0016021-24306-N	SHAFT-HW-0016021-25001-N
				Sample Date:	2024-09-18	2024-11-07	2025-01-07
				Sample Type:	N (Normal)	N (Normal)	N (Normal)
Method Group	Analyte	EPA RSL	EPA MCL				
Per- and Polyfluoroalkyl Substances (EPA 537.1) (ppt)	Perfluorotetradecanoic acid (PFTeDA)	--	--	ND	ND	ND	
	Perfluorotridecanoic acid (PFTrDA)	--	--	ND	ND	ND	
	Perfluoroundecanoic acid (PFUnA)	--	--	ND	ND	ND	

Appendix 3: Treatment System Process Flow Diagram

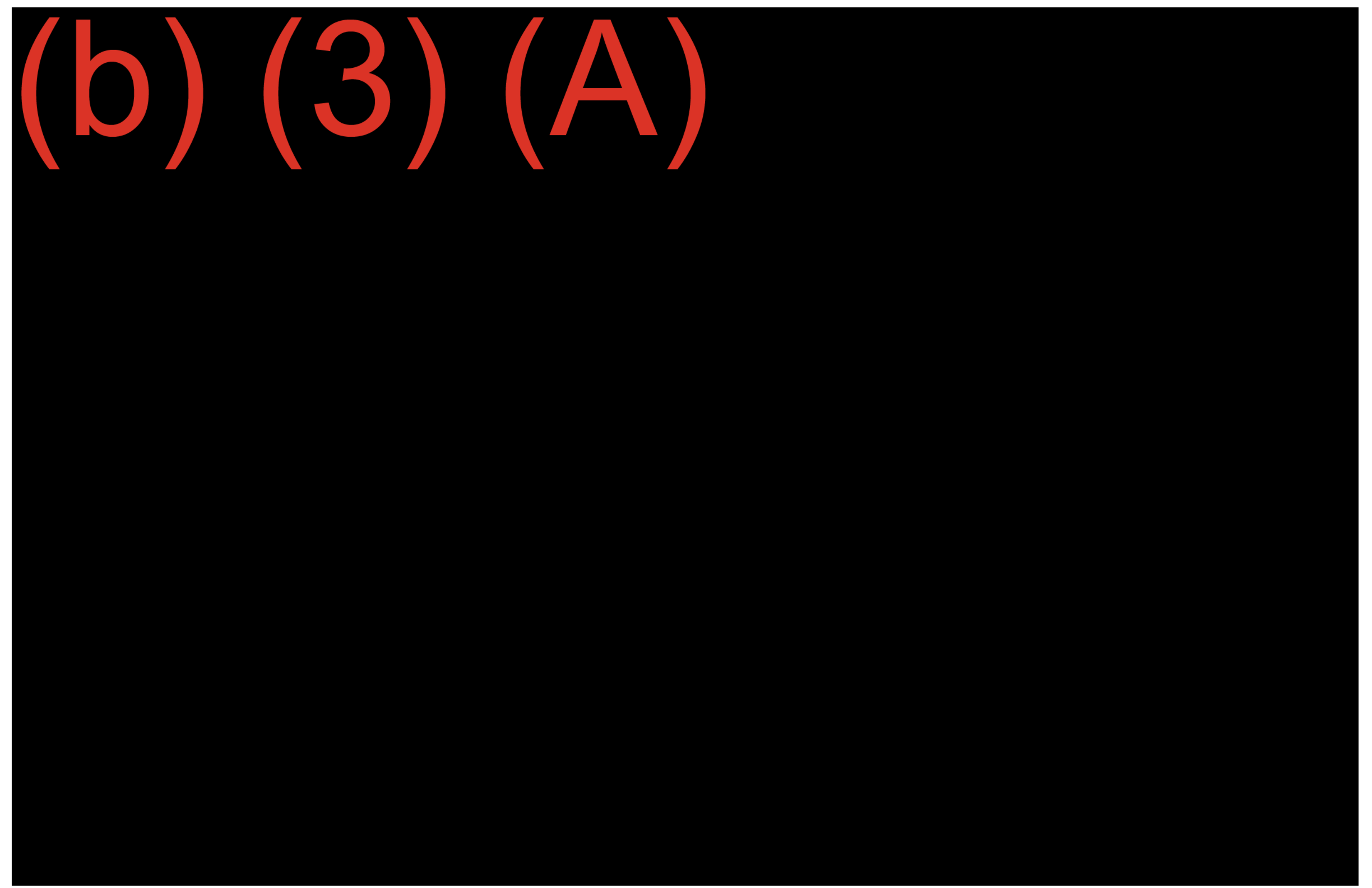


(b) (3) (A)

(b) (3) (A)



(b) (3) (A)



(b) (3) (A)

Appendix 4: NAHS Pilot Study Sample Analyte List

Navy Aiea-Halawa Shaft Treatment System Pilot Study
Sampling and Analysis Plan

NAHS Pilot Study Analyte List

Analytical Method	Analyte	CASRN	EPA / DOH Maximum Contaminant Level (MCL; µg/L)	Method Detection Limit (MDL; µg/L)	Method Reporting Limit (MRL; µg/L)
EPA 524.2	Benzene	71-43-2	5	0.25	0.5
EPA 524.2	n-Butylbenzene	104-51-8		0.25	0.5
EPA 524.2	sec-Butylbenzene	135-98-8		0.25	0.5
EPA 524.2	Tert-Butylbenzene	98-06-6		0.25	0.5
EPA 524.2	Ethyl Benzene	100-41-4	700	0.25	0.5
EPA 524.2	Isopropylbenzene	98-82-8		0.25	0.5
EPA 524.2	n-Propylbenzene	103-65-1		0.25	0.5
EPA 524.2	Toluene	108-88-3	1000	0.25	0.5
EPA 524.2	1,2,4-Trimethylbenzene	95-63-6	—	0.26	0.5
EPA 524.2	1,3,5-Trimethylbenzene	108-67-8	—	0.25	0.5
EPA 524.2	Xylenes (Total)		10000	0.25	0.5
	• m,p-Xylenes	1330-20-7	—	0.25	0.5
	• o-Xylenes	95-47-6	—	0.25	0.5
EPA 525.2	1-Methylnaphthalene	90-12-0	—	0.25	0.5
EPA 525.2	• 2-Methylnaphthalene	91-57-6	—	0.25	0.5
EPA 525.2	• Naphthalene	91-20-3	—	0.25	0.5
EPA 525.2	• Acenaphthylene	208-96-8		0.25	0.5
EPA 525.2	• Anthracene	120-12-7		0.25	0.5
EPA 525.2	Benzo[a]pyrene	50-32-8	0.2/0.2	0.01	0.02
EPA 525.2	Benzo[b]fluoranthene	205-82-3		0.25	0.5
EPA 525.2	Benzo[k]fluoranthene	207-08-9		0.25	0.5
EPA 525.2	Benzo[g,h,i]perylene	191-24-2		0.25	0.5
EPA 525.2	Chrysene	218-01-9		0.25	0.5
EPA 525.2	Dibenz[a,h]anthracene	53-70-3		0.25	0.5
EPA 525.2	Fluorene	86-73-7		0.25	0.5
EPA 525.2	Indeno[1,2,3-cd]pyrene	193-39-5		0.25	0.5
EPA 525.2	Phenanthrene	85-01-8		0.25	0.5

Notes:

All: The analytical laboratory will report non-detected results to the MDL.
Values between the MDL and MRL will be flagged as estimates ('J' flag).

Navy Aiea-Halawa Shaft Treatment System Pilot Study
Sampling and Analysis Plan

Analytical Method	Analyte	CASRN	EPA / DOH Maximum Contaminant Level (MCL; µg/L)	Method Detection Limit (MDL; µg/L)	Method Reporting Limit (MRL; µg/L)
EPA 525.2	Pyrene	129-00-0		0.25	0.5
EPA 8260 EPA 8015 EPA 8015	JP-5 as Combined TPH- Gasoline, Diesel, and Oil Ranges	PCHG PCHD MOIL	—	GRO, DRO, ORO = 50	GRO, DRO, ORO = 80
HACH 8021 (Based on SM 4500-Cl G)	Chlorine, Free (Field Test)	7782-50-5	4000	—	—
EPA 170.1	Temperature (Field Test)	TMP	—	—	—
EPA 150.3	pH (Field Test)	pH	—	—	—
SM 2510 B	Conductivity (Field Test)	CONDUCT	—	—	—
SM 2130 B	Turbidity (Field Test)	TURBID	< 5 NTUs	—	—
SM 2320 B	Total Alkalinity	TOTAL_AL K	—	—	—
EPA 200.7	Cations: • Sodium • Potassium • Calcium • Magnesium • Iron • Manganese	7440-23-5 7440-09-7 7440-70-2 7439-95-4 7439-89-6 7439-96-5	—	51 250 53 31 10 1.1	400 1000 400 200 20 5
EPA Method 160.2	Total Suspended Solids	TSS	500 mg/L	2.5 mg/L	5 mg/L
EPA method 300.0 Rev. 2.1	Anions: • Chloride • Sulfate • Fluoride • Ortho-Phosphate-P • Bromide	16887-00-6 14808-79-8 16984-48-8 14265-44-2 24959-67-9	— 4000 — — —	400 400 50 35 25	500 500 100 50 50
EPA method 300.1 Rev. 1.0	Anions: • Chlorite • Bromate • Chlorate	14998-27-7 15541-45-4 14866-68-3	1000 10 —	5 25 5	10 10 10

Notes:

All: The analytical laboratory will report non-detected results to the MDL.
Values between the MDL and MRL will be flagged as estimates ('J' flag).

Navy Aiea-Halawa Shaft Treatment System Pilot Study
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NAHS Pilot Study PFAS Analyte List

11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9	x	x
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1	x	x
4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4	x	x
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6	x	x
Perfluorobutanesulfonic acid	PFBS	375-73-5	x	x
Perfluorodecanoic acid	PFDA	335-76-2	x	x
Perfluorododecanoic acid	PFDoA	307-55-1	x	x
Perfluoroheptanoic acid	PFHpA	375-85-9	x	x
Perfluorohexanoic acid	PFHxA	307-24-4	x	x
Perfluorohexanesulfonic acid	PFHxS	355-46-4	x	x
Perfluorononanoic acid	PFNA	375-95-1	x	x
Perfluorooctanoic acid	PFOA	335-67-1	x	x
Perfluorooctanesulfonic acid	PFOS	1763-23-1	x	x
Perfluoroundecanoic acid	PFUnA	2058-94-8	x	x
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2FTS	757124-72-4	x	
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2FTS	27619-97-2	x	
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2FTS	39108-34-4	x	
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6	x	
Perfluorobutanoic acid	PFBA	375-22-4	x	
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7	x	
Perfluoroheptanesulfonic acid	PFHpS	375-92-8	x	
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5	x	
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	x	
Perfluoropentanoic acid	PFPeA	2706-90-3	x	
Perfluoropentanesulfonic acid	PFPeS	2706-91-4	x	
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6		x
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9		x
Perfluorotetradecanoic acid	PFTA	376-06-7		x
Perfluorotridecanoic acid	PFTTrDA	72629-94-8		x

EPA Analytical Methods for PFAS in Drinking Water; Office of Water (MS-140); EPA 815-B-19-21
December 2019

Appendix 5: Sample Containers, Preservatives, and Holding Times

Navy Aiea-Halawa Shaft Treatment System Pilot Study
Sampling and Analysis Plan

Parameter	Analytical Method	Container	Preservative	Holding Times (Extraction/ Analysis)
Volatile Organic Compounds (including TTHMs)	524.2	3 x 40 mL Glass VOA	0.5 mL HCl; (Unchlorinated); 25 mg Ascorbic / 3 drops HCl (Chlorinated)	14 days
Synthetic Organic Compounds	525.2	2 x 1 L Amber Glass	2 mL HCl (unchlorinated); 45 mg Sodium Sulfite / 2 mL HCl (chlorinated)	7 days to extraction/ 40 days extraction to analysis
JP-5 (TPH-D and TPH- O)	3511 (Hexane) with High Volume Injection)/8015 (Micro-Extraction)	3 x 60 mL Glass VOA	0.5 mL HCl (added in the laboratory). Quench with Sodium Thiosulfate (added to sample container prior to sample collection).	7 days
JP-5 (TPH-G)	5030/8260	3 x 40 mL Glass VOA	25 mg Ascorbic / 3 drops HCl	14 days
Chlorine, Free (Field Test)	Hach Method 08021	This parameter will be analyzed in the field.		
Temperature (Field Test)	170.1	This parameter will be analyzed in the field.		
pH (Field Test)	150.3	This parameter will be analyzed in the field.		
Conductivity (Field Test)	SM 2510 B	This parameter will be analyzed in the field.		
Turbidity (Field Test)	SM 2130 B	This parameter will be analyzed in the field.		
Total Alkalinity	SM 2320 B	250 mL Poly	Cool to $\leq 4^{\circ}\text{C}$	14 days
Cations	200.7	250 mL Poly	Acidify to pH < 2 with HNO ₃	6 months
Anions (Bromide, fluoride, chloride, sulfate)	300.0 Rev. 2.1	125 mL Poly	Cool to $\leq 4^{\circ}\text{C}$	28 days
Anions (ortho-Phosphate-P)	300.0 Rev. 2.1	125 mL Poly	Cool to $\leq 4^{\circ}\text{C}$	48 hours
Anions (bromate and chlorate)	300.1 Rev. 1.0	250 mL Amber Poly	50 mg/L EDA and Cool to $\leq 4^{\circ}\text{C}$	28 days
Anions (chlorite)	300.1 Rev. 1.0	250 mL Amber Poly	50 mg/L EDA and Cool to $\leq 4^{\circ}\text{C}$	14 days

Note: All samples will be chilled to $< 6^{\circ}\text{C}$, unless otherwise noted.

EPA Method 8015 is not a drinking water method and is typically run on unchlorinated water samples. However, the JBPHH drinking water samples are chlorinated. Therefore, samples will be quenched with sodium thiosulfate prior to sample collection to stop reactions from occurring between chlorine, potential analytes, and reagents added to the sample by the laboratory. This is done for drinking water analyses (e.g., drinking water methods 524.2 and 525.2).