DEPARTMENT OF THE NAVY
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13 JAN 2005

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Mr. Richard Takaba
Project Officer
Solid & Hazardous Waste Branch
Hawaii Department of Health
919 Ala Moana Boulevard Room 212
Honolulu HI 96814

001

SUBJECT: RED HILL TANK COMPLEX QUARTERLY PROGRESS REPORT (JANUARY 2005)
FACILITY I.D. NO. 9-[redacted]271/RELEASE I.D. NOS. 99[redacted], 010011 & [redacted]020028

Dear Mr. Takaba:

In response to the State of Hawaii Department of Health Letter, U08023RT, dated August 12, 2004, we are providing the following quarterly progress report as required.

Groundwater and Drinking Water Sampling

The "Draft Work Plan and Field Sampling Plan for Groundwater Sampling of the Red Hill Fuel Storage Facility" is submitted in enclosure (1). Please review and comment on the "Draft Work Plan and Field Sampling Plan". If no comments are received by the Navy from the DOH by the end of January 2005, the Navy will proceed as planned.

The "Draft Health and Safety Plan for Groundwater Sampling of the Red Hill Fuel Storage Facility" was submitted to the Navy Region Hawaii Health and Safety Department for review and comment on January 7, 2005.

Drinking water sampling and analyses for specific petroleum contaminants performed at a higher frequency than once every three years is currently being discussed with Public Works Center.

Risk Assessment

A meeting was held on November 8, 2004, with the contractors to discuss plan of action. During the meeting the Navy and contractor agreed to install a vertical monitoring well in the middle of the tank farm to determine if a contaminant plume actually exists beneath the fuel farm. This would increase resolution of the geophysical survey and would provide additional information for the geologic characterization for modeling purposes of the area from the tank bottoms to the groundwater (approximately 100 foot depth). The well would be installed during Phase 1 of the project.

We will be using a FeFlow model to simulate contaminant transport of light non-aqueous phase liquid and contaminants of concern. The FeFlow model for Red Hill will be developed by the same contractor who just completed the development of the groundwater model of Oahu for the Honolulu Board of Water Supply to evaluate saltwater intrusion of the Oahu basal aquifer.

Tank Inspections

Red Hill Tanks have been tentatively scheduled as follows:

FY2004 - Tanks 1 & 15 (Currently on-going)
FY2005 - Tanks 17 & 18
FY2006 - Tanks 11 & 20
FY2007 - Tanks 4 & 5
FY2008 - Tanks 2, 3 & 19

If there are any questions regarding this matter, or if more information is needed, please contact Mr. Darren Uchima at (808) 471-1171, extension 217. The next quarterly progress report will be provided in April 2005.

Sincerely,

R. M. WAKUMOTO
Director
Regional Environmental Department
By direction of
Commander, Navy Region Hawaii

Enclosure: 1. Draft Work Plan and Field Sampling Plan for Groundwater Sampling at the Red Hill Fuel Storage Facility, Hawaii dated December 2004

Draft Work Plan and Field Sampling Plan

Groundwater Sampling

RED HILL FUEL STORAGE FACILITY, HAWAII

December 2004

Department of the Navy
Commander, Pacific Division
Naval Facilities Engineering Command
Pearl Harbor, HI 96860-3134

NAVFAC
Naval Facilities Engineering Command
NAVFAC PACIFIC

Long-Term Monitoring/Remedial Acton Operations
Contract Number N62742-01-D-1806, CTO 0013

Draft Work Plan and Field Sampling Plan

Groundwater Sampling

RED HILL FUEL STORAGE FACILITY, HAWAII

December 2004

Prepared for:

Department of the Navy
Commander, Pacific Division
Naval Facilities Engineering Command
258 Makalapa Drive, Suite #100
Pearl Harbor, HI 96860-3134

Prepared by:

DAWSON GROUP, INC.
3375 Koapaka Street, Suite B200
Honolulu, Hawaii 96819-1862

Prepared under:

Long-Term Monitoring / Remedial Action Operations
Contract Number N62742-01-D-1806, CTO 0013

Draft Work Plan and Field Sampling Plan

Groundwater Sampling
Red Hill Fuel Storage Facility, Hawaii

December 2004

Prepared for:

DAWSON GROUP, INC.
3375 Koapaka Street, Suite B-200
Honolulu, Hawaii 96819

DRAFT

Heather Kerr
Project Manager / Environmental Scientist

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ACRONYMS AND ABBREVIATIONS

ACRONYM/ ABBREVIATION	DEFINITION/MEANING
°C	degrees Celsius
1,2 DCA	1,2 dichloroethane
AMEC	AMEC Earth and Environmental, Inc.
BTEX	benzene, toluene, ethylbenzene, and total xylene
CAS	Columbia Analytical Services
CFR	Code of Federal Regulations
COPC	contaminants of potential concern
COTR	Contracting Officer's Technical Representative
CPR	cardio-pulmonary resuscitation
CTO	contract task order
DAWSON	Dawson Group, Inc.
DQO	Data Quality Objectives
DW	drinking water
EDB	ethylene dibromide
EMT	emergency medical technician
EPA	United States Environmental Protection Agency
fbg	feet below grade
FISC	Fleet Industrial Supply Center
FSF	fuel storage facility
FSP	Field Sampling Plan
GWAL	groundwater action level
HASP	Health and Safety Plan
HCl	hydrochloric acid
HDOH	State of Hawaii Department of Health
HNO_3	nitric acid
IDW	investigation derived waste
IP	interface probe
mg/L	milligrams per liter
mL	milliliter
MtBE	methyl tert-butyl ether
$Na_2S_2O_3$	sodium thiosulfate
NAVFAC PACIFIC	Naval Facilities Engineering Command, Pacific
NRCS	Natural Resources Conservation Service
PAH	polynuclear aromatic hydrocarbon
PE	professional engineer
PG	professional geologist/geoscientist
PPE	personal protective equipment
PWC	Public Works Center
QC	quality control
RCRA	Resource Conservation and Recovery Act

ACRONYMS AND ABBREVIATIONS

ACRONYM/ ABBREVIATION	DEFINITION/MEANING
RPM/NTR	Remedial Project Manager / Navy Technical Representative
SSHO	Site Safety and Health Officer
SVOC	semivolatile organic compounds
TCLP	toxic characteristic leaching potential
TPH	total petroleum hydrocarbons
USDA	U.S. Department of Agriculture
UST	underground storage tank
VOC	volatile organic compound
WP	Work Plan

1. INTRODUCTION

The Department of the Navy, Naval Facilities Engineering Command, Pacific (NAVFAC PACIFIC) has retained Dawson Group, Inc. (DAWSON) to perform groundwater monitoring activities at the Red Hill Fuel Storage Facility (FSF), Hawaii, which consists of 20 active underground storage tanks (USTs) operated by the Fleet Industrial Supply Center (FISC) Pearl Harbor. Figure 1, *Site Vicinity Map*, illustrates the location of the project site.

This work will be performed under NAVAFAC PACIFIC Contract Number N62742-01-D-1806, Contract Task Order (CTO) 0013. This document represents the planning documents in accordance with the NAVAFAC Pacific Statement of Work, dated 10 May 2004 (US Navy, 2004). This Work Plan and Field Sampling Plan provide the overall plan for surface and groundwater sampling at the Red Hill FSF project site. The Site Health and Safety Plan is under a separate cover.

1.1 Project Objectives

The project objective is to determine if groundwater contamination is present downgradient of the 20 active USTs. In order to achieve this objective, the following tasks will be conducted:

- Conduct quarterly sampling of surface water located in the stilling basin located at the potable water infiltration tunnel operated by of the Navy Public Works Center (PWC).
- Conduct quarterly sampling of groundwater from the sentinel monitoring well (MW-V1D) located downgradient of the 20 USTs.
- Present data in a quarterly report, which will include a description of the nature and extent of contamination, if any.

1.2 Scope of Work

The scope of work for this project consists of the following three (3) phases:

Planning Phase

- Acquire and review any available additional site information such as as-built/record drawings, historical data, and other pertinent background information.
- Prepare project planning documents including the Work Plan, Field Sampling Plan, and Site Health and Safety Plan.
- Coordinate site access, work schedule, establishment of work area, right-of-entry clearances, and responsibilities, as needed.
- Obtain all necessary permits and approvals for work.

Field Phase

The Scope of Work for this project, specific to the Field Phase, consists of the following:

- Collect primary samples and quality control (QC) samples (i.e., field duplicates).

- Submit all samples to Columbia Analytical Services (CAS) in Canoga, California.
- Place a laboratory-supplied trip blank and temperature blank in every cooler.
- Dispose of all investigation-derived waste (IDW) by a certified disposal contractor, immediately following receipt of sample results.

The Scope of Work, specific to the **Stilling Basin**, consists of the following:

- Notify the Navy PWC personnel at the potable water infiltration tunnel to shut-off pumps for 24-hours prior to sampling activities.
- Collect one (1) primary surface water sample in the stilling basin from the near-surface at the platform three-feet from below the entrance hatch.
- Collect one (1) field duplicate (QC) surface water sample in the stilling basin from the near-surface at the platform three-feet from below the entrance hatch.
- After the pumps have been turned on and run for at least 20 to 25 minutes, collect one (1) primary surface water sample in the stilling basin from the near-surface at the platform three-feet from below the entrance hatch.
- Analyze two (2) primary, one (1) field duplicate (QC) and one (1) trip blank (total = 4 samples) for:
  - Benzene, toluene, ethylbenzene, and total xylenes (BTEX); methyl tert-butyl ether (MtBE); and 1,2 dichloroethane (1,2 DCA) by United States Environmental Protection Agency (EPA) Method 8260B,
  - Total petroleum hydrocarbons (TPH) as gasoline by EPA Method 8015M,
  - Ethylene dibromide (EDB) by EPA Drinking Water (DW) Method 504.1,
  - TPH as diesel by EPA Method 8015M,
  - Polynuclear aromatic hydrocarbons (PAHs) by EPA Method 8270C/SIM-PAHs, and
  - Total lead by EPA Method 6020.

The Scope of Work, specific to the **Sentinel Well** (MW-V1D), consists of the following:

- Collect one (1) primary groundwater sample from sentinel well MW-1VD.
- Collect one (1) field duplicate (QC) groundwater sample from sentinel well MW-1VD.
- Analyze one (1) primary, one (1) field duplicate (QC) and one (1) trip blank (total = 3 samples) for:
  - BTEX; MtBE; and 1,2 DCA by EPA Method 8260B,
  - TPH as gasoline by EPA Method 8015M,
  - EDB by EPA DW Method 504.1,
  - TPH as diesel by EPA Method 8015M,
  - PAHs by EPA Method 8270C/SIM-PAHs, and
  - Total lead by EPA Method 6020.

Reporting Phase

- Receive a Navy Level C data package from CAS in Canoga, California.
- Perform a desktop review of laboratory reports to evaluate the completeness, correctness, and conformance/compliance of the data set against method, procedural, or contractual requirements.
- Prepare a *Quarterly Groundwater Monitoring Report* documenting the field investigation, IDW disposal, sample results, conclusions and recommendations.

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2. BACKGROUND

2.1 Site Location

The Red Hill FSF project site is located in Halawa Heights on Oahu, Hawaii. Access is via Halawa Valley Road, located north of the project site. Primary highways in the vicinity of the project site are Interstate Highway H-1 and H-3.

Land adjacent to the north of the project site is occupied by Halawa High and Medium Security Facility and private businesses. Land to the south and west of the project site includes the Coast Guard Reservation. Moanalua Valley is located east of the facility (Figure 1, *Site Vicinity Map*).

2.2 Facility Description

The Red Hill FSF consists of 20 active USTs operated by Navy FISC Pearl Harbor. Each UST has a capacity of 12.5 million gallons. The facility is located approximately 100 feet above the basal aquifer. Approximately 1,550 feet hydraulically downgradient from the tank farm, the Navy PWC operates a potable water infiltration tunnel (Figure 2, *Site Plan Map*).

2.3 Geology

Regional Geology

The island of Oahu is composed of two volcanoes: the Koolau Volcano and the Waianae Volcano. The Waianae Range is the older of the two volcanoes and lies to the west of the younger Koolau Volcano.

The Waianae Volcano is a shield volcano built up by a series of eruptions, which produced the Waianae Volcanic Series. The Waianae Volcanic Series consists of three members. The lower and middle members consist of tholeitic *pahoehoe* and *aa* lava flows and associated pyroclastic rocks that compose the main mass of the Waianae shield volcano. The upper member is mostly hawaiite with lesser amounts of alkalic olivine basalts produced during the late stages of Waianae volcanism. The eroded remains of the Waianae Volcanic Shield comprise western Oahu.

The Koolau Volcano is an unusually elongate shield volcano built principally by eruptions along a northwest-southeast-trending rift zone. The lavas produced during the shield-building phase of the volcano are known as the Koolau Volcanic Series and consist of tholeitic and olivine basalts with small amounts of oceanite. The eroded remains of the Koolau Volcanic Shield are approximately 37 miles long, trending northwest-southeast, and comprise the remainder of Oahu. Lava flows from the Koolau rift zone flowed and banked against the older Waianae volcanoes forming the Schofield Plateau, the central plain of Oahu (Macdonald, et al., 1983).

A long period of volcanic quiescence followed the Koolau shield-building stage, during which erosion occurred and alluvium and marine sediments accumulated along coastal regions. Deep valleys were incised into the bedrock by major streams and subsequently filled with sediments. Following a long period of volcanic quiescence, volcanic activity resumed. These eruptions constitute the Honolulu Volcanic Series. Lavas of the Honolulu Volcanic Series include nephelinites, melilite nephelinites, basanites, and alkalic olivine basalts.

Site Geology

The project site is located in the southern foothills of the Koolau Mountain Range, which is 37 miles long and is deeply dissected by numerous drainage ways. Two soil types occur in this area and these are the Helemano-Wahiawa and Rough Mountainous Land-Kapaa Associations (U.S. Department of Agriculture [USDA] Natural Resources Conservation Service [NRCS], 2004).

The Helemano-Wahiawa Association consists of well-drained, moderately fine textured and fine textured soils on uplands on the island of Oahu. These soils are nearly level to moderately sloping and occur in broad areas dissected by very steep gulches. They formed in material weathered from basalt. The association makes up about 18 percent of the island. The elevation ranges from 100 to 1,200 feet. Helemano soils make up about 40 percent of the association, and Wahiawa soils 30 percent. Kunia, Lahaina, and Molokai soils make up the rest. Helemano soils are dark reddish-brown silty clays. They occur on the sides of very steep gulches and have slopes of 30 to 90 percent. Wahiawa soils have a surface layer of very, dusky red silty clay, a subsoil of dark reddish-brown silty clay, and a substratum of soft weathered rock. They are on uplands and have slopes of 0 to 25 percent. Helemano soils are dark reddish-brown silty clays. They occur on the sides of very steep gulches and have slopes of 30 to 90 percent. Wahiawa soils have a surface layer of very, dusky red silty clay, a subsoil of dark reddish-brown silty clay, and a substratum of soft weathered rock. They are on uplands and have slopes of 0 to 25 percent. Helemano soils are used for pasture. Large acreages of Wahiawa soils are used for sugarcane and pineapple. Sugarcane is grown under irrigation. Pineapple is irrigated only in the driest areas (USDA NRCS, 2004).

The Rough Mountainous Land-Kapaa Association consists of very steep land broken by numerous drainage ways and makes up about 20 percent of the island of Oahu. The elevation ranges from 1,000 to 3,000 feet. Rough mountainous land makes up about 80 percent of the association and Kapaa soils about 15 percent. Rock land and Rock outcrop make up the rest. Rough mountainous land consists of very steep gulches and narrow ridges. The soil material is very shallow, very dark grayish-brown, smeary silty clay. Kapaa soils are in very steep gulches and on narrow ridges at the northern end of the island. They have a surface layer and subsoil of dark reddish-brown silty clay that contains gibbsite nodules. This association is inaccessible except for a few trails used by hunters and hikers. It is used for watershed and wildlife habitat. Gently sloping areas of Kapaa soils are suited to timber. The heavy rainfall is an important factor in recharging the supply of ground water. The most important wildlife species is wild pigs (USDA NRCS, 2004).

2.4 Hydrogeology

Regional Hydrogeology

The primary drinking water in the Hawaiian Islands is developed from basal groundwater. Basal groundwater is formed by water percolating down through the residual soils and permeable volcanic rock. The parts of the island below sea level, except within rift zones of the volcanoes, are saturated with ocean salt water. Fresh water moving downward through the hundreds of lava flows encounters the saltwater in the rocks, and because it is less dense than salt water, floats on and displaces the underlying salt water. The fresh basal water floating on salt water presses downward on the salt water forming a basal lens or a "Ghyben-Herzberg" lens. A zone of transition between the fresh groundwater and the salt water occurs due to the constant movement of the interface as a result of tidal fluctuations, seasonal fluctuations in recharge and discharge, and discharge due to aquifer development.

Because rainfall tends to be greatest in the interior mountainous areas of the island, recharge to the basal groundwater bodies is also greatest in these areas. As a result, groundwater levels are high in these areas that cause groundwater to flow, generally, from the interior to the shoreline. Frictional resistance to groundwater flow causes it to build up within the island until it attains sufficient hydraulic head to overcome friction. For this reason, basal groundwater acquires slope toward the shoreline.

Not all water percolating downward through the zone of aeration goes directly into the basal water table. Perched groundwater occurs when descending water encounters an impermeable layer of soil or rock. A perching member may be a bed of dense lava; however, more commonly it is either alluvium or volcanic ash. Another type of groundwater occurrence in Hawaii is High Level, dike confined water. This high elevation groundwater is trapped in dike-bound compartments in the upper elevations of the Koolau and Waianae Mountain Ranges and provides spillover after heavy rains (Mink and Lau, 1990).

Basal groundwater in Hawaii occurs within the islands' unweathered basalt as a lens of fresh water floating on seawater. Along the southern coast of Oahu, a coastal plain of less permeable caprock hinders seaward flow of the groundwater, thereby increasing hydraulic pressure. Static water head levels of +15 to +20 feet mean sea level within the basalts are the result. Permeability of the basalt aquifer is generally high, on the average of 1,000 feet per day.

The regional groundwater system includes the Schofield High-Level Water Body, which extends beneath the eastern portion of the project site, and dike impounded water bodies in the Waianae Mountain Range, bounding the western portion of the project site.

Site Hydrogeology

The Red Hill FSF project site lies in the Waimalu Aquifer System in the Pearl Harbor Aquifer Sector of the island of Oahu and overlies the aquifer coded as 30201111 (11111). The aquifer is classified as a basal, unconfined, flank-type. It is currently being used as a drinking water source. It is considered fresh with less than 250 milligrams per liter of chloride and is considered an irreplaceable resource with a high vulnerability to contamination (Mink and Lau, 1990).

2.5 Previous Environmental Actions/Studies

From 1998 to 2001, the Navy conducted an investigation at the facility to assess the potential for releases from the fuel storage facility. In February 2001, the Navy installed a one-inch diameter vertical well (MW-V1D) to serve as a sentinel well to monitor for contamination of the basal aquifer underlying the storage facility (AMEC Earth and Environmental, Inc. [AMEC], 2002). Sentinel well MW-V1D was installed and completed at approximately 100 feet below grade (fbg). At the time of well completion, depth to water in MW-V1D was measured at 86 fbg. The groundwater at the project site fluctuates from "dry" season to "wet" season (AMEC, 2002).

A second monitoring well (MW-V2S) was installed and completed above the water-bearing zone at approximately 52 fbg. This monitoring well is located southwest of sentinel well MW-V1D and does not contain either groundwater or product. MW-V2S was intentionally completed above the water-bearing zone in order to avoid contamination of the deep aquifer by creating a possible "direct conduit" to the basal aquifer (AMEC, 2002).

In February 2001, groundwater samples collected from sentinel well MW-V1D contained detectable amounts of TPH ranging from 0.883 milligrams per liter (mg/L) to 1.05 mg/L and total lead ranging from 0.0104 mg/L to 0.015 mg/L. The maximum total lead concentrations in the samples were equal to the primary drinking water standard of 0.015 mg/L for lead, as well as, exceeded the State of Hawaii Department of Health (HDOH) Tier 1 groundwater action level (GWAL) of 0.0056 mg/L (US Navy, 2004).

Per discussions with HDOH, a recommendation was made to initiate a program to monitor the sentinel well MW-V1D and the stilling basin for indications of contamination from the upgradient tank farm. The recommended parameters for analyses were TPH; BTEX; 1,2 DCA; PAHs; total lead; and EDB (US Navy, 2004).

3. PROJECT ORGANIZATION AND SCHEDULE

This section identifies the key personnel for this project and provides an estimated project schedule.

3.1 Project Organization

The following individuals are identified as the key personnel for this project:

NAVAFAC PACIFIC

Administrative Contracting Officer	Ms. Bernie Julian	(808) 474-0514
Project Contract Specialist	Ms. Sharon Tsuru	(808) 471-9473
Contracting Officer's Technical Representative (COTR)	Ms. Debbie Loo	(808) 472-1234
Alternative COTR	Ms. Kay O'Keefe	(808) 472-1435
Remedial Project Manager/Navy Technical Representative (RPM/NTR)	Mr. Glenn Yoshinaga	(808) 472-1416

DAWSON

Project Manager / Environmental Scientist	Ms. Heather Kerr	(808) 536-5500 ext. 341
Operations Manager / QC Manager	Mr. James Frifeldt	(808) 536-5500 ext. 305
Project Superintendent / Site Safety and Health Officer (SSHO)	Mr. Royce Ynigues	(808) 536-5500 ext. 331
Senior Project Scientist/ Alternate SSHO	Ms. Lani Dulay, PG	(808) 536-5500 ext. 311
Senior Engineer	Mr. Frank Carlos, PE	(808) 536-5500 ext. 312
Field Technician	Mr. Mike Kim	(808) 536-5500
Field Technician	Mr. Lyle Ragragola	(808) 536-5500
Field Technician	Mr. Bryson Avilla, Jr.	(808) 536-5500

SUBCONTRACTORS

Columbia Analytical Services	Laboratory Services	Ms. Tracie Sober	(808) 682-1767
Pacific Commercial Services	Soil/Water Disposal Services	Mr. Jingbo Chang	(808) 545-4599

Figure 3, *Project Organization Chart*, provides a general diagram for this project.

3.2 Project Schedule

The estimated project schedule is divided into three major phases as shown in Figure 4, *Estimated Project Schedule*. The first phase, *Planning*, includes preparing the planning documents and obtaining any necessary permits and approvals. This phase is scheduled from 10 May to 31 December 2004.

The second phase of the schedule is the *Field* Phase. Field mobilization is scheduled to begin in January 2005, upon approval of submittals by NAVAFAC PACIFIC. Each quarter, work is scheduled to continue for a period of approximately two days. The final phase, *Reporting*, of the schedule includes the preparation and submittal of the *Quarterly Groundwater Monitoring Report*. This work is scheduled to be performed from January 2005 through December 2005. This schedule is subject to change due to any unanticipated problems.

4. DATA QUALITY OBJECTIVES

The Data Quality Objectives (DQO) for the project sites are: 1) determine if groundwater contamination is present at the project site; 2) provide data sufficient to determine the best course of action; and 3) characterize IDW wastewater for remediation or acceptance at an on-island facility.

4.1 Chemical Data Quality Objectives

The overall chemical DQOs for this project are to provide valid chemical data to confirm the presence or absence of contaminants of potential concern (COPC) impact on the groundwater beneath the Red Hill FSF. The COPCs for this investigation include TPH as diesel and as gasoline; BTEX; MtBE; 1,2 DCA; total lead; and EDB. The chemical DQOs were designed to comply with the HDOH's *Technical Guidance Manual for Underground Storage Tank Closure and Release Response, Second Edition* (HDOH, 2000) and *Risk-Based Corrective Action and Decision Making at Sites With Contaminated Soil and Groundwater, Volume I and II* (HDOH, 1996).

The action levels for this investigation will draw on the HDOH Tier 1 groundwater action levels for sites receiving less than 200 centimeters of rainfall per year and threatening a drinking water source (HDOH, 2000).

Laboratory chemical data will be used to assess each analyte's concentration, detectable extent, and extent exceeding HDOH Tier 1 soil action levels. Chemical analyses of COPC will be performed using EPA publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition* methodology (EPA, 1998). The laboratory analytical methods were selected to provide reporting limits that were lower than regulatory action levels.

To assess the precision and accuracy of the analytical measurements, at each sampling location (i.e.., stilling basin and sentinel well), the Contractor will collect one (1) field duplicate (QC) and one (1) trip blank. The field duplicate (QC) sample will be analyzed using the same methods by the same laboratory used to analyze the primary samples. The trip blank will be analyzed using the same methods by the same laboratory used to analyze the volatile organic compounds (VOCs), which include BTEX, MtBE, and 1,2 DCA.

4.2 Management of Investigative Derived Waste

While on-site, investigation derived waste (IDW), which includes purge water and decontamination fluids (water, detergent solution), will be managed in accordance with Title 40 Code of Federal Regulations (CFR) Parts 260 through 268 (CFR, 2003a). Management activities will include, but not be limited to, hazardous waste determination; packaging, labeling, and marking; on-site accumulation and storage; and record keeping and reporting. IDW determined to be hazardous waste shall be properly manifested, transported, and treated or disposed pursuant to the above-mentioned Federal regulations as well as applicable sections of Title 49 CFR Subchapter C (CFR, 2003b).

4.3 Laboratory Analysis

Details of analysis and QC are presented in Sections 7 through 9 and Tables 1 through 3. Surface water samples collected from the stilling basin and groundwater samples collected from sentinel well MW-V1D will be analyzed for the following COPC:

- BTEX, including MtBE
- 1,2 DCA
- TPH as gasoline
- EDB
- TPH as diesel
- PAHs
- Total Lead

5. PLANNING PHASE

5.1 Planning Documents

The following sections describe the various planning documents.

5.1.1 Work Plan and Field Sampling Plan

A Work Plan (WP) and Field Sampling Plan (FSP) were developed for this project. These documents identify data quality objectives and describe the rationale, activities, and requirements needed to achieve them. The FSP outlines the approach selected to collect and interpret the chemical data by describing the proposed sampling and the chemical data quality objectives of the sampling. It discusses field activities, laboratory activities, and data validation that are part of the chemical data acquisition for this project.

5.1.2 Site Safety and Health Plan

The Site Health and Safety Plan (HASP) covers the safety and health aspects of the on-site project activities with respect to project personnel and the surrounding community. The HASP includes a hazard assessment and risk analysis for each task performed on-site. The HASP is based on the site-specific information available to the Contractor. The HASP is submitted under separate cover.

5.2 Site Preparation

5.2.1 Site Access and Clearing

Currently, paved roads provide access to the Red Hill FSF project site. If required, necessary right of entry permits and base passes will be obtained through the NAVAFAC PACIFIC RPM/NTR prior to the start-up of work.

5.2.2 Utility Clearances and Permits

The Contractor will coordinate with the proper authorities to obtain all required permits and clearances for each site prior to start-up of work.

5.2.3 Site Visit

Prior to the initiation of field activities, qualified personnel will visit the specific sampling locations at the project site and note existing structures (if any), layouts, and other pertinent information. The actual site configuration will be compared to the preliminary site plan. Any deviations will be noted in a field logbook and on the preliminary site plan.

5.2.4 Site Security

Stilling Basin

The entrance hatch to the stilling basin must remain open at all times during the sampling activities. The Contractor will secure the open hatch with a lock out/tag out to ensure that the hatch is not accidentally closed while personnel are inside. In addition, the entry supervisor/attendant will remain at all times at the hatch opening.

Sentinel Well

Due to the nature of the project site, IDW drums will be staged near the sentinel well at the area designated by the RPM/NTR. At the end of each sampling event, the IDW wastewater will be contained in a 5-gallon bucket and placed into a 20-gallon, open-head, steel drum (i.e., secondary containment) until disposal.

6. FIELD PHASE: General Field Procedures

This section along with Sections 7 through 9 describes the field activities and sampling and analysis strategy for the Red Hill FSF project site.

6.1 Investigation Derived Waste Management

The process of collecting environmental samples generates different types of potentially contaminated IDW. Listed below are the procedures that will be followed for the handling and storage of the different types of IDW.

6.1.1 IDW Types

RCRA Hazardous Waste – Under the Resource Conservation and Recovery Act (RCRA), a solid waste that is not excluded from regulation is defined as hazardous if (1) it is listed as a hazardous waste in Title 40 CFR Parts 261.13 through 261.33 (CFR, 2003a); (2) it exhibits any of four hazardous characteristics: ignitability, corrosively, reactivity, or toxicity (as determined using the toxic characteristic leaching potential [TCLP]); or (3) it is subject to certain mixture rules. If IDW is determined to be a hazardous waste, then RCRA storage, transportation, and disposal requirements will apply.

Decontamination Fluids – Decontamination fluids consist of all fluids used in decontamination procedures conducted during site investigation activities. These fluids consist of washwater, rinse water, and solvents used for the decontamination of non-consumable personal protective equipment (PPE), sampling equipment, and drilling equipment. Decontamination fluids will be containerized in drums.

PPE, Disposable Sampling Equipment, and Non-IDW Trash – PPE refers to all disposable materials used to protect personnel from contact with potentially contaminated site media, such as inner and outer gloves, Tyvek® suits and overboots, and disposable respirator cartridges. Disposable sampling equipment consists of all single-use equipment that may have been exposed to potentially contaminated site media. These items include sample bailers, plastic drop cloths, plastic bags, and bucket liners.

Non-IDW trash is all waste materials such as waste paper, drink containers, food, and packaging generated in the support zone that have not come in contact with potentially contaminated site media.

Disposable sampling equipment from groundwater sampling activities includes plastic sheeting used as liner material in containment areas around monitoring wells and disposable sampling equipment. If, according to the Project Manager's best professional judgment, the visibly soiled PPE can be decontaminated and rendered non-hazardous or "clean," then the decontaminated PPE shall be double-bagged and disposed of offsite as municipal waste. PPE and disposable sampling equipment generated on separate days in the field may be combined in a single drum, provided clean and visibly soiled IDW are segregated as discussed above. Any PPE and disposable equipment that is to be disposed of and can still be reused will be rendered inoperable before disposal.

6.1.2 IDW Management Procedures

IDW Minimization

The generation of on-site IDW will be minimized to reduce the need for special storage or disposal requirements that may result in substantial additional costs and provide little or no reduction in site risks. Applying minimization practices throughout the course of site investigation activities will reduce the volume of IDW. These minimization strategies include substitution of biodegradable raw materials; use of disposable sampling equipment; use of bucket and drum liners; and separating trash from IDW.

Segregation of IDW by Matrix and Location

To facilitate subsequent IDW screening, sampling, classification and/or disposal, IDW will generally be segregated by matrix and source location at the time it is generated. Each drum of solid IDW will be completely filled, when possible. For liquid IDW, drums will be left with headspace of approximately 5 percent by volume to allow for expansion of the liquid and potential volatile contaminants. IDW from only one matrix will be stored in a single drum (e.g., water or PPE will not be mixed in one drum). In general, IDW from separate sources will not be combined in a single drum.

Potentially hazardous PPE and disposable sampling equipment will be stored in drums separate from other IDW. PPE from generally clean field activities will be segregated from visibly soiled PPE, double-bagged and disposed of off-site as municipal waste.

Decontamination fluids will be stored in drums separate from other IDW. If practical, decontamination fluids generated from different sources will not be stored in the same drum. If decontamination fluids generated over several days or from different sources are stored in a single drum, information about the dates and IDW sources represented in the drum will be recorded. This information will be noted in the field notebook, on the drum label, and on the drum inventory log.

Drum Labeling

Proper labeling of IDW drums is essential to the success and cost-effectiveness of subsequent waste screening and disposal activities. Labels will be permanent and descriptive to facilitate correlation of field analytical data with the contents of individual IDW drums. All IDW drums must be labeled using the two distinct labeling methods described below to ensure durability of the information.

- **Preprinted Labels**

  Two preprinted drum labels will be completed as described below. Both labels will be sealed in separate heavy-duty, clear plastic bags to prevent moisture damage. One label will be affixed to the drum at the midpoint of the drum height using a sufficient quantity of adhesive tape (e.g., duct tape, packing/strapping tape). This will enable the bag to remain on the drum as along as possible during storage. A second copy of the preprinted label will be prepared, sealed in a plastic bag, affixed to the underside of the drum lid, and sealed inside the drum. If appropriate, a third label may be prepared and placed in the plastic bag, behind the outside label and facing the drum. The information on the preprinted labels is discussed below. A preprinted drum label is presented in Appendix A, *Field Forms*.

– **Drum Identification Number:** Enter the drum identification number according to the convention described below.

AAAA – BBCC – Dzzz

Where	**AAAA**	the CTO (i.e., 0013)
	BB	the unique project initials (i.e., RH = Red Hill),
	CC	the sampling location (i.e., SW = Sentinel Well),
	D	represents, "drum identification number," and
	zzz	the sequential drum number for the site, beginning with 001.

For example, the third drum would be identified as **0013 – RHSW – D003**.

– **Date(s) Collected:** The date(s) the IDW was generated and placed in the drum. If IDW was generated over a number of days, then the start and end dates will be entered.

– **Contents:** Enter a "✓" in the box corresponding to the type of IDW placed in the drum. For "soil" and "water," use the space provided to record observations on the condition of the drum contents (e.g., diesel odor, high turbidity, specific liquid IDW type). Check "solid waste" for PPE and indicate that PPE is present in the drum. Check "Other" for disposable sampling equipment and potentially contaminated monitoring well construction materials, and indicate the type of waste on the line provided.

– **Project Type:** Enter a "✓" in the box corresponding to the type of investigation. Choices are Subsurface Investigation (SI), Underground Storage Tank (UST), and Removal/Remedial Action (RA). If "Other" is specified, indicate the type of project in the "Comments" area, as described below.

– **Comments:** Enter any additional information regarding the drum contents that will assist individuals who will characterize and dispose of the contents of the drum. In addition, use this space on the label to complete any descriptions that were too large to fit in preceding label fields such as the turbidity of decontamination water, or the site activities from which PPE was generated.

- **Painted Labels**

  The second method for labeling drums is to paint label information directly on the outer surface of the drum. At a minimum, the information placed on the drum will include the source, type of IDW, and the telephone number provided at the bottom of the preprinted label appropriate for the project location. Paint markers (oil-based enamel paint) that are non-photodegradable will be used to provide maximum durability and contrast with the drum surface.

Drum Storage

Drum storage procedures will minimize potential human contact with the stored IDW and prevent extreme weathering of the stored drums. All IDW drums will be placed upright and stored in a secured area at Red Hill FSF designated by the RPM/NTR prior to disposal, except as directed by RCRA requirements for removal when professional judgment suggests the IDW may pose an immediate or permanent public endangerment. RCRA storage requirements include the following:

- Containers will be in good condition and closed during storage.
- Wastes will be compatible with containers.
- Storage areas will have a containment system.
- Spills or leaks will be removed as necessary.

However, until the IDW is conclusively determined to be a RCRA hazardous waste, the Project Manager will manage the IDW in a protective manner, and not necessarily in accordance with these listed RCRA storage requirements. If the IDW is determined to be RCRA hazardous waste, then RCRA storage, transportation, and disposal requirements will apply including a limited 90-day storage permit exemption period prior to required disposal. At a minimum, yellow caution tape will be placed around the stored drums.

Proper drum storage will be implemented to minimize damage to the drums from weathering and possible exposure to humans and the environment. When possible, drums will be stored in dry, shaded areas and covered with impervious plastic sheeting or tarpaulin material. Every effort will be made to protect the preprinted drum labels from direct exposure to sunlight. Drums in storage will be placed with sufficient space between rows of drum pallets and will not be stacked; such that authorized personnel may access all drums for inspection. Proper placement will also render subsequent IDW screening, sampling, and disposal more efficient. IDW drums will be segregated in separate rows/areas by matrix (i.e., liquid or PPE/other).

Drum Inventory

Accurate preparation of an IDW drum inventory is essential to all subsequent activities associated with IDW drum tracking and disposal. A Drum Inventory Log is included in Appendix A, *Field Forms*. The drum inventory information will include ten elements that identify drum contents and indicate their fate:

- **Generator / Site Name:** inventory data will be included the site name where the IDW was generated (i.e., Red Hill FSF).
- **Contract Task Order:** inventory data will include the four-digit CTO number associated with each drum (i.e., 0013).
- **Drum Number:** drum numbers will adhere to the numbering convention presented above (e.g., 0013 – RHSW – D001, 0013 – RHSW – D002, etc.)
- **Storage Location Prior to Disposal:** the storage location of each drum prior to disposal will be included in the inventory.
- **Origin of Contents:** the source identification of the contents of each IDW drum will be specified in the inventory (e.g., monitoring well number or rinse water generating activities).
- **IDW Type:** inventory data will include the type of IDW in each drum (e.g., PPE, disposable sampling equipment, decontamination rinse water, etc.).
- **Waste Volume:** the amount of waste in each drum will be specified in the inventory as a percentage of the total drum volume or an estimated percentage filled level (e.g., 95 percent maximum for liquid IDW).
- **Generation Date:** inventory data will include the date IDW was placed in each drum. If a drum contains IDW generated over more than one day, the start date for the period

will be specified. This date is not to be confused with a RCRA hazardous waste accumulation date [Title 40 CFR 262 (CFR, 2003a)].

- **Expected Disposal Date:** the forecasted date each drum is to be disposed of will be specified as part of the inventory. This date is for informational purposes only, and will not be considered contractually binding.
- **Actual Disposal Date:** the actual drum disposal date occurs at the time of on-site disposal, or acceptance by the off-site treatment or disposal facility.

6.2 Decontamination

Decontamination of equipment used in groundwater sampling is necessary to prevent cross-contamination and to maintain the highest integrity possible in collected sample.

An appropriate location for the decontamination area at a site will be selected based on the ability to control access to the area, control residual material removal from equipment, and the ability to restrict access to the area being investigated. The decontamination area will be located an adequate distance away from potential contaminant sources to avoid contamination of clean equipment.

Groundwater equipment that must be decontaminated includes, but is not limited to, interface probe (IP), multiparameter meter, and field parameter collection containers. Equipment with a porous surface, such as rope, cannot be thoroughly decontaminated and will be properly disposed of after one use.

Down-hole sampling equipment will be decontaminated prior to initial use and between each sampling location to prevent the possible introduction of contaminants into successive samples.

A rinse decontamination procedure is acceptable and the procedure will consist of the following:

- Wash with a non-phosphate detergent (e.g., alconox, liquinox, or other suitable detergent) and potable water solution
- Rinse in with potable water,
- Spray with isopropyl alcohol,
- Rinse with deionized or distilled water, and
- Spray with deionized or distilled water.

If possible, equipment will be disassembled prior to cleaning. A second wash will be added at the beginning of the process if equipment is very soiled.

6.3 Recordkeeping/Documentation

This section provides standards for documenting field activities; labeling the samples; documenting sample custody; and completing chain-of-custody/analytical request forms. The standards presented are intended to ensure that samples collected are maintained for their intended purpose, and the conditions encountered during field activities are documented.

Field Logbooks

The field logbook will serve as the primary record of field activities. Entries will be made chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct the applicable events. The logbook will be stored in a clean location and used only when outer gloves used for personal protective equipment have been removed.

Individual data forms may be generated to provide systematic data collection documentation. Entries on these forms shall be referenced in the applicable logbook entry. Individual data forms will reference the applicable logbook and page number. At a minimum, names of all samples collected will be included in the logbook even if recorded elsewhere.

All field descriptions and observations are entered into the logbook using indelible black ink. Typical information to be entered includes, but is not limited to, the following:

- Date and time of all onsite activities
- Site location and description
- Weather conditions
- Field work documentation
- Descriptions of and rationale for approved deviations from the Work Plan or FSP
- Field instrumentation readings
- Personnel present
- Photograph references
- Sample locations
- Sample numbers and sample identification
- Sample naming
- Field QC sample information
- Field descriptions, Standard Operating Procedures, equipment used, and field activities accomplished
- Meeting information
- Important times and dates of telephone conversations, correspondence, or deliverables
- Field calculations
- Calibration records
- Subcontractors present
- Equipment decontamination procedures and effectiveness

7. FIELD PHASE: General Sampling Procedures

This section describes the general sampling procedures to be employed at the Red Hill FSF project site.

7.1 Sample Containers and Preservatives

Sample containers and the volumes required for analysis are shown in Table 1, *Analytical Sample Preservation, Maximum Holding Times, and Containers*. These may be changed to accommodate selected laboratory preferences, but will meet the essential requirements of the method.

7.2 Sample Labeling

A weatherproof sample label with adhesive backing shall be affixed to each individual sample container. If necessary, clear tape shall be placed over each label to prevent the labels from tearing off, falling off, being smeared, and to prevent loss of information on the label. The following information shall be recorded with a waterproof marker on each label:

- EPA sample number
- Date and time of collection
- Sampler's initials
- Matrix (optional)
- Sample preservatives (if applicable)
- Analysis to be performed on sample

These labels will be printed from a computer file onto weatherproof adhesive labels or alternatively obtained from the analytical laboratory.

7.2.1 EPA Number

An EPA number will be assigned to each sample (to facilitate data tracking and storage) as follows:

WWXyyy

where **WW** Unique project initials (i.e., RH = Red Hill)

X Unique facility initials (i.e., **B** = Stilling Basin, **W** = Sentinel Well,)

yyy Chronological number, starting with 001

For example, the EPA number for the 5th sample from the stilling basin would be **RHB005** and for the 9th sample from the sentinel well would be **RHW009**.

Each field duplicate (QC) sample from the specific sampling location (i.e., stilling basin or sentinel well) will be included in the chronological sequence. For example the field duplicate (QC) sample following the 5th sample collected from the stilling basin would be **RHB006**.

If a sample is lost during shipping, a replacement sample will be assigned a new EPA number. If different containers for the same sample are shipped on different days, a new EPA number must be assigned. The EPA numbers are the only sample numbers that will be sent to the laboratory. The detailed information regarding the specifics of the sample (i.e., type, matrix, location, time, etc.) will be recorded on the Sample Inventory Log (Appendix A, *Field Forms*).

7.2.2 Custody Procedures

Standard sample custody procedures will be used to maintain the quality of samples during collection, transport, and storage prior to analysis. The following documents will be prepared to ensure proper sample identification:

- Sample identification label
- Custody seals
- Sample Inventory Log
- Chain-of-custody records
- Field notebooks

Field personnel will log individual water samples onto carbon-copy chain-of-custody forms and on a separate Sample Inventory Log (Appendix A, *Field Forms*) when a sample is collected. The chain-of-custody form serves as an analytical request form and as a place to record sample condition upon receipt. Custody seals will be signed and dated and then placed over each cooler and each sample container to detect potential tampering. The chain-of-custody form will reflect the time zone (for accurate tracking of the holding times).

A sample is considered to be in custody if the sample is (1) in one's actual physical possession or view; (2) in one's physical possession and has not been tampered with (i.e., in a container and secured with an official seal); (3) retained in a secured area with restricted access; or (4) placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

Upon receipt, the laboratory will sign and retain copies of the air bill. The chain-of-custody form will be signed, and the temperature of the samples or cooler, upon receipt, will be documented on the chain-of-custody form and the Sample Condition upon Receipt form. All samples requiring a preservative will be checked for proper preservation by pH testing.

If any sample container breaks, or if discrepancies are noted between the chain-of-custody form, sample labels, or requested analysis, the sample custodian will notify the laboratory project manager. A nonconformance report will be completed, and the project manager will be notified within 24 hours. At the time of notification, corrective action will be chosen. The sample custodian will enter the corrective action into the laboratory system, and a log-in confirmation sheet will be sent within 48 hours to the project manager. The laboratory will also send a declaration of the samples in each sample delivery group.

7.3 Sample Handling, Storage, Packing and Shipping

7.3.1 Handling and Storage

Immediately following collection, all samples will be labeled according to the procedures in Section 7.2, *Sample Labeling*. The lids of the containers will not be sealed with duct tape, but may be covered with custody seals or placed directly into self-sealing bags. The sample containers will be placed in an insulated cooler with wet ice. Samples will occupy the lower portion of the cooler, while the ice will occupy the upper portion.

Prior to shipment, the ice in the coolers will be replaced with frozen gel ice (e.g., Blue Ice ®) in order to allow samples to be maintained as close to 4 degrees Celsius (°C) as possible. This will allow samples to be maintained as close to 4°C as possible from the time of collection through transport of the samples to the analytical laboratory. Styrofoam pads will be placed on the bottom and top (and optionally on the sides) of the inside of the cooler. All empty space between sample containers will be filled with Styrofoam "peanuts" or other appropriate material. Prior to shipping, glass sample containers will be wrapped on the sides, tops, and bottoms with bubble wrap or other appropriate padding and/or surrounded by Styrofoam to prevent breakage during transport. All glass containers for water samples must be packed in an upright position, never stacked or on their sides, and an absorbent material will be placed on the bottom of the cooler to help contain any spillage that might occur. Samples will be shipped on a schedule allowing the laboratory to meet holding times for analyses. The procedures for maintaining sample temperatures at 4°C, pertains to all field samples.

7.3.2 Sample Packing

When a cooler is ready for shipment to the laboratory, two copies of the chain-of-custody form will be placed inside a self-sealing bag and taped to the inside of an insulated cooler. The coolers will then be sealed with waterproof tape and labeled "Fragile," "This-End-Up" (or directional arrows pointing up), or other appropriate notices and chain-of-custody seals will be placed on the coolers.

7.3.3 Sample Shipment

Shipment of sample coolers to the U.S. from locations outside the continental U.S. is controlled by the USDA and is subject to their inspection and regulation. Documentation is required to prove that the receiving analytical laboratory is certified by the USDA to receive and properly dispose of soil; this is called a "USDA Soil Import Permit." In addition, all sample coolers must be inspected by a USDA representative, affixed with a label indicating that the coolers contain environmental samples, and shipping forms stamped by the USDA inspector prior to shipment.

Alternatively, the Contractor has received approval from the USDA to ship soil samples, and has received a stamp that can be used to facilitate shipment. In this way, the USDA does not need to inspect each soil sample shipment. Water sample shipments do not need to be inspected by the USDA. Custody seals are to be placed on each container to ensure proper chain-of-custody controls in the event coolers are opened for inspection. A diagram of a properly labeled cooler is presented in Appendix B, *Example*.

In summary, the paperwork will be taped to the outside of the coolers to assist sample shipments. If a shipment is made up of multiple pieces (e.g., more than one cooler), the paperwork will be attached only to one cooler, if the courier agrees. All other coolers in the shipment will only be taped and have address and chain-of-custody seals affixed.

1. **Courier Shipping Form & Commercial Invoice** - Both forms will be placed inside a clear plastic adhesive-backed pouch, which adheres to the package (typically supplied by the courier) and placed on the cooler lid.

2. **Soil Import Permit and USDA Letter (soil only)** - The laboratory will supply these documents prior to mobilization. The USDA in Hawaii often does stop shipments of soil without these documents. The 2" x 2" USDA label (described below), the USDA letter, and soil impact permit will be stapled together and placed inside a clear plastic pouch. The Soil Import Permit label will be supplied by the laboratory. Copies of this Soil Import Permit label are acceptable, and will be cut out to 2" x 2" dimensions. Water samples are not controlled by the USDA, so the requirements for soil listed above do not apply.

3. **Custody Seals** - Seals will be supplied by the laboratory. Field personnel must sign and date these; at least two seals will be placed in such a manner that they stick to both the cooler lid and body. Placing the seals over the tape, then covering it with clear packing tape is suggested. This prevents the seal from coming loose and enables detection of tampering.

4. **Address Label** - A label stating the destination (laboratory address) will be affixed to each cooler.

For this project, CAS will be supplying courier service to pickup the samples from the project site or from the Contractor's office. The CAS office in Hawaii will be responsible for shipping the water samples to their laboratory in Canoga, California.

8. FIELD PHASE: Stilling Basin Sampling Methodology

This section describes two sampling methodology options, entry and non-entry, which may be employed at the Red Hill FSF project site, specifically in collecting a surface water sample at the stilling basin.

The characteristics of the stilling basin identify it as a confined space; furthermore, these characteristics also classify it as a ***permit-required confined space.***

8.1 Entry into the Stilling Basin

As a ***permit-required confined space***, certain OSHA safety protocols must be initiated before any sampling activities can be performed.

- Confined Space Training and Certification for authorized entrants, attendants, and entry supervisor
- Initial atmospheric testing along with continual/periodic atmospheric testing
- Completed confined-space entry permit
- Entry/retrieval system, including tripod, lifeline, and full-body harness
- Rescue plan

Further details of the Occupational Safety and Health Administration (OSHA) and Contractor-required safety protocols can be found in the related HASP (Dawson, 2004).

8.1.1 Access into the Stilling Basin

Access into the stilling basin area is through an entrance hatch (approximately 24-inches in diameter) and descend down a ladder to a platform anchored three feet below the entrance hatch and located approximately 84 feet above the water surface (approximate measurements based on a depth to water reading of 87.25 fbg taken on 30 August 2004).

As stated in Section 5.2.4, *Site Security*, the entrance hatch will remain open with a lockout/tagout procedure. An entry/retrieval system, which includes a tripod mounting device, self-retracting lifeline with emergency retrieval hoist, and full-boy harness, will be used by the authorized entrant to enter and exit the confined space. At no time will the authorized entrant detach themselves from the lifeline. The entry procedure will be as follows:

1. The entrance hatch will be opened and lock *out/tag out* will be employed to prevent accidental closure.

2. From the entrance hatch, measure the depth to water to the nearest 0.01 foot using an interface probe (IP). Record the measurement and time on the Surface Water Sampling Field Form (Appendix A, *Field Forms*).

3. The atmosphere inside the confined space will be tested for levels of oxygen, carbon monoxide, and hydrogen sulfide using a calibrated multi-gas meter with a vacuum pump. The attached tubing will be lowered down in one-foot intervals until six fbg and the atmosphere will be sampled at each interval.

4. Once the atmosphere at each interval has been deemed safe, a permit will be completed and posted and the tripod with the self-retracting lifeline will be set-up. The authorized entrant will don the full-body harness and attach to the lifeline. In addition, the authorized entrant will have a full-face respirator on hand in case of an emergency and will have available a 15-minute oxygen supplied air container within the confined space.

5. The authorized entrant will descend the ladder to the platform immediately below the entrance hatch.

6. The authorized entrant will prepare for sampling at the platform.

7. At all times during the sampling activities, one multi-gas meter will be located on the platform to constantly monitor the entrant's breathing zone, while a second multi-gas meter will be constantly monitoring the atmosphere below the platform at approximately six fbg.

8.1.2 Surface Water Sampling Methodology

The purpose of surface water sampling is to acquire accurate, representative information about surface water body that could be affected by a release from a hazardous waste site.

A dip or grab sample is appropriate for a small body of water, or for collecting surface samples in a larger surface water body. The sampling method involves the filling of a sample container by submerging it either just below the surface, or by lowering the container to a desired depth by using a weighted holder (i.e., weighted bailer). Any preservative should be added after sample collection to avoid loss of preservative. Alternately, a transfer device may be dipped into the water then the contents transferred to the appropriate container containing the preservative.

The selected sampling device must not compromise sample integrity; therefore, samples will be collected using a new weighted, disposable, single- or double-check valve bailer that remains sealed in plastic (by the manufacturer). These bailers will be equipped with bottom-discharging devices. The sampling system is a combination of a clear polyvinyl chloride (PVC) casing and a disposable bailer, where the bailer will be inserted inside the PVC casing, and an IP probe will be attached to the outside of the PVC casing. Together, they will be lowered to approximately six inches above the water surface, and then the bailer will be lowered into the water to collect a sample. Once full, the bailer will be raised into the PVC casing and together will be raised up to the platform, where the sample bottles will be filled. The following sample collection procedure continues from Section 8.1.1, *Access into the Stilling Basin.*

8. Sampling equipment and containers will be carefully lowered to the entrant using a 5-gallon plastic bucket that is securely attached to a rope/cable. Once the bucket has been lowered, it will be securely tied off outside the entrance hatch.

9. A new length of rope will be tied securely to the top of a new weighted, disposable bailer and lowered in such a way as to minimize disturbance and aeration of the water.

10. Together the PVC casing, bailer, and IP probe will be lowered from the open side of the platform.

11. At approximately six inches above the water surface, the PVC casing and IP probe will be kept stationary and the disposable bailer will continue to be lowered into the water for sample collection.

12. Once the bailer is full, it will be raised into the PVC casing, and then the entire sampling system will be raised to the platform, where the laboratory-supplied containers will be filled. The samples will be collected in this order:

    - VOC samples (i.e., TPH as gasoline; BTEX; MtBE; 1,2 DCA; and EDB) will be collected first by attaching a VOC bottom-discharging device (i.e., VOC sampler) to the bottom of the bailer and transferring the collected sample into the laboratory-supplied VOA vials with hydrochloric acid (HCl) or sodium thiosulfate ($Na_2S_2O_3$) (for EDB) preservative (Tables 1 and 2). Remove the VOC sampler.
    - Semivolatile organic compounds (SVOCs), which include TPH as diesel and PAHs will be collected by attaching the bottom-discharging nozzle to the bottom of the bailer and transferring the collected sample into the laboratory-supplied 500-milliliter (mL) amber glass bottle with HCL preservative and 1-liter amber glass bottles (Tables 1 and 2), respectively.
    - Total lead will be collected using the same bottom-discharging nozzle as described above and transferred to the laboratory-supplied 500-mL polyethylene bottle with nitric acid (HNO_3) preservative (Tables 1 and 2).

13. All sample containers will be properly sealed; assigned and labeled with an EPA number; placed into bubble-wrap sleeves then into a sealable plastic bag (i.e., Ziplock®); sealed; tagged with a custody seal placed over the bag opening as described in Section 7.2, *Sample Labeling*, and Section 7.3, *Sample Handling, Storage, Packing and Shipping*.

14. The sample will be logged on the chain-of-custody form and on the sample inventory log.

15. The samples will then be placed immediately into an insulated cooler chilled with wet ice.

This procedure will be repeated until all required primary and field duplicate (QC) samples have been collected.

8.1.3 Exit from the Stilling Basin

Exit from the stilling basin will continue from the above section with the following procedures:

16. Once all collected samples and sample equipment have been removed from the confined space, the authorized entrant will begin to ascend the three-foot ladder.

17. When the authorized entrant has exited the confined space, the lockout/tagout will be removed from the entrance hatch and the hatch securely locked.

18. Only when the authorized entrant is firmly on solid ground can the lifeline be detached from their harness and the harness removed.

All samples, sampling equipment, and confined space equipment will be removed from the project site at the end of each quarterly sampling event.

8.2 Non-Entry Into the Stilling Basin

Non-entry access to the stilling basin requires opening an entrance hatch (approximately 24-inches in diameter), which will be opened and lockout/tagout will be employed to prevent accidental closure. From the open entrance hatch, measure the depth to water to the nearest 0.01 foot using an interface probe (IP). Record the measurement and time on the Surface Water Sampling Field Form (Appendix A, *Field Forms*). It should be noted that at no time during the field activities will entry be permitted into the confined space.

The same sampling system described in Section 8.1.2, *Surface Water Sampling Methodology*, will be used for the non-entry sampling of the stilling basin.

Surface water sampling procedures for non-entry into the stilling basin is detailed in Section 8.1.2, *Surface Water Sampling Methodology,* specifically procedures 9 through 15.

8.3 Field Quality Control Sampling

8.3.1 Field Duplicates

Surface water field duplicate (QC) samples will be collected once per sampling event, following the sample collection procedures listed in Section 8.2, *Surface Water Sampling Methodology.*

8.3.2 Trip Blank

A laboratory-supplied trip blank will be placed in each sample cooler containing the VOC samples to be shipped to the laboratory. The trip blank will be recorded on the chain-of-custody form and the sample inventory log and analyzed for the VOC parameters (i.e., TPH as gasoline; BTEX; MtBE; 1,2 DCA; and EDB) requested for the primary samples.

8.3.3 Temperature Blank

A temperature blank will be placed in each sample cooler per shipment to be shipped to the laboratory.

8.4 Rescue Plan

In the event that an emergency should occur during entry, sampling, and/or exit of the stilling basin, the following steps will be performed:

1. The confined space entry supervisor will direct the attendant to call 471-7117.

2. If possible, where no further injuries will occur, the confined space entry supervisor will activate the lifeline's retrieval mechanism and begin emergency evacuation of the authorized entrant.

3. If necessary, the confined space entry supervisor will perform first aid and cardio-pulmonary resuscitation (CPR) until the emergency medical technicians (EMTs) arrive.

Further details on the rescue plan are found in the accompanying HASP (DAWSON, 2004).

9. FIELD PHASE: Sentinel Well Sampling Methodology

This section describes the specific sampling methodology to be employed when collecting a groundwater sample at the sentinel well located at the Red Hill FSF project site.

9.1 Groundwater Sampling Methodology

The purpose of groundwater sampling is to acquire groundwater samples that are representative of aquifer conditions with as little alteration of water chemistry as possible. At a minimum, groundwater sampling procedures shall include:

- Measurement of static water level elevations
- Assessment of the presence or absence of an immiscible phase
- Assessment of purge parameter stabilization
- Purging of static water within the well and well bore
- Obtaining a groundwater sample

Each step is discussed in sequence below. Depending upon specific field conditions, additional steps may be necessary.

9.1.1 Measurement of Static Water Level and Detection of an Immiscible Phase

Before initiating sampling, the depth to standing water, depth to an immiscible layer (if any), and/or the total depth of the well will be measured to the nearest 0.01 foot using an IP to provide baseline hydrologic data. Each measurement will be referenced to the permanent, reference point located on the monitoring well. Water level will be measure twice in quick succession. This data will be recorded on the Monitoring Well Sampling Log (Appendix A, *Field Forms*).

If an immiscible phase is detected with the IP, the Project Manager and the Navy RPM/NTR will be notified immediately. No groundwater sample will be collected unless otherwise directed by the Project Manager and/or Navy RPM/NTR.

If no immiscible phase is detected with the IP, the measurements of depth to water and total depth of the well will be used to calculate the volume of water in the well, the amount of water to be purged, as well as provides information on the integrity of the well (e.g., identification of siltation problems).

As detailed in Section 6.2, *Decontamination,* the IP will be decontaminated prior to entering the well to minimize the potential for cross-contamination, and will be decontaminated prior to leaving the site. The decontaminated IP will not be placed directly on the ground or other contaminated surfaces prior to insertion into the well.

9.1.2 Well Purging Methodology

The water present in a well prior to sampling may not be representative of *in situ* groundwater quality and shall be removed prior to sampling. All groundwater removed from potentially contaminated wells shall be handled in accordance with the IDW handling procedures described in Section 6.1, *Investigation Derived Waste Management*.

Purging will be accomplished by removing groundwater from the well using a new, disposable 0.75-inch polyethylene bailer with new, dedicated rope. The bailer will be lowered into the well with as little disturbance of the water as possible to minimize aeration of the water in the well. The groundwater removed during purging will be collected in a 5-gallon plastic bucket with lid and stored on-site inside a 20-gallon, open-head, steel drum (i.e., secondary containment) until its disposition is determined based upon laboratory analytical results.

Purging Procedures

1. A new length of polyethylene rope will be tied securely to the top end of the new, disposable polyethylene bailer.

2. Each time the bailer is lowered to the water surface, it shall be lowered in such a way as to minimize disturbance and aeration of the water. Once the bailer is full, it will be slowly brought out of the water and the water will be transferred to a clean container for evaluation of field parameters. The remaining water will be placed in a 5-gallon plastic bucket.

   - The purge water will be evaluated on a regular basis during purging and analyzed in field for temperature, pH, specific conductivity, dissolved oxygen, redox potential, and turbidity using a water quality meter.
   - At least four (4) to six (6) reading will be taken during the purging process.

3. Purging Procedures 1 through 3 will be repeated until the calculated purge volume has been removed and when two (2) or three (3) consecutive field parameter measurements have stabilized to within approximately 10 percent. All this information will be recorded on the Monitoring Well Field Sampling Log (Appendix A, *Field Forms*). All blanks on this field log will be completed during field sampling.

Low Yield Well

Low yield wells are wells that exhibit less than 80 percent recovery after two hours. If this is the case at the sentinel well, then only one borehole volume of water will be removed. The well then will be allowed to recover sufficiently to provide enough water for the specified analytical parameters, and sampled.

9.1.3 Sample Collection Procedures

The sentinel well will be sampled when groundwater within it is representative of aquifer conditions and after it has recovered sufficiently to provide enough volume for the groundwater sampling parameters. A period of no more than two (2) hours will elapse between purging and sampling to prevent groundwater interaction with the casing and atmosphere. This may not be possible with a low yield well. Depth to water will be measured and recorded prior to sampling to demonstrate the degree of recovery of the well. The bailer shall never be dropped into the well because this could cause aeration of the water upon impact. Additionally the sampling methodology shall allow for the collection of a groundwater sample in as undisturbed a condition as possible, minimizing the potential for volatilization or aeration, as well as minimizing agitation and aeration during transfer to the sample containers.

Sampling Procedures

1. A new length of polyethylene rope will be tied securely to the top end of the new, disposable polyethylene bailer. Each time the bailer is lowered to the water surface, it shall be lowered in such a way as to minimize disturbance and aeration of the water.

2. Once the bailer is full, it will be brought out of the water and the sample transferred directly into the laboratory-supplied containers. The samples will be collected in this order:

   - VOC samples (i.e., TPH as gasoline; BTEX; MtBE; 1,2 DCA; and EDB) will be collected first by attaching a VOC bottom-discharging device (i.e., VOC sampler) to the bottom of the bailer and transferring the collected sample into the laboratory-supplied VOA vials with HCl or $Na_2S_2O_3$ preservative (Tables 1 and 3). Remove the VOC sampler.
   - SVOCs, which include TPH as diesel and PAHs will be collected by attaching the bottom-discharging nozzle to the bottom of the bailer and transferring the collected sample into the laboratory-supplied 500-mL amber glass bottle with HCl preservative and 1-liter amber glass bottles (Tables 1 and 3), respectively.
   - Total lead will be collected using the same bottom-discharging nozzle as described above and transferred to the laboratory-supplied 500-mLpolyethylene bottle with HNO_3 preservative (Tables 1 and 3).

3. All sample containers will be properly sealed; assigned and labeled with an EPA number; placed into bubble-wrap sleeves then into a sealable plastic bag (i.e., Ziplock®); sealed; tagged with a custody seal placed over the bag opening.

4. The sample will be logged on the chain-of-custody form and on the sample inventory log and placed immediately into an insulated cooler chilled with wet ice.

This procedure will be repeated until all required primary and field duplicate (QC) samples have been collected.

9.2 Field Quality Control Sampling

9.2.1 Field Duplicates

Groundwater field duplicate (QC) samples will be collected once per sampling event, following the sample collection procedures listed in Section 9.1.3, *Sample Collection Procedures*.

9.2.2 Trip Blank

A laboratory supplied trip blank will be placed in each sample cooler containing the VOC samples to be shipped to the laboratory. The trip blank will be recorded on the chain-of-custody form and the sample inventory log and analyzed for the VOC parameters (i.e., TPH as gasoline; BTEX; MtBE; 1,2 DCA; and EDB) requested for the primary samples.

9.2.3 Temperature Blank

A temperature blank will be placed in each sample cooler per shipment to be shipped to the laboratory.

10. REPORTING PHASE

10.1 Data Management and Validation

The laboratory reports will be reviewed as soon as they are available. The laboratory reports shall include all samples, blanks, and internal quality control results. A sample table listing each laboratory sample will be prepared. The table shall correlate the QC samples to the primary samples from which they were duplicated.

10.2 Quality Control and Corrective Action

10.2.1 Field Quality Control

Field Duplicates

Surface water and groundwater field duplicates (QC) samples will be collected once every quarter for each sample location (i.e., stilling basin and sentinel well).

10.2.2 Laboratory Quality Control

Each laboratory is required to have an approved QA program with current standard operating procedures for each method performed. The laboratory QA program will meet the requirements of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition* (EPA, 1998).

Method Blanks

A method blank will be analyzed with every batch of 20 or fewer samples to measure laboratory contamination. The method blank will be an analyte-free matrix (water) that will be carried through the entire preparation and analysis procedure. If analytes are found above detection limits, the results of samples in the batch will be examined. Those with results less than the detection limit or greater than 10 times the blank value will be accepted. Other samples will be reanalyzed in another batch. Consistent presence of contamination will require investigation and corrective action.

10.2.3 Corrective Action Plan

In order to maximize the potential for obtaining valid and usable analytical data, a corrective action plan will be employed for all data results. The detection limits for each of the target analytes will be included with each chain-of-custody form. The chain-of-custody includes instructions to contact the Project Manager, should any problems be encountered. This will help to minimize any problems encountered due to contract required detection limit exceedances. In the event that holding times are missed, or detection limits are exceeded, data will be flagged as estimated and the data used, or the data will be rejected and the results considered inconclusive. The decision to flag and use or reject will be based on the severity of the discrepancies encountered, and comparison to standard QC limits.

10.2.4 Action Correction Plan

If more than 30 percent of the data is rejected based on the guidelines above, samples will be recollected from the areas where the rejected results were obtained, with the laboratory responsible for the cost associated with the re-sampling effort. If it is necessary to contact personnel for response to unforeseen circumstances, use the contact information listed in Section 3, *Project Organization and Schedule,* of this WP.

10.3 Data Evaluation

Upon receipt of each laboratory's deliverables, a desktop review will be performed that includes the following tasks:

- A check that all contract deliverables have actually been delivered
- A review of preservation (if any), holding times, and proper chain-of-custody
- If provided in the deliverables, laboratory standard operating procedures will be reviewed against SW-846 methods and deviations noted
- A review of all laboratory quality control data (laboratory blanks, laboratory duplicates, matrix spike/matrix spike duplicates, and laboratory control spike); rejection of data will take place if accuracy and precision are not within limits established for the method.

Upon completing all data collection and data review, chemical analytical data will be evaluated as follows:

- Evaluate near surface water and groundwater data to assess the nature and extent of impacts from contamination (if any).
- Assess the need for further response actions.

As part of the laboratory data quality assessment, data quality measurements will be compared with standards established for the project.

10.4 Report Submittals

<u>*Quarterly Groundwater Monitoring Report*</u>

Based on the data collected during each quarterly sampling event, the Contractor will prepare a *Quarterly Groundwater Monitoring Report.* The report will document the sampling activities, present the analytical results, waste disposal manifests, and conclusions and recommendations.

11. PROJECT QUALITY CONTROL/ QUALITY ASSURANCE

The Contractor will be responsible for all aspects of project quality control/quality assurance (QC/QA) and will establish and maintain an effective quality control system. The quality control system will consist of plans, procedures, and organization necessary to produce a product, which complies with the contract requirements. The Contractor will ensure that subcontractors and all necessary supplies comply with the requirements of the contract between NAVAFAC PACIFIC and DAWSON. The controls will be adequate to cover all levels of onsite and offsite work. The controls will include the following:

- A check to assure that all materials and equipment have been tested/calibrated, submitted, and approved.
- A check of substrates and other preliminary work to ensure that it complies with the contract requirements.
- Check the level of workmanship and verify that it meets minimum acceptable workmanship standards.
- Implement corrective measures when defects are detected.

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12. REFERENCES

AMEC Earth and Environmental, Inc., 2002. *Red Hill Bulk Fuel Storage Facility Investigation Report, Volume I of III (Final) for Fleet Industrial Supply Center (FISC), Oahu, Hawaii.* August 2002.

Code of Federal Regulations, 2003a. *Protection of the Environment. Title 40, Parts 260 through 280.* Office of Federal Registrar, National Archivist Record Administration. United States Government Printing Office, Washington, DC.

_____, 2003b. *Transportation. Title 49, Subpart C.* Office of Federal Registrar, National Archivist Record Administration. United States Government Printing Office, Washington, DC.

Dawson Group, Inc., 2004. *Site Health and Safety Plan, Groundwater Sampling, Red Hill Fuel Storage Facility, Hawaii.* September 2004.

Macdonald, George A., Abbot, A.T. and Peterson F.L., 1983. *Volcanoes in the Sea*, University of Hawaii Press.

Mink, John F. and Lau, S.L. 1990. *Aquifer Identification and Classification for Oahu: Groundwater Protection Strategy for Hawaii, University of Hawaii WRRC Technical Report #179.*

State of Hawaii Department of Health, 1996. *Risk-based Corrective Action and Decision Making at Sites with Contaminated Soil and Groundwater, Volume I and II.*

State of Hawaii Department of Health, 2000. *Technical Guidance Manual for Underground Storage Tank Closure and Release Response, Second Edition.* March 2000.

United States Department of Agriculture, Natural Resources Conservation Service, 2004. *Hawaii Soils,* http:/www.ctahr.hawaii.edu/soilsurvey/soils.htm (September 2004).

United States Environmental Protection Agency, 1998. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition.*

United States Navy, 2004. *Statement of Work – 10 May 2004.* May 2004.

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FIGURES

Dawson Group, Inc.

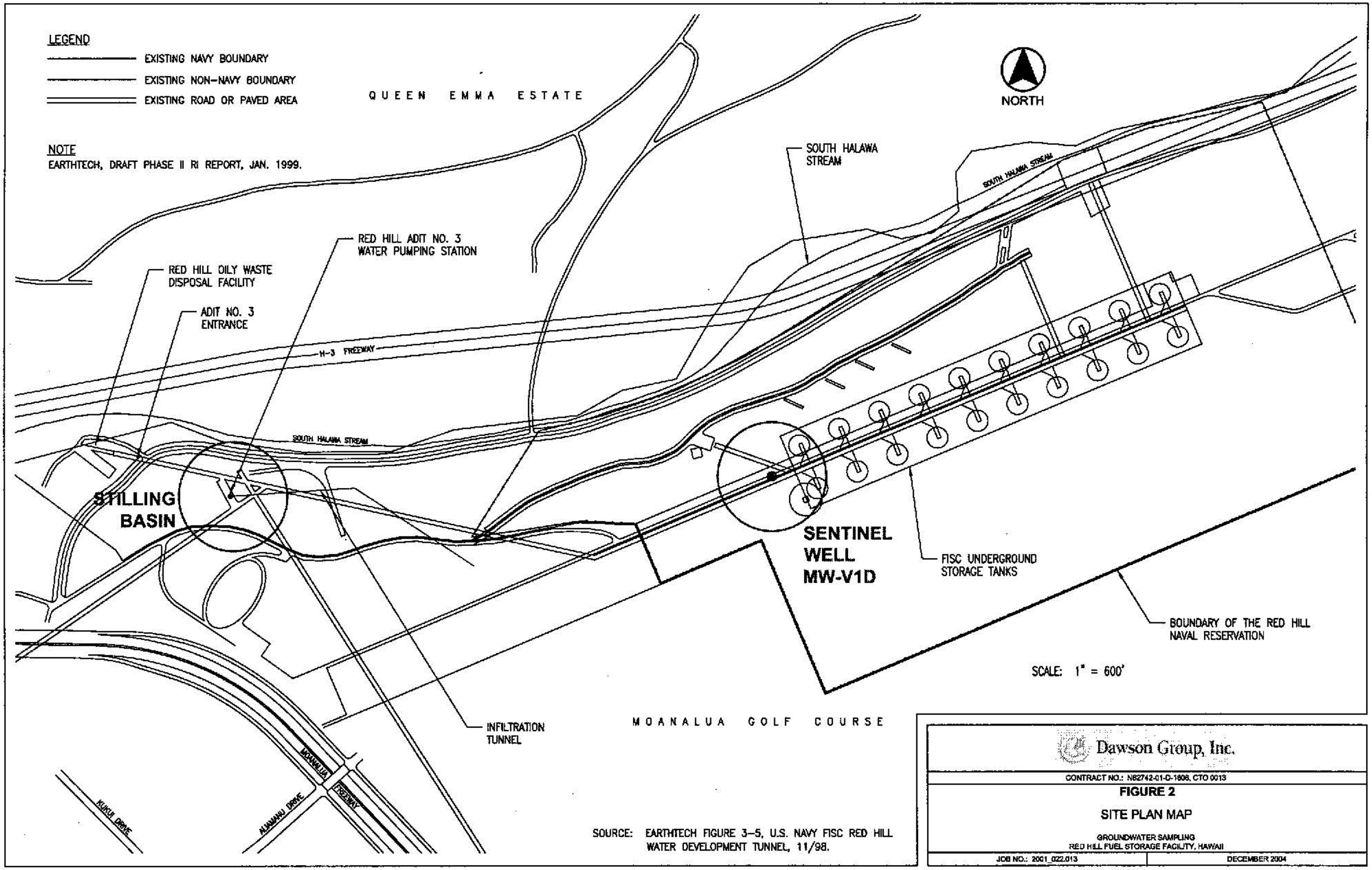
FIGURE 1

SITE VICINITY MAP

RED HILL FUEL STORAGE FACILITY
OAHU, HAWAII

JOB NO. 2001 022.013	DECEMBER 2004	N62742-01-D-1806

WORK PLAN



Dawson Group, Inc.

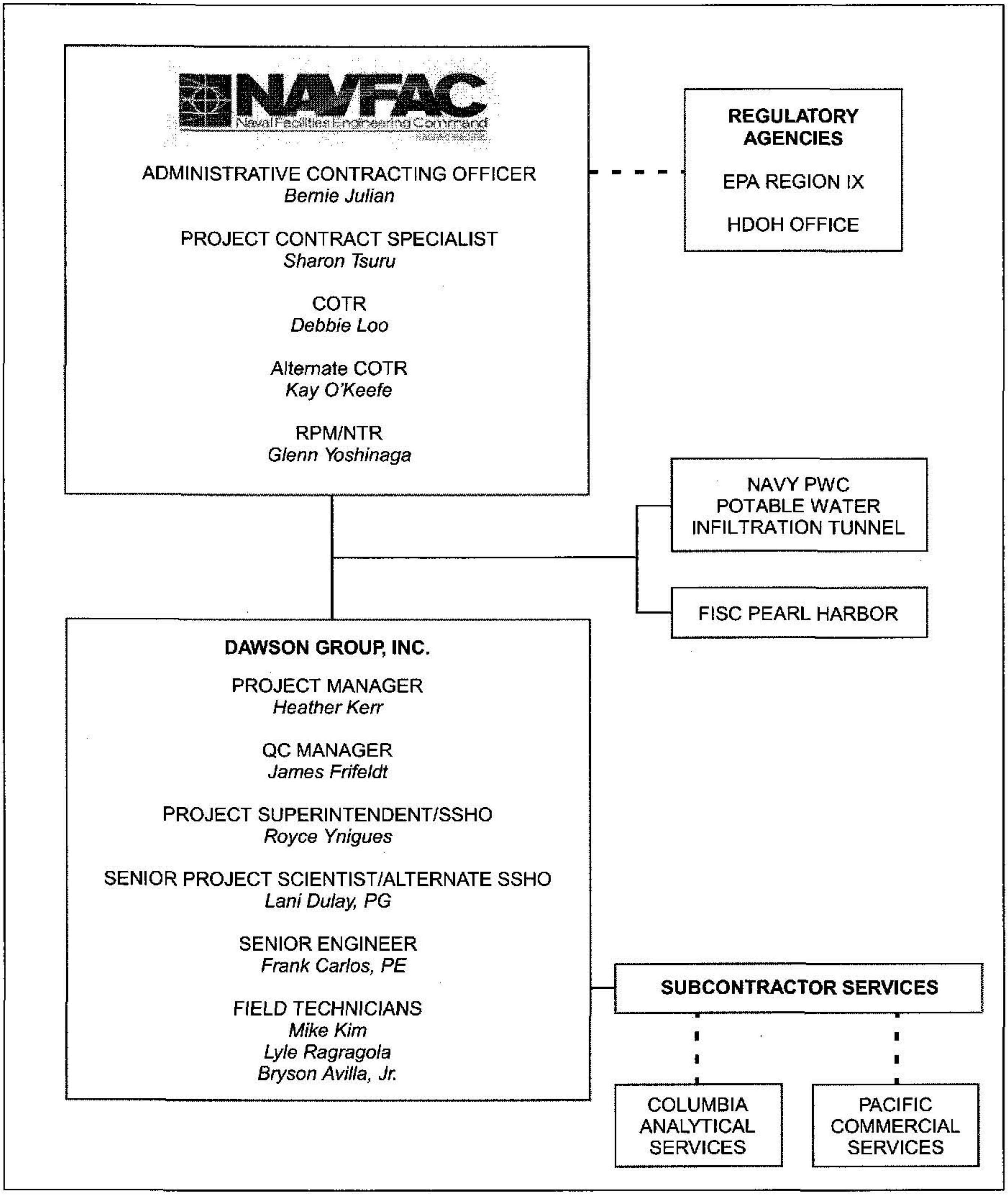
CONTRACT NO.: N62742-01-D-1806, CTO 0013

FIGURE 2

SITE PLAN MAP

GROUNDWATER SAMPLING
RED HILL FUEL STORAGE FACILITY, HAWAII

JOB NO.: 2001_022.013	DECEMBER 2004



Dawson Group, Inc.

CONTRACT NO.: N62742-01-D-1806, CTO 0013

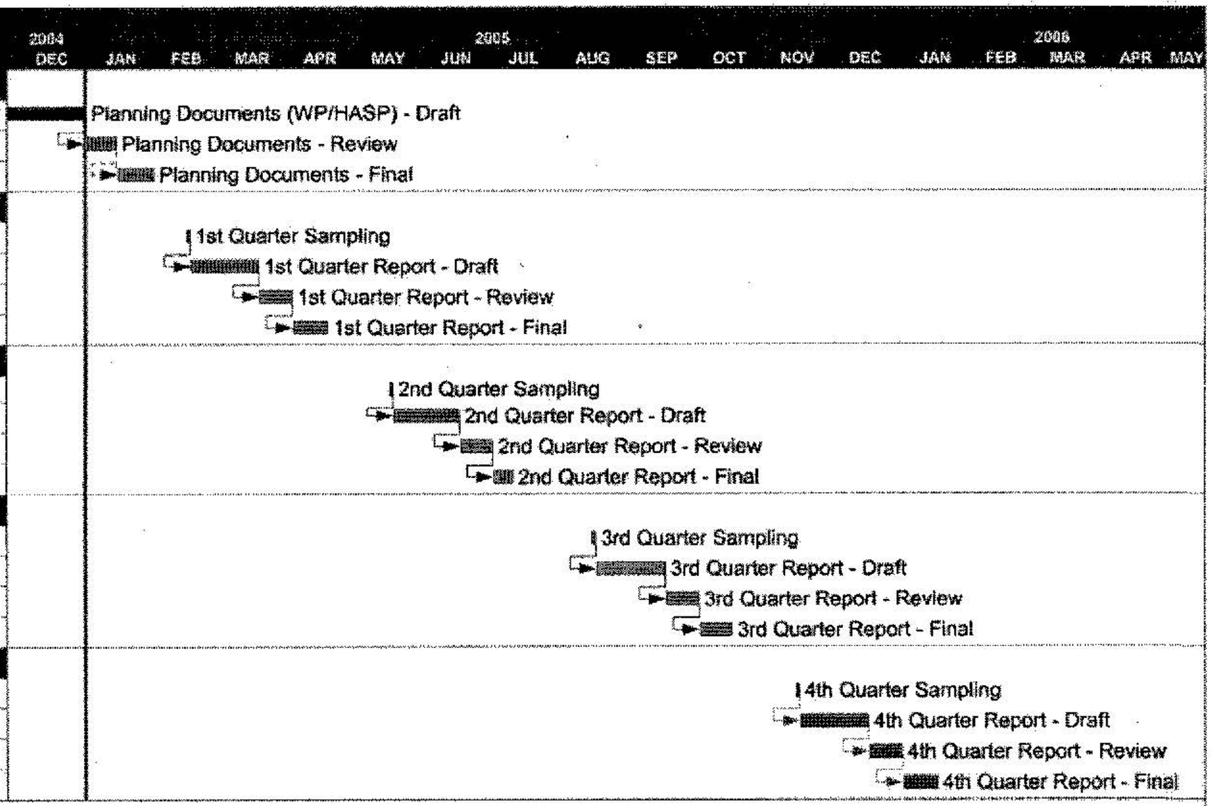
FIGURE 3

PROJECT ORGANIZATIONAL CHART

GROUNDWATER SAMPLING, RED HILL FUEL STORAGE FACILITY, HAWAII

JOB NO.: 2001_022.013	DECEMBER 2004

Description	Early Start	Early Finish
Planning		
Planning Documents (WP/HASP) - Draft	10MAY04 A	31DEC04 A
Planning Documents - Review	31DEC04	14JAN05
Planning Documents - Final	15JAN05 *	31JAN05
1st Quarter		
1st Quarter Sampling	15FEB05 *	16FEB05
1st Quarter Report - Draft	17FEB05 *	19MAR05
1st Quarter Report - Review	20MAR05 *	03APR05
1st Quarter Report - Final	04APR05 *	19APR05
2nd Quarter		
2nd Quarter Sampling	17MAY05 *	18MAY05
2nd Quarter Report - Draft	19MAY05 *	17JUN05
2nd Quarter Report - Review	18JUN05 *	02JUL05
2nd Quarter Report - Final	03JUL05 *	11JUL05
3rd Quarter		
3rd Quarter Sampling	16AUG05 *	17AUG05
3rd Quarter Report - Draft	18AUG05 *	17SEP05
3rd Quarter Report - Review	18SEP05 *	02OCT05
3rd Quarter Report - Final	03OCT05 *	17OCT05
4th Quarter		
4th Quarter Sampling	15NOV05 *	16NOV05
4th Quarter Report - Draft	17NOV05 *	17DEC05
4th Quarter Report - Review	18DEC05 *	01JAN06
4th Quarter Report - Final	02JAN06 *	17JAN06



Start date	10MAY04
Finish date	17JAN06
Data date	31DEC04
Run date	29DEC04
Page number	1A

Dawson Group, Inc.

CONTRACT NO: N62742-01-D-1806, CTO 0013
FIGURE 4
ESTIMATED PROJECT SCHEDULE
Red Hill Fuel Storage Facility

- Early bar
- Progress bar
- Critical bar
- Summary bar
- Start milestone point
- Finish milestone point

TABLES

TABLE 1

Analytical Sample Preservation, Maximum Holding Times, and Containers

Groundwater Sampling
Red Hill Fuel Storage Facility, Hawaii

PARAMETER	ANALYTICAL METHOD	MATRIX	PRESERVATION	MAXIMUM HOLDING TIME	SAMPLE CONTAINER TYPE
BTEX, MtBE, 1,2 DCA (VOCs)	EPA 8260B	Water	4°C, HCL, pH<2	14 days[(a)]	3 x 40-mL vial with Teflon-lined septa
EDB (VOCs)	EPA DW 504.1	Water	4°C, 0.008% $Na_2S_2O_3$/L	14 days[(a)]	3 x 40-mL vial with Teflon-lined septa
TPH as gasoline	EPA 8015B	Water	4°C, HCL, pH<2	14 days[(a)]	3 x 40-mL vial with Teflon-lined septa
PAHs	EPA 8270C or SIM-PAHs	Water	4°C	7 days[(b)] / 40 days[(c)]	2 x 1-L amber glass with Teflon-lined cap
TPH as diesel	EPA 8015B	Water	4°C, HCL, pH<2	7 days[(b)] / 40 days[(c)]	2 x 500-mL amber glass with Teflon-lined cap
Total lead	EPA 6020	Water	4°C, HNO_3, pH<2	6 months	1 x 500-mL polyethylene bottle

Notes:

BTEX	benzene, toluene, ethylbenzene, and total xylenes	DW	drinking water
MtBE	methyl tertiary-butyl ether	°C	degrees Celsius
1,2 DCA	1,2 dichloroethane	HCL	hydrochloric acid
EDB	ethylene dibromide	<	less than
VOC	volatile organic compound	$Na_2S_2O_3$	sodium thiosulfate
TPH	total petroleum hydrocarbons	HNO_3	nitric acid
PAH	polynuclear aromatic hydrocarbon	mL	milligram per liter
EPA	U.S. Environmental Protection Agency	L	liter

(a) From sample collection to analysis
(b) From sample collection to extraction
(c) From extraction to analysis

TABLE 2

Stilling Basin - Surface Water Sampling Summary

Groundwater Sampling
Red Hill Fuel Storage Facility, Hawaii

PARAMETER	ANALYTICAL METHOD	PRIMARY SAMPLE	QC SAMPLE	TRIP BLANK	TOTAL SAMPLES
BTEX, MtBE, 1,2 DCA (VOCs)	EPA 8260B	2	1	①	3
EDB (VOCs)	EPA DW 504.1	2	1	①	3
TPH as gasoline	EPA 8015B	2	1	①	3
PAHs	EPA 8270C or SIM-PAHs	2	1	①	3
TPH as diesel	EPA 8015B	2	1	①	3
Total lead	EPA 6020	2	1	①	3

Notes:

BTEX	benzene, toluene, ethylbenzene, and xylenes	PAHs	polynuclear aromatic hydrocarbon
MtBE	methyl tertiary-butyl ether	EPA	U.S. Environmental Protection Agency
1,2 DCA	dichloroethane	DW	drinking water
EDB	ethylene dibromide	QC	quality control
TPH	total petroleum hydrocarbon		

① A trip blank will be placed in one cooler for each shipping day of groundwater and equipment rinsate samples and submit for analysis of VOCs by EPA Method 8260B

TABLE 3

Sentinel Well - Groundwater Sampling Summary

Groundwater Sampling
Red Hill Fuel Storage Facility, Hawaii

PARAMETER	ANALYTICAL METHOD	PRIMARY SAMPLE	QC SAMPLE	TRIP BLANK	TOTAL SAMPLES
BTEX, MtBE, 1,2 DCA (VOCs)	EPA 8260B	1	1	①	2
EDB (VOCs)	EPA DW 504.1	1	1	①	2
TPH as gasoline	EPA 8015B	1	1	①	2
PAHs	EPA 8270C or SIM-PAHs	1	1	①	2
TPH as diesel	EPA 8015B	1	1	①	2
Total lead	EPA 6020	1	1	①	2

Notes:

BTEX	benzene, toluene, ethylbenzene, and xylenes	PAHs	polynuclear aromatic hydrocarbon
MtBE	methyl tertiary-butyl ether	EPA	U.S. Environmental Protection Agency
1,2 DCA	dichloroethane	DW	drinking water
EDB	ethylene dibromide	QC	quality control
TPH	total petroleum hydrocarbon		

① A trip blank will be placed in one cooler for each shipping day of groundwater and equipment rinsate samples and submit for analysis of VOCs by EPA Method 8260B

APPENDIX A

Field Forms

Drum Label

Drum Inventory Log

Sample Inventory Log

Surface Water Sampling Log

Monitoring Well Sampling Log

NON-HAZARDOUS WASTE

0013 - RH SW - D

DATE(s) COLLECTED: ______________________

CONTENTS: [ ] Soil [X] Water [ ] Solid Waste [ ] Other ______

PROJECT TYPE: [ ] SI [X] UST [ ] RA [ ] Other ______

COMMENTS: ______________________

GENERATOR INFORMATION:
NAME: NAVFAC Pacific - Glenn Yoshinaga
ADDRESS: 258 Makalapa Drive, Suite 100 PHONE: (808) 472-1416
CITY: Honolulu STATE: Hawaii ZIP CODE: 96860

ADDITIONAL CONTACT:
NAME: Dawson Group, Inc. - Heather Kerr PHONE: (808) 536-5500 EXT. 341

NON-HAZARDOUS WASTE

0013 - RH SW - D

DATE(s) COLLECTED: ______________________

CONTENTS: [ ] Soil [X] Water [ ] Solid Waste [ ] Other ______

PROJECT TYPE: [ ] SI [X] UST [ ] RA [ ] Other ______

COMMENTS: ______________________

GENERATOR INFORMATION:
NAME: NAVFAC Pacific - Glenn Yoshinaga
ADDRESS: 258 Makalapa Drive, Suite 100 PHONE: (808) 472-1416
CITY: Honolulu STATE: Hawaii ZIP CODE: 96860

ADDITIONAL CONTACT:
NAME: Dawson Group, Inc. - Heather Kerr PHONE: (808) 536-5500 EXT. 341

Dawson Group, Inc.

DRUM INVENTORY LOG

PAGE ________ OF ________

PROJECT: Groundwater Sampling, Red Hill Fuel Storage Facility, Oahu

SPECIFIC AREA: Sentinel Well MW-V1D location

CONTRACT NO.: N62742-01-D-1806, CtO 0013

JOB NO.: 2001 022.013

DRUM IDENITIFICATION NUMBER						DRUM STORAGE LOCATION	ORIGIN OF CONTENTS	IDW TYPE (soil, water, etc.)	WASTE VOLUME (% Full)	WASTE GENRATION DATE	EXPECTED DISPOSAL DATE	ACTUAL DISPOSAL DATE	COMMENTS (indicate if waste volume changed, high levels of contamination, etc.)
CTO NO.	-	FACILITY	-	D	DRUM NO.								
0013	-	RH SW	-	D	001								
	-		-	D									
	-		-	D									
	-		-	D									
	-		-	D									
	-		-	D									
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	-		-	D									
	-		-	D									

SAMPLE INVENTORY LOG

PAGE ______ OF ______

Dawson Group, Inc.
Airport Industrial Park
3375 Koapaka Street
Suite B200
Honolulu, Hawaii 96819
Phone 808-536-5500
Fax 808-536-5530
www.dawson8a.com

PROJECT: Groundwater Sampling, Red Hill Fuel Storage Facility, Hawaii

CONTRACT NO.: N62742-01-D-1806

LOCATION: Sentinel Well MW-V1D (FISC)

JOB NO.: 2001_022.013

PERSONNEL:

SAMPLE INFORMATION

	LABORATORY	P/QC or QA	ADDRESS	CONTACT	PHONE
1	Columbia Analytical Services	P & QC	91-235 Oihana Street, Kapolei, HI 96707	Tracie Sober	682-1767
2					
3					

SAMPLE INFORMATION												SPECIFIC PROJECT SITE (see below)	COMMENTS (indicate any observations)	DESTINATION & SHIPMENT DATE	
EPA NUMBER															
Facility Initials		Sample Location Initials		Chrono. No.	DATE	TIME	LOCATION	TYPE (see below)	# PER LOCATION	QC NOTE (see below)	DEPTH (feet bgs)				
RH	-	W	-	001			MW-V1D	water				FSF		1	00/00/00
RH	-	W	-												
RH	-	W	-												
RH	-	W	-												
RH	-	W	-												
RH	-	W	-												
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RH	-	W	-												
RH	-	W	-												
RH	-	W	-												
RH	-	W	-												
RH	-	W	-												

Facility Initials:
RH = Red Hill

Type:
water

QC Note:
S = primary
D = duplicate (QC)

Site-specific project:
FSF = fuel storage facility, downgradient of USTs

MONITORING WELL FIELD SAMPLING LOG

Dawson Group, Inc.

PROJECT: Groundwater Sampling, Red Hill Fuel Storage Facility, Hawaii - Potable Water Infiltration Tunnel *

CONTRACT NO.: N62742-01-D-1806, CTO 0013 JOB NO.: 2001_022.013

DATE: TIME: CLIMATIC CONDITIONS:

PERSONNEL:

WELL INFORMATION

Well Name/Number: Stilling Basin

Well Location: *

Casing Diameter (inches): NA (d_c)

Total Well Depth (feet): NA

Initial Depth to Water (feet):

Depth to Product (feet): NA

Height of Water Column (feet): NA (h)

PURGE VOLUME

$V_c = (d_c)^2 \times (h) \times 0.041$

Volume of water in casing (gallons): NA (V_c)

Minimum Purge Volume (gallons): NA

EQUIPMENT

Instrument(s): Solinst Interface Probe

Calibration Time: NA

Calibration Result / Comments: NA

PURGE LOG *Measurements of temperature, pH, specific conductivity, turbidity, dissolved oxygen, and redox will be collected initially, after every well volumne removed, and at the end.*

METHOD OF REMOVAL: New, disposable, polyethylene bailer PUMPING RATE: NA

DATE	TIME	CUMULATIVE GALLONS REMOVED	TEMP. (°C)	pH	SP. COND. ( )	TURBIDITY ( )	DISSOLVED O_2 ( )	REDOX ( )

SAMPLE INFORMATION

SAMPLE WITHDRAWAL METHOD: New, disposable, polyethylene bailer SAMPLED BY:

SAMPLE ID	P, QC, OR QA	TIME COLLECTED	DATE COLLECTED	NOTES

Notes: P = primary sample; QC = quality control (duplicate) sample; QA = quality assurance (triplicate) sample

APPEARANCE OF SAMPLE: Color: Temp: NA DO: NA

Turbidity: NA pH: NA Redox: NA

Sediment: Sp. Cond.: NA

LAB ANALYSIS PARAMETERS: (1) BTEX, MtBE, 1,2-DCA - EPA Method 8260B (2) EDB - EPA DW Method 504.1

(3) TPH as gasoline - EPA Method 8015B (4) TPH as diesel - EPA Method 8015B

(5) PAHs - EPA Method 8270C or SIM-PAHs (6) Total lead - EPA Method 6020

NUMBER & TYPE OF SAMPLE CONTAINERS USED (include preservatives, if any): (1) 3 40-mL VOAs with HCL

(2) 3 40-mL VOAS with sodium thiosulfate (3) 3 40-mL VOAs with HCL (4) 2 500-mL Glass Amber with HCL

(5) 2 1-L Glass Amber (none) (6) 1 500-mL plastic with HNO3

DECONTAMINATION PROCEDURES:

SAMPLES DELIVERED TO: DATE:

TRANSPORTER: FedEx - Tracking # TIME:

MONITORING WELL FIELD SAMPLING LOG

Dawson Group, Inc.

PROJECT: Groundwater Sampling, Red Hill Fuel Storage Facility, Hawaii - downgradient of USTs *

CONTRACT NO.: N62742-01-D-1806, CTO 0013 JOB NO.: 2001_022.013

DATE: TIME: CLIMATIC CONDITIONS:

PERSONNEL:

WELL INFORMATION

Well Name/Number: MW-V1D

Well Location: *

Casing Diameter (inches): 1 (d_c)

Total Well Depth (feet): 100

Initial Depth to Water (feet):

Depth to Product (feet):

Height of Water Column (feet): (h)

PURGE VOLUME

$V_c = (d_c)^2 \times (h) \times 0.041$

Volume of water in casing (gallons): (V_c)

Minimum Purge Volume (gallons):

EQUIPMENT

Instrument(s):

Calibration Time:

Calibration Result / Comments:

PURGE LOG

Measurements of temperature, pH, specific conductivity, turbidity, dissolved oxygen, and redox will be collected initially, after every well volumne removed, and at the end.

METHOD OF REMOVAL: PUMPING RATE:

DATE	TIME	CUMULATIVE GALLONS REMOVED	TEMP. (°C)	pH	SP. COND. ( )	TURBIDITY ( )	DISSOLVED O_2 ( )	REDOX ( )

SAMPLE INFORMATION

SAMPLE WITHDRAWAL METHOD: SAMPLED BY:

SAMPLE ID	P, QC, OR QA	TIME COLLECTED	DATE COLLECTED	NOTES

Notes: P = primary sample; QC = quality control (duplicate) sample; QA = quality assurance (triplicate) sample

APPEARANCE OF SAMPLE: Color: Temp: DO:

Turbidity: pH: Redox:

Sediment: Sp. Cond.:

LAB ANALYSIS PARAMETERS: (1) BTEX, MtBE, 1,2-DCA - EPA Method 8260B (2) EDB - EPA DW Method 504.1

(3) TPH as gasoline - EPA Method 8015B (4) TPH as diesel - EPA Method 8015B

(5) PAHs - EPA Method 8270C or SIM-PAHs (6) Total lead - EPA Method 6020

NUMBER & TYPE OF SAMPLE CONTAINERS USED (include preservatives, if any): (1) 3 40-mL VOAs with HCL

(2) 3 40-mL VOAS with sodium thiosulfate (3) 3 40-mL VOAs with HCL (4) 2 500-mL Glass Amber with HCL

(5) 2 1-L Glass Amber (none) (6) 1 500-mL plastic with HNO3

DECONTAMINATION PROCEDURES:

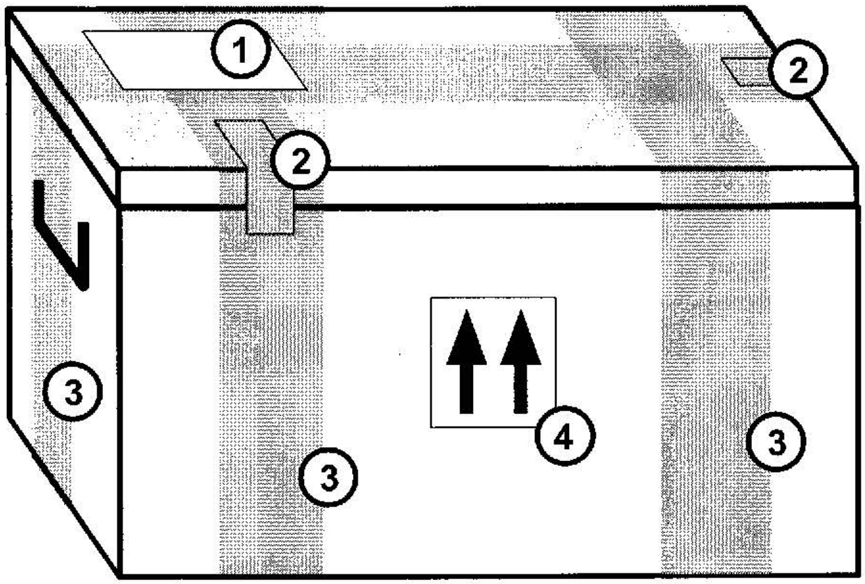
SAMPLES DELIVERED TO: DATE:

TRANSPORTER: FedEx - Tracking # TIME:

APPENDIX B

Example

Diagram of Properly Labeled Cooler



① Air Bill

② Custody Seals

③ Clear Tape

④ Direction Arrow Stickers - Two Required

Dawson Group, Inc.

CONTRACT NO.: N62742-01-D-1806, CTO 0013

EXAMPLE

DIAGRAM OF PROPERLY LABELED COOLER

GROUNDWATER SAMPLING, RED HILL FUEL STORAGE FACILITY, HAWAII

JOB NO.: 2001_022.013	DECEMBER 2004