Quarterly Groundwater Monitoring Report – Outside (Non-Tunnel) Wells

Red Hill Bulk Fuel Storage Facility, Pearl Harbor, O‘ahu, Hawai‘i

Latitude: 21°22’15”N
Longitude: 157°53’33”W

DOH Facility ID No. 9-102271
DOH Release ID No. 99051, 010011, 020028

December 2010

Department of the Navy
Naval Facilities Engineering Command, Hawai‘i
400 Marshall Road
Pearl Harbor, HI 96860-3139

NAVFAC
Naval Facilities Engineering Command
NAVFAC HAWAII

Environmental Technical Services
Contract Number N62742-08-D-1930, Contract Task Order HC14

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Prepared for:

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Naval Facilities Engineering Command, Hawai‘i
400 Marshall Road
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Prepared under:

Environmental Technical Services
Contract Number N62742-08-D-1930, Contract Task Order HC14

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List of Acronyms

µg/L	micrograms per liter
amsl	above mean sea level
bTOC	below top of casing
COPC	chemical of potential concern
DL	detection limit or MDL
DLNR	Department of Land and Natural Resources
DOH	State of Hawai‘i Department of Health
DON	Department of the Navy
DRO	diesel range organics
dup	duplicate
EAL	Environmental Action Level
EPA	U.S. Environmental Protection Agency
FISC	Fleet and Industrial Supply Center
GRO	gasoline range organics
HAR	Hawai‘i Administrative Rules
IDW	investigation-derived waste
J	Estimated result. Indicates that the compound was identified but the concentration was above the DL and below the LOQ.
JP	Jet Propellant
LOD	limit of detection
LOQ	limit of quantitation or RL
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NA	not available
NAVFAC	Naval Facilities Engineering Command
ND	not detected
PAHs	polynuclear aromatic hydrocarbons
pH	hydrogen activity
PHWS	Pearl Harbor Water System
PPE	personal protective equipment
Q	data qualifier
QC	quality control
RHSF	Red Hill Bulk Fuel Storage Facility
RL	reporting limit
RPD	relative percent difference
TEC	The Environmental Company, Inc.
TPH	total petroleum hydrocarbons
U	Indicates the compound or analyte was analyzed for but not detected. The result is reported as ND.
U.S.	United States
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound

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Executive Summary

There are 18 active and two inactive, 12.5 million gallon capacity, field-constructed underground storage tanks (USTs) located at the Red Hill Bulk Fuel Storage Facility (RHSF). Previous environmental site investigations indicated a release had occurred and contaminated the groundwater underlying the RHSF.

The United States (U.S.) Navy implemented a groundwater monitoring program, which includes collecting quarterly groundwater samples from U.S. Navy Well 2254-01 (RHMW2254-01) and four groundwater monitoring wells installed in the RHSF lower access tunnel (RHMW01, RHMW02, RHMW03, and RHMW05). The U.S. Navy Well 2254-01 is located approximately 3,000 feet downgradient from the RHSF and provides approximately 24 percent of the potable water to the Pearl Harbor Water System (PHWS). The groundwater samples are analyzed for petroleum constituents and compared against State of Hawai‘i Department of Health (DOH) Drinking Water Environmental Action Levels (EALs) (DOH, 2009).

In response to increasing concentrations of chemicals of potential concern (COPCs) in the groundwater monitoring wells within the facility (specifically RHMW02) during 2008, plans were made to conduct four quarterly sampling events starting in August 2009 and ending in April 2010 at the following outside (non-tunnel) monitoring well locations:

- RHMW04;
- Oily Waste Disposal Facility Monitoring Well 01 (OWDFMW01); and
- Hālawa Deep Well 2253-03 (HDMW2253-03).

The four consecutive quarterly sampling events indicated all COPC concentrations were below the EALs for samples collected at monitoring well RHMW04. As a result, quarterly monitoring was discontinued at this monitoring well. This groundwater monitoring report presents the analytical results for samples collected on October 21, 2010 at the two outside monitoring wells (OWDFMW01 and HDMW2253-03).

Laboratory analytical results indicate that all COPC concentrations during the October 2010 groundwater sampling event were below the EALs. Acetone was detected in monitoring well OWDFMW01 at an estimated concentration of 1.4 micrograms per liter (µg/L) and lead was detected in both wells (0.60 µg/L in OWDFMW01; 0.56 µg/L in HDMW2253-03). All other COPCs were not detected at or above the limits of detection (LODs) and limits of quantitation (LOQs). All LODs and LOQs were generally below the EALs. In the case where an EAL for a specific COPC is less than the LOQ, it is generally acceptable to consider the LOQ in place of the EAL (DOH, 2009). The results of this groundwater monitoring event indicate significant concentrations of COPCs detected within the facility are not impacting these two outside wells.

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Section 1 Introduction

This report presents the results of the October 2010 quarterly groundwater monitoring event at the two outside monitoring wells (OWDFMW01 and HDMW2253-03) at the RHSF, Pearl Harbor, Oʻahu, Hawaiʻi (Figure 1-1). The groundwater monitoring was performed by Environet for the Department of the Navy (DON), Naval Facilities Engineering Command (NAVFAC) Hawaiʻi under Environmental Technical Services, Contract Number N62742-08-D-1930, Contract Task Order Number HC14.

This groundwater monitoring event is considered supplemental to the quarterly groundwater monitoring program conducted within the tunnels of the RHSF. This supplemental groundwater monitoring was conducted in response to increasing concentrations of COPCs in a groundwater monitoring well within the RHSF, specifically RHMW02, during the October 2008 groundwater monitoring event. The field activities performed for the October 2010 quarterly groundwater monitoring event were conducted in accordance with the procedures described in the *Work Plan, Long-Term Monitoring, Red Hill Bulk Fuel Storage Facility, Pearl Harbor, Oʻahu, Hawaiʻi* (Environet, 2010).

1.1 Project Objective

The groundwater monitoring was performed to evaluate the presence of COPCs in groundwater surrounding the RHSF. The groundwater monitoring was conducted to ensure the DON remains in compliance with DOH UST release response requirements as described in Hawaiʻi Administrative Rules (HAR) 11-281 Subchapter 7, Release Response Action.

1.2 Background

The U.S. Navy implemented a groundwater monitoring program, which includes collecting quarterly groundwater samples from U.S. Navy Well 2254-01 (RHMW2254-01) and four groundwater monitoring wells installed in the RHSF lower access tunnel (RHMW01, RHMW02, RHMW03, and RHMW05). The U.S. Navy Well 2254-01 is located approximately 3,000 feet downgradient from the RHSF and provides approximately 24 percent of the potable water to the PHWS. The groundwater samples are analyzed for petroleum constituents and compared against DOH Drinking Water EALs (DOH, 2009).

In response to increasing concentrations of COPCs in the groundwater monitoring wells within the facility (specifically RHMW02) during 2008, plans were made to conduct four quarterly sampling events starting in August 2009 and ending in April 2010 at the following outside (non-tunnel) monitoring well locations:

- RHMW04;
- Oily Waste Disposal Facility Monitoring Well 01 (OWDFMW01); and
- Hālawa Deep Well 2253-03 (HDMW2253-03).

The four consecutive quarterly sampling events indicated all COPC concentrations were below the EALs for samples collected at monitoring well RHMW04. As a result, quarterly monitoring was discontinued at this monitoring well. This groundwater monitoring report presents the analytical results for samples collected on October 21, 2010 at the two outside monitoring wells (OWDFMW01 and HDMW2253-03). The following sections provide a description of the site and information on the RHSF and USTs.

1.2.1 Site Description

The RHSF is located on the island of O‘ahu, Hawai‘i, approximately 2.5 miles northeast of Pearl Harbor in Hālawa Heights (Figure 1-1). Land adjacent to the north of the RHSF is occupied by the Hālawa Correctional Facility and private businesses. Land to the south and west of the facility includes the Coast Guard Reservation and other residential neighborhoods. Moanalua Valley is located east of the facility (Environet, 2010).

The Navy Public Works Department operates a potable water infiltration tunnel approximately 1,550 feet hydraulically downgradient from the RHSF (Environet, 2010). The U.S. Navy Well 2254-01 is located approximately 3,000 feet downgradient (west) of the RHSF and provides approximately 24 percent of the potable water to the PHWS, which serves approximately 52,200 military consumers (The Environmental Company, Inc. (TEC), 2008).

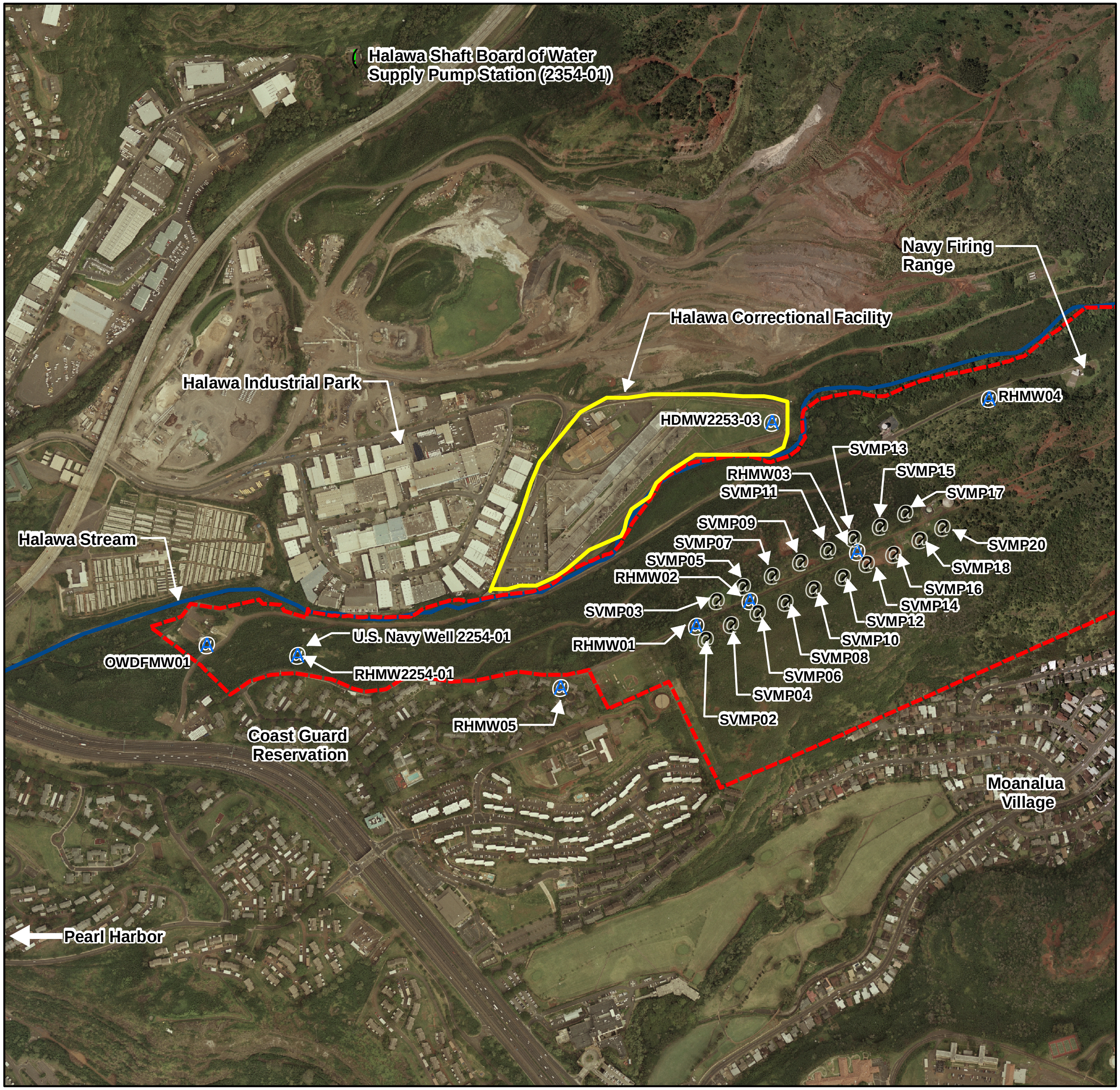
1.2.2 Facility Information

The RHSF consists of 18 active and two inactive USTs operated by the Navy Fleet and Industrial Supply Center (FISC) Pearl Harbor. Each UST has a capacity of 12.5 million gallons. The RHSF is located approximately 100 feet above the basal aquifer (Dawson Group, Inc., 2006).

In 2002, the U.S. Navy installed a groundwater monitoring well (RHMW01) into the basal aquifer, directly down-gradient from the RHSF, within the lower access tunnel. Groundwater samples from this well indicated that petroleum from the RHSF had migrated to the basal aquifer (AMEC Earth and Environmental, Inc., 2002). In 2005, the U.S. Navy began quarterly monitoring of the aquifer to protect their down-gradient drinking water resource associated with the U.S. Navy Well 2254-01.

By September 2005, the U.S. Navy had installed two more groundwater monitoring wells (RHMW02 and RHMW03) within the RHSF UST system, a groundwater monitoring well (RHMW04) north of the RHSF (adjacent to the U.S. Navy Firing Range), and a groundwater monitoring well within the U.S. Navy Well 2254-01 infiltration gallery (RHMW2254-01). Since 2005, RHMW01, RHMW02, RHMW03, and RHMW2254-01 have been sampled quarterly for total petroleum hydrocarbons (TPH)-diesel range organics (DRO), TPH-gasoline range organics (GRO), volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and dissolved lead.

Due to increasing concentrations of COPCs at the groundwater monitoring wells within the RHSF (specifically RHMW02) during 2008, response measures were warranted. In April 2009, another groundwater monitoring well (RHMW05) was installed within the lower access tunnel



LEGEND

?	Soil Vapor Monitoring Points
A	Groundwater Monitoring Wells
(	Board of Water Supply Pump Station
🟨	Halawa Correctional Facility
🟥	Red Hill Naval Reservation
—	Halawa Stream

SOURCE

USGS, 2005

1,000 500 0 1,000 Feet

Figure 1-1
Groundwater Monitoring Well Location Map

Quarterly Groundwater Monitoring Report-Outside (Non-Tunnel) Wells, Red Hill Bulk Fuel Storage Facility, Pearl Harbor, O'ahu, Hawai'i

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between RHMW01 and RHMW2254-01. It was installed to identify the extent of contaminant migration before it reaches the infiltration gallery at RHMW2254-01.

Additionally, plans were made to sample three monitoring wells surrounding the outside of RHSF: RHMW04, OWDFMW01, and HDMW2253-03 (Figure 1-1 and Table 1-1). RHMW04 was installed to provide contaminant chemistry data for water moving through the basal aquifer beneath RHSF. OWDFMW01 (originally known as MW08) was installed into the basal aquifer in 1998 for a Phase II Remedial Investigation/Feasibility Study for the Red Hill Oily Waste Disposal Facility (Earth Tech, Inc., 2000). It is located geographically downgradient of the USTs and U.S. Navy Well 2254-01. HDMW2253-03 is controlled by the State of Hawaii Commission on Water Resource Management. HDMW2253-03 is located between the RHSF and the municipal drinking water supply well which is operated by the City and County of Honolulu Board of Water Supply (Hālawa Shaft Pumping Station 2354-01) (Figure 1-1).

Table 1-1: Outside Monitoring Well Information

Groundwater Monitoring Well	bTOC Elevation (feet amsl)	Depth to Water (feet bTOC)	Total Depth of Well (feet)
RHMW04	313.03	---	320
OWDFMW01	138.94	121.69	142.8
HDMW2253-03	225	209.39*	1,575

Notes:
*Depth to water provided by the Department of Land and Natural Resources (DLNR) on October 21, 2010.
--- Depth to water was not gauged at RHMW04 during the October 2010 groundwater sampling event.
amsl - above mean sea level
bTOC - below top of casing

1.2.3 UST Information

The USTs were constructed in the early 1940s. The tanks were constructed of steel and currently contain Jet Propellant (JP)-5 fuel, JP-8, and marine diesel fuel (F-76). Previously, several tanks stored Navy Special Fuel Oil, Navy Distillate, aviation gasoline, and motor gasoline. Each tank measures approximately 245 feet in height and 100 feet in diameter. The upper domes of the tanks lie at depths varying between approximately 100 feet and 200 feet below the existing ground surface (TEC, 2006).

1.2.4 Regulatory Updates

During the summer and fall of 2008, DOH updated their EALs, which resulted in significant changes to the action levels associated with methylnaphthalenes. The drinking water toxicity EAL for these compounds was 240 µg/L. This concentration presumed that methylnaphthalenes were non-carcinogenic. Evidence that they are human carcinogens has now been accepted by the U.S. Environmental Protection Agency (EPA). As a result, DOH adopted more rigorous EALs of 4.7 µg/L for 1-methylnaphthalene and 24 µg/L for 2-methylnaphthalene, corresponding to a residential tap water scenario, and a one in a million cancer risk (DOH, 2009).

Also, the drinking water EAL for naphthalene was increased from 6.2 µg/L to 17 µg/L (DOH, 2009). Finally, the DOH Drinking Water EAL for TPH-DRO was increased from 100 µg/L to 210 µg/L, although the DOH Groundwater Gross Contamination EAL for TPH-DRO remains 100 µg/L.

1.3 Previous Reports

The following groundwater monitoring reports were previously submitted to the DOH for the groundwater monitoring wells within the RHSF:

1. Groundwater Sampling Report, First Quarter 2005 (submitted April 2005);
2. Groundwater Sampling Report, Second Quarter 2005 (submitted August 2005);
3. Groundwater Sampling Report, Third Quarter 2005 (submitted November 2005);
4. Groundwater Sampling Report, Fourth Quarter 2005 (submitted February 2006);
5. Groundwater Monitoring Results, July 2006 (submitted September 2006);
6. Groundwater Monitoring Results, December 2006 (submitted January 2007);
7. Groundwater Monitoring Results, March 2007 (submitted May 2007);
8. Groundwater Monitoring Results, June 2007 (submitted August 2007);
9. Groundwater Monitoring Results, September 2007 (submitted October 2007);
10. Groundwater Monitoring Results, January 2008 (submitted March 2008);
11. Groundwater Monitoring Results, April 2008 (submitted May 2008);
12. Groundwater Monitoring Results, July 2008 (submitted October 2008);
13. Groundwater Monitoring Results, October and December 2008 (submitted February 2009);
14. Groundwater Monitoring Results, February 2009 (submitted May 2009);
15. Groundwater Monitoring Results, May 2009 (submitted July 2009);
16. Groundwater Monitoring Results, July 2009 (submitted September 2009);
17. Groundwater Monitoring Results, October 2009 (submitted December 2009);
18. Groundwater Monitoring Results, January, February, and March 2010 (submitted April 2010);
19. Groundwater Monitoring Results, April 2010 (submitted May 2010); and
20. Groundwater Monitoring Results, July 2010 (submitted August 2010).

The following groundwater monitoring reports were previously submitted to the DOH for the groundwater monitoring wells outside the RHSF:

1. Groundwater Monitoring Results, August 2009 (submitted September 2009);
2. Groundwater Monitoring Results, October 2009 (submitted December 2009);
3. Groundwater Monitoring Results, January 2010 (submitted April 2010);
4. Groundwater Monitoring Results, April 2010 (submitted May 2010); and
5. Groundwater Monitoring Results, July 2010 (submitted August 2010).

Section 2 Monitoring Activities

Groundwater monitoring was conducted on October 21, 2010 using guidelines presented in the Work Plan (Environet, 2010). Field activities were documented in the field notebook (Appendix A).

2.1 Groundwater Gauging

Groundwater gauging measurements were collected at the two monitoring wells (OWDFMW01 and HDMW2253-03) prior to purging and sample collection. A Solinst® water level meter was used to measure the depth to groundwater to the nearest 0.01 foot within monitoring well OWDFMW01, according to the procedures described in Procedure I-C-3, *Monitoring Well Sampling* (DON, 2007). The depth to groundwater for monitoring well HDMW2253-03 was measured by a DLNR employee prior to well purging (Table 1-1).

2.2 Groundwater Sampling

Groundwater samples were collected from the two monitoring wells according to the procedures described in Procedure I-C-3, *Monitoring Well Sampling* (DON, 2007).

2.2.1 Monitoring Well Purging

Due to the well construction characteristics of OWDFMW01 and HDMW2253-03 (large casing and very deep well; cased only until it reaches groundwater, then turns into an open hole), three well casing volumes were not purged prior to sampling. Instead, water was purged using disposable bailers until three or more successive water quality parameter measurements had stabilized within 10 percent. A Horiba® U-22 multi-parameter water quality meter was used to measure hydrogen activity (pH), temperature, specific conductivity, dissolved oxygen, turbidity, and oxidation reduction potential. At least four to six readings were recorded on Groundwater Sampling Log data sheets (Appendix B).

2.2.2 Groundwater Sample Collection

Groundwater samples were collected from OWDFMW01 and HDMW2253-03 using four-inch disposable bailers. Groundwater samples were collected directly into laboratory provided, specially cleaned sample containers already containing the appropriate preservatives (i.e., hydrochloric acid for VOC analysis and nitric acid for dissolved lead analysis). The dissolved lead samples were filtered in the field and placed in polyethylene bottles containing the appropriate preservatives.

2.2.3 Sample Management and Shipment

Each sample container sent to the laboratory was assigned a project-specific chain of custody identification number and a descriptive identification number. The sample identifiers provided specific data unique to each sample and were entered into the field notebook. The samples were labeled according to the procedures described in Procedure III-E, *Record Keeping, Sample Labeling, and Chain-of-Custody* (DON, 2007).

Following sample collection and labeling, the sample containers were packaged with bubble-wrap and placed into individual ZipLoc® bags, then immediately into insulated coolers with ice for preservation. The samples were shipped via FedEx to the laboratory on the same day of collection. The samples were managed under standard chain-of-custody protocol and documentation from collection to delivery to the laboratory. Sample handling, storage, and transport were performed according to the requirements described in Procedure III-F, *Sample Handling, Storage, and Shipping* (DON, 2007).

2.3 Analytical Program

During the October 2010 groundwater monitoring event, two sets of primary groundwater samples, one set of duplicate groundwater samples, and one set of quality control (QC) groundwater samples were submitted to APPL, Inc. located in Clovis, California. Groundwater samples were analyzed for VOCs and TPH-GRO by EPA Method 8260B, TPH-DRO by EPA Method 8015B, PAHs by EPA Method 8270D SIM, and dissolved lead by EPA Method 6020. The results of the laboratory analyses are presented and discussed in Section 3.

2.4 Field Quality Control Samples

Field QC procedures were followed to ensure viability and integrity of sample analytical data. Field duplicates were collected according to the procedures described in Procedure III-B, *Field QC Samples (Water, Soil)* (DON, 2007) and the Work Plan (Environet, 2010). Field duplicate samples were collected at a minimum of 10 percent of primary samples and analyzed for the same contaminants. Field rinsate samples were not required since disposable bailers were used.

2.5 Laboratory Quality Control Samples

Laboratory QC samples were analyzed as part of the standard laboratory QC protocols as presented in the Work Plan (Environet, 2010). Laboratory QC for the groundwater monitoring event consisted of matrix spike (MS)/matrix spike duplicate (MSD) samples for organic analysis. Laboratory QC samples were collected and analyzed according to the procedures described in Procedure III-A *Laboratory QC Samples (Water, Soil)* (DON, 2007). Laboratory QC MS/MSD samples are an aliquot (i.e., a subset) of the field sample; they are not separate samples, but a special designation of an existing sample. Laboratory QC MS/MSD samples were analyzed for the same constituents as the standard samples. At a minimum, one MS/MSD sample pair was required per 20 samples, including duplicates.

2.6 Equipment Decontamination

Decontamination of monitoring equipment was performed to ensure data quality, to prevent cross contamination, and to prevent the potential introduction of contaminants into previously un-impacted areas. Decontamination of monitoring equipment (i.e., Solinst® water level meter and Horiba® U-22 water quality meter) was conducted between monitoring locations according to the procedures described in Procedure I-F, *Equipment Decontamination* (DON, 2007). Decontamination water generated at monitoring well OWDFMW01 was disposed of in the RHSF's lower tunnel oil/water separator sump.

2.7 Investigation-Derived Waste Management

IDW was managed in accordance with the procedures described in Procedure I-A-6, *IDW Management* (DON, 2007). The various potential waste streams included the following:

- personal protective equipment (PPE) including: nitrile gloves, etc.;
- liquids including: equipment rinse water and purged groundwater; and
- disposable sampling equipment and supplies, including: bailers, poly sheeting, etc.

Equipment rinse water and purge water from OWDFMW01 was disposed of in the RHSF’s lower tunnel oil/water separator sump. Purge water from monitoring well HDMW2253-03 was disposed of in the surrounding grass (as directed by DLNR) since it was of drinking water quality. Spent PPE and non-contaminated sample jars and bottles (acid free) were disposed of on a daily basis as solid waste.

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Section 3 Groundwater Analytical Results

This section provides a summary of analytical results for groundwater samples collected from the two outside monitoring wells on October 21, 2010. Complete analytical laboratory reports are provided in Appendix C.

3.1 Summary of Groundwater Analytical Results

OWDFMW01

Acetone was detected at an estimated concentration of 1.4 µg/L which is below both the Drinking Water EAL (22,000 µg/L) and the Gross Contamination EAL (20,000 µg/L) (Table 3-1).

Lead was detected at a concentration of 0.60 µg/L which is below both the Drinking Water EAL (15 µg/L) and the Gross Contamination EAL (5,000 µg/L) (Table 3-1).

All other COPCs were not detected at or above the LODs and LOQs in OWDFMW01. All LODs and LOQs were generally below the EALs. In the case where an EAL for a specific COPC is less than the LOQ, it is generally acceptable to consider the LOQ in place of the EAL (DOH, 2009).

HDMW2253-03

Lead was detected at a concentration of 0.56 µg/L which is below both the Drinking Water EAL (15 µg/L) and the Gross Contamination EAL (5,000 µg/L) (Table 3-1).

All other COPCs were not detected at or above the LODs and LOQs in HDMW2253-03. All LODs and LOQs were generally below the EALs. In the case where an EAL for a specific COPC is less than the LOQ, it is generally acceptable to consider the LOQ in place of the EAL (DOH, 2009).

3.1.1 Data Quality Control Results

The analytical trip blank sample results for October 2010 were all not detected at or above the LODs except for acetone. Acetone was detected at an estimated value of 1.3 µg/L, which is below both the Drinking Water EAL (22,000 µg/L) and the Gross Contamination EAL (20,000 µg/L) (Table 3-2).

Lead was not detected in the laboratory method blank samples (Appendix C).

3.2 Groundwater Contaminant Trend

Concentrations of PAHs and VOCs were previously not detected above the EALs during the August 2009, October 2009, January 2010, April 2010, and July 2010 groundwater monitoring events. These constituents were also not detected above the EALs during this groundwater monitoring event.

TPH-DRO (detected at both OWDFMW01 and HDMW2253-03 in January 2010 and only at OWDFMW01 in April 2010) has been the only parameter detected above the DOH Drinking Water EALs during the outside well groundwater sampling events (Table 3-3).

TPH-DRO detected at OWDFMW01 during January 2010 (1,490 µg/L) significantly decreased in April 2010 (288 µg/L) (Table 3-3). OWDFMW01 was not sampled in July 2010, and TPH-DRO was not detected at or above the LOD or LOQ in October 2010 (Table 3-1). TPH-DRO concentrations at this well are decreasing.

The concentration of TPH-DRO at HDMW2253-03 has decreased to non-detect for three consecutive events (Table 3-3). TPH-DRO concentrations at this well are decreasing.

The October 2010 detection of acetone at an estimated concentration below the DOH Drinking Water EAL was the first at monitoring well OWDFMW01. Acetone was also detected at an estimated concentration in the trip blank sample. This suggested that acetone was introduced to the samples during transport to and from the laboratory and is not representative of groundwater at OWDFMW01.

The October 2010 detections of lead at concentrations below the DOH Drinking Water EAL were the first at these two monitoring wells (OWDFMW01 and HDMW2253-03). The contaminant trend for lead cannot be determined at this time.

Table 3-1: Analytical Results for Quarterly Groundwater Monitoring-Outside (Non-Tunnel) Wells, October 2010

Method	Chemical	DOH Drinking Water EALs for Human Toxicity[a]	DOH Groundwater Gross Contamination EALs[a]	OWDFMW01 (ES007)					HDMW2253-03 (ES006)				
				Result	Q	LOQ	LOD	DL	Result	Q	LOQ	LOD	DL
EPA 8015B (Petroleum)	TPH-DRO	210	100	ND	U	150[b]	80.8	40.4	ND	U	150[b]	80.8	40.4
EPA 8260B (Petroleum)	TPH-GRO	100	100	ND	U	20.0	12.12	6.06	ND	U	20.0	12.12	6.06
EPA 8270D SIM (PAHs)	Acenaphthene	370	20	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06
	Acenaphthylene	240	2000	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06
	Anthracene	1800	22	ND	U	0.2	0.10	0.05	ND	U	0.2	0.10	0.05
	Benzo(a)anthracene	0.092	4.7	ND	U	0.2[b]	0.14	0.07	ND	U	0.2[b]	0.14	0.07
	Benzo(g,h,i)perylene	1500	0.13	ND	U	0.2[b]	0.16	0.08	ND	U	0.2[b]	0.16	0.08
	Benzo(a)pyrene	0.2	0.81	ND	U	0.2	0.14	0.07	ND	U	0.2	0.14	0.07
	Benzo(b)fluoranthene	0.092	0.75	ND	U	0.2[b]	0.12	0.06	ND	U	0.2[b]	0.12	0.06
	Benzo(k)fluoranthene	0.92	0.4	ND	U	0.2	0.14	0.07	ND	U	0.2	0.14	0.07
	Chrysene	9.2	1	ND	U	0.2	0.10	0.05	ND	U	0.2	0.10	0.05
	Dibenzo(a,h)anthracene	0.0092	0.52	ND	U	0.2[b]	0.10	0.05	ND	U	0.2[b]	0.10	0.05
	Fluoranthene	1500	130	ND	U	0.2	0.16	0.08	ND	U	0.2	0.16	0.08
	Fluorene	240	950	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06
	Ideno(1,2,3-cd)pyrene	0.092	0.095	ND	U	0.2[b]	0.14	0.07	ND	U	0.2[b]	0.14	0.07
	1,-Methylnaphthalene	4.7	10	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06
	2,-Methylnaphthalene	24	10	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06
	Naphthalene	17	21	ND	U	0.2	0.10	0.05	ND	U	0.2	0.10	0.05
	Phenanthrene	240	410	ND	U	0.2	0.14	0.07	ND	U	0.2	0.14	0.07
	Pyrene	180	68	ND	U	0.2	0.16	0.08	ND	U	0.2	0.16	0.08
EPA 8260B (VOCs)	1,1,1-Trichloroethane	200	970	ND	U	1.0	0.28	0.14	ND	U	1.0	0.28	0.14
	1,1,2-Trichloroethane	5	50,000	ND	U	1.0	0.40	0.20	ND	U	1.0	0.40	0.20
	1,1-Dichloroethane	2.4	50,000	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19
	1,1-Dichloroethylene (1,1-Dichloroethene)	7	1,500	ND	U	1.0	0.60	0.30	ND	U	1.0	0.60	0.30
	1,2,3-Trichloropropane	0.6	50,000	ND	U	2.0[b]	0.78	0.39	ND	U	2.0[b]	0.78	0.39
	1,2,4-Trichlorobenzene	70	3,000	ND	U	1.0	0.42	0.21	ND	U	1.0	0.42	0.21
	1,2-Dibromo-3-chloropropane	0.04	10	ND	U	2.0[b]	1.52	0.76	ND	U	2.0[b]	1.52	0.76
	1,2-Dibromoethane	0.0065	50,000	ND	U	1.0[b]	0.40	0.20	ND	U	1.0[b]	0.40	0.20
	1,2-Dichlorobenzene	600	10	ND	U	1.0	0.34	0.17	ND	U	1.0	0.34	0.17
	1,2-Dichloroethane	0.15	7,000	ND	U	1.0[b]	0.28	0.14	ND	U	1.0[b]	0.28	0.14
	1,2-Dichloropropane	5	10	ND	U	1.0	0.34	0.17	ND	U	1.0	0.34	0.17
	1,3-Dichlorobenzene	180	50,000	ND	U	1.0	0.22	0.11	ND	U	1.0	0.22	0.11
	1,3-Dichloropropene (total of cis/trans)	0.43	50,000	ND	U	1.0[b]	0.36	0.18	ND	U	1.0[b]	0.36	0.18
	1,4-Dichlorobenzene	75	5	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19
	Acetone	22,000	20,000	1.4	J	10.0	1.90	0.95	ND	U	10.0	1.90	0.95
	Benzene	5	170	ND	U	1.0	0.32	0.16	ND	U	1.0	0.32	0.16
	Bromodichloromethane	0.22	50,000	ND	U	1.0[b]	0.28	0.14	ND	U	1.0[b]	0.28	0.14
	Bromoform	100	510	ND	U	1.0	0.28	0.14	ND	U	1.0	0.28	0.14
	Bromomethane	8.7	50,000	ND	U	2.0	0.48	0.24	ND	U	2.0	0.48	0.24
	Carbon Tetrachloride	5	520	ND	U	1.0	0.20	0.10	ND	U	1.0	0.20	0.10
	Chlorobenzene	100	50	ND	U	1.0	0.42	0.21	ND	U	1.0	0.42	0.21
	Chloroethane	8,600	16	ND	U	1.0	0.42	0.21	ND	U	1.0	0.42	0.21
	Chloroform	70	2,400	ND	U	1.0	0.14	0.07	ND	U	1.0	0.14	0.07
	Chloromethane	1.8	50,000	ND	U	1.0	0.62	0.31	ND	U	1.0	0.62	0.31
	cis-1,2-Dichloroethylene	70	50,000	ND	U	1.0	0.32	0.16	ND	U	1.0	0.32	0.16
	Dibromochloromethane (Chlorodibromomethane)	0.16	50,000	ND	U	1.0[b]	0.38	0.19	ND	U	1.0[b]	0.38	0.19
	Ethylbenzene	700	30	ND	U	1.0	0.46	0.23	ND	U	1.0	0.46	0.23
	Hexachlorobutadiene	0.86	6	ND	U	1.0[b]	0.38	0.19	ND	U	1.0[b]	0.38	0.19
	Methyl ethyl ketone (2-Butanone)	7,100	8,400	ND	U	10.0	1.20	0.60	ND	U	10.0	1.20	0.60
	Methyl isobutyl ketone (4-Methyl-2-pentanone)	2,000	1,300	ND	U	10.0	3.80	1.90	ND	U	10.0	3.80	1.90
	Methyl tert-butyl Ether	12	5	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19
	Methylene chloride	4.8	9,100	ND	U	5.0[b]	0.70	0.35	ND	U	5.0[b]	0.70	0.35
	Styrene	100	10	ND	U	1.0	0.50	0.25	ND	U	1.0	0.50	0.25
	Tetrachloroethane, 1,1,1,2-	0.52	50,000	ND	U	1.0[b]	0.26	0.13	ND	U	1.0[b]	0.26	0.13
	Tetrachloroethane, 1,1,2,2-	0.067	500	ND	U	1.0[b]	0.20	0.10	ND	U	1.0[b]	0.20	0.10
	Tetrachloroethylene (Tetrachloroethene)	5	170	ND	U	1.0	0.30	0.15	ND	U	1.0	0.30	0.15
	Toluene	1,000	40	ND	U	1.0	0.34	0.17	ND	U	1.0	0.34	0.17
	trans-1,2-Dichloroethylene	100	260	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19
	Trichloroethylene (Trichloroethene)	5	310	ND	U	1.0	0.32	0.16	ND	U	1.0	0.32	0.16
	Vinyl chloride	2	3,400	ND	U	1.0	0.46	0.23	ND	U	1.0	0.46	0.23
	Xylenes	10,000	20	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19
EPA 6020	Lead	15	5000	0.60		0.5	0.22	0.11	0.56		0.5	0.22	0.11

Notes:

All units are in micrograms per liter (µg/L).

[a] DOH EALs (DOH, 2009): Table D-1b. Groundwater Action Levels (Groundwater is a current or potential drinking water resource; surface water body is not located within 150 meters of release site).

[b] In the case where an EAL for a specific chemical is less than the LOQ for a commercial laboratory, it is generally acceptable to consider the LOQ in place of the action level (DOH, Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater 2008, updated March 2009).

DL - detection limit or method detection limit (MDL)
DRO - diesel range organics
GRO - gasoline range organics
J - Estimated result. Indicates that the compound was identified but the concentration was above the DL and below the LOQ.
LOD - limit of detection
LOQ - limit of quantitation or reporting limit (RL)
ND - not detected
PAHs - polynuclear aromatic hydrocarbons
Q - data qualifier
TPH - total petroleum hydrocarbons
U - Indicates the compound or analyte was analyzed for but not detected. The result is reported as ND.
VOC - volatile organic compound
Bold - Result exceeds one or both DOH EALs.

Table 3-2: Field QC Results-Outside Wells, October 2010

Method	Chemical	DOH Drinking Water EALs for Human Toxicity[a]	DOH Groundwater Gross Contamination EALs[a]	OWDFMW01 (ES007)					OWDFMW01 dup (ES008)					RPD Duplicate (%)	Trip Blank (10/19/10)				
				Result	Q	LOQ	LOD	DL	Result	Q	LOQ	LOD	DL		Result	Q	LOQ	LOD	DL
EPA 8015B (Petroleum)	TPH-DRO	210	100	ND	U	150[b]	80.8	40.4	ND	U	150[b]	80.8	40.4	0	--	--	--	--	--
EPA 8260B (Petroleum)	TPH-GRO	100	100	ND	U	20.0	12.12	6.06	ND	U	20.0	12.12	6.06	0	ND	U	20.0	12.12	6.06
EPA 8270D SIM (PAHs)	Acenaphthene	370	20	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06	0	--	--	--	--	--
	Acenaphthylene	240	2000	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06	0	--	--	--	--	--
	Anthracene	1800	22	ND	U	0.2	0.10	0.05	ND	U	0.2	0.10	0.05	0	--	--	--	--	--
	Benzo(a)anthracene	0.092	4.7	ND	U	0.2[b]	0.14	0.07	ND	U	0.2[b]	0.14	0.07	0	--	--	--	--	--
	Benzo(g,h,i)perylene	1500	0.13	ND	U	0.2[b]	0.16	0.08	ND	U	0.2[b]	0.16	0.08	0	--	--	--	--	--
	Benzo(a)pyrene	0.2	0.81	ND	U	0.2	0.14	0.07	ND	U	0.2	0.14	0.07	0	--	--	--	--	--
	Benzo(b)fluoranthene	0.092	0.75	ND	U	0.2[b]	0.12	0.06	ND	U	0.2[b]	0.12	0.06	0	--	--	--	--	--
	Benzo(k)fluoranthene	0.92	0.4	ND	U	0.2	0.14	0.07	ND	U	0.2	0.14	0.07	0	--	--	--	--	--
	Chrysene	9.2	1	ND	U	0.2	0.10	0.05	ND	U	0.2	0.10	0.05	0	--	--	--	--	--
	Dibenzo(a,h)anthracene	0.0092	0.52	ND	U	0.2[b]	0.10	0.05	ND	U	0.2[b]	0.10	0.05	0	--	--	--	--	--
	Fluoranthene	1500	130	ND	U	0.2	0.16	0.08	ND	U	0.2	0.16	0.08	0	--	--	--	--	--
	Fluorene	240	950	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06	0	--	--	--	--	--
	Ideno(1,2,3-cd)pyrene	0.092	0.095	ND	U	0.2[b]	0.14	0.07	ND	U	0.2[b]	0.14	0.07	0	--	--	--	--	--
	1,-Methylnaphthalene	4.7	10	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06	0	--	--	--	--	--
	2,-Methylnaphthalene	24	10	ND	U	0.2	0.12	0.06	ND	U	0.2	0.12	0.06	0	--	--	--	--	--
	Naphthalene	17	21	ND	U	0.2	0.10	0.05	ND	U	0.2	0.10	0.05	0	--	--	--	--	--
	Phenanthrene	240	410	ND	U	0.2	0.14	0.07	ND	U	0.2	0.14	0.07	0	--	--	--	--	--
	Pyrene	180	68	ND	U	0.2	0.16	0.08	ND	U	0.2	0.16	0.08	0	--	--	--	--	--
EPA 8260B (VOCs)	1,1,1-Trichloroethane	200	970	ND	U	1.0	0.28	0.14	ND	U	1.0	0.28	0.14	0	ND	U	1.0	0.28	0.14
	1,1,2-Trichloroethane	5	50,000	ND	U	1.0	0.40	0.20	ND	U	1.0	0.40	0.20	0	ND	U	1.0	0.40	0.20
	1,1-Dichloroethane	2.4	50,000	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19	0	ND	U	1.0	0.38	0.19
	1,1-Dichloroethylene (1,1-Dichloroethene)	7	1,500	ND	U	1.0	0.60	0.30	ND	U	1.0	0.60	0.30	0	ND	U	1.0	0.60	0.30
	1,2,3-Trichloropropane	0.6	50,000	ND	U	2.0[b]	0.78	0.39	ND	U	2.0[b]	0.78	0.39	0	ND	U	2.0[b]	0.78	0.39
	1,2,4-Trichlorobenzene	70	3,000	ND	U	1.0	0.42	0.21	ND	U	1.0	0.42	0.21	0	ND	U	1.0	0.42	0.21
	1,2-Dibromo-3-chloropropane	0.04	10	ND	U	2.0[b]	1.52	0.76	ND	U	2.0[b]	1.52	0.76	0	ND	U	2.0[b]	1.52	0.76
	1,2-Dibromoethane	0.0065	50,000	ND	U	1.0[b]	0.40	0.20	ND	U	1.0[b]	0.40	0.20	0	ND	U	1.0[b]	0.40	0.20
	1,2-Dichlorobenzene	600	10	ND	U	1.0	0.34	0.17	ND	U	1.0	0.34	0.17	0	ND	U	1.0	0.34	0.17
	1,2-Dichloroethane	0.15	7,000	ND	U	1.0[b]	0.28	0.14	ND	U	1.0[b]	0.28	0.14	0	ND	U	1.0[b]	0.28	0.14
	1,2-Dichloropropane	5	10	ND	U	1.0	0.34	0.17	ND	U	1.0	0.34	0.17	0	ND	U	1.0	0.34	0.17
	1,3-Dichlorobenzene	180	50,000	ND	U	1.0	0.22	0.11	ND	U	1.0	0.22	0.11	0	ND	U	1.0	0.22	0.11
	1,3-Dichloropropene (total of cis/trans)	0.43	50,000	ND	U	1.0[b]	0.36	0.18	ND	U	1.0[b]	0.36	0.18	0	ND	U	1.0[b]	0.36	0.18
	1,4-Dichlorobenzene	75	5	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19	0	ND	U	1.0	0.38	0.19
	Acetone	22,000	20,000	1.4	J	10.0	1.90	0.95	ND	U	10.0	1.90	0.95	200.0	1.3	J	10.0	1.90	0.95
	Benzene	5	170	ND	U	1.0	0.32	0.16	ND	U	1.0	0.32	0.16	0	ND	U	1.0	0.32	0.16
	Bromodichloromethane	0.22	50,000	ND	U	1.0[b]	0.28	0.14	ND	U	1.0[b]	0.28	0.14	0	ND	U	1.0[b]	0.28	0.14
	Bromoform	100	510	ND	U	1.0	0.28	0.14	ND	U	1.0	0.28	0.14	0	ND	U	1.0	0.28	0.14
	Bromomethane	8.7	50,000	ND	U	2.0	0.48	0.24	ND	U	2.0	0.48	0.24	0	ND	U	2.0	0.48	0.24
	Carbon Tetrachloride	5	520	ND	U	1.0	0.20	0.10	ND	U	1.0	0.20	0.10	0	ND	U	1.0	0.20	0.10
	Chlorobenzene	100	50	ND	U	1.0	0.42	0.21	ND	U	1.0	0.42	0.21	0	ND	U	1.0	0.42	0.21
	Chloroethane	8,600	16	ND	U	1.0	0.42	0.21	ND	U	1.0	0.42	0.21	0	ND	U	1.0	0.42	0.21
	Chloroform	70	2,400	ND	U	1.0	0.14	0.07	ND	U	1.0	0.14	0.07	0	ND	U	1.0	0.14	0.07
	Chloromethane	1.8	50,000	ND	U	1.0	0.62	0.31	ND	U	1.0	0.62	0.31	0	ND	U	1.0	0.62	0.31
	cis-1,2-Dichloroethylene	70	50,000	ND	U	1.0	0.32	0.16	ND	U	1.0	0.32	0.16	0	ND	U	1.0	0.32	0.16
	Dibromochloromethane (Chlorodibromomethane)	0.16	50,000	ND	U	1.0[b]	0.38	0.19	ND	U	1.0[b]	0.38	0.19	0	ND	U	1.0[b]	0.38	0.19
	Ethylbenzene	700	30	ND	U	1.0	0.46	0.23	ND	U	1.0	0.46	0.23	0	ND	U	1.0	0.46	0.23
	Hexachlorobutadiene	0.86	6	ND	U	1.0[b]	0.38	0.19	ND	U	1.0[b]	0.38	0.19	0	ND	U	1.0[b]	0.38	0.19
	Methyl ethyl ketone (2-Butanone)	7,100	8,400	ND	U	10.0	1.20	0.60	ND	U	10.0	1.20	0.60	0	ND	U	10.0	1.20	0.60
	Methyl isobutyl ketone (4-Methyl-2-pentanone)	2,000	1,300	ND	U	10.0	3.80	1.90	ND	U	10.0	3.80	1.90	0	ND	U	10.0	3.80	1.90
	Methyl tert-butyl Ether	12	5	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19	0	ND	U	1.0	0.38	0.19
	Methylene chloride	4.8	9,100	ND	U	5.0[b]	0.70	0.35	ND	U	5.0[b]	0.70	0.35	0	ND	U	5.0[b]	0.70	0.35
	Styrene	100	10	ND	U	1.0	0.50	0.25	ND	U	1.0	0.50	0.25	0	ND	U	1.0	0.50	0.25
	Tetrachloroethane, 1,1,1,2-	0.52	50,000	ND	U	1.0[b]	0.26	0.13	ND	U	1.0[b]	0.26	0.13	0	ND	U	1.0[b]	0.26	0.13
	Tetrachloroethane, 1,1,2,2-	0.067	500	ND	U	1.0[b]	0.20	0.10	ND	U	1.0[b]	0.20	0.10	0	ND	U	1.0[b]	0.20	0.10
	Tetrachloroethylene (Tetrachloroethene)	5	170	ND	U	1.0	0.30	0.15	ND	U	1.0	0.30	0.15	0	ND	U	1.0	0.30	0.15
	Toluene	1,000	40	ND	U	1.0	0.34	0.17	ND	U	1.0	0.34	0.17	0	ND	U	1.0	0.34	0.17
	trans-1,2-Dichloroethylene	100	260	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19	0	ND	U	1.0	0.38	0.19
	Trichloroethylene (Trichloroethene)	5	310	ND	U	1.0	0.32	0.16	ND	U	1.0	0.32	0.16	0	ND	U	1.0	0.32	0.16
	Vinyl chloride	2	3,400	ND	U	1.0	0.46	0.23	ND	U	1.0	0.46	0.23	0	ND	U	1.0	0.46	0.23
	Xylenes	10,000	20	ND	U	1.0	0.38	0.19	ND	U	1.0	0.38	0.19	0	ND	U	1.0	0.38	0.19
EPA 6020	Lead	15	5000	0.60		0.5	0.22	0.11	0.57		0.5	0.22	0.11	5.13	--	--	--	--	--

Notes:

All units are in micrograms per liter (µg/L).

[a] DOH EALs (DOH, 2009): Table D-1b. Groundwater Action Levels (Groundwater is a current or potential drinking water resource; surface water body is not located within 150 meters of release site).

[b] In the case where an EAL for a specific chemical is less than the LOQ for a commercial laboratory, it is generally acceptable to consider the LOQ in place of the action level (DOH, Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater 2008, updated March 2009).

DL - detection limit or method detection limit (MDL)
DRO - diesel range organics
dup - duplicate
GRO - gasoline range organics
J - Estimated result. Indicates that the compound was identified but the concentration was above the DL and below the LOQ.
LOD - limit of detection
LOQ - limit of quantitation or reporting limit (RL)
ND - not detected
PAHs - polynuclear aromatic hydrocarbons
Q - data qualifier
RPD - relative percent difference
TPH - total petroleum hydrocarbons
U - Indicates the compound or analyte was analyzed for but not detected. The result is reported as ND.
VOC - volatile organic compound
-- not analyzed
Bold - Result exceeds one or both DOH EALs.

Table 3-3: Historical and Current Groundwater Sample Analytical Results, August 2009 through October 2010

	OWDFMW01										HDMW2253-03									
	TPH-DRO					TPH-GRO					TPH-DRO					TPH-GRO				
	Result	Q	LOQ	LOD	DL	Result	Q	LOQ	LOD	DL	Result	Q	LOQ	LOD	DL	Result	Q	LOQ	LOD	DL
August 2009	ND	U	457	NA	171	ND	U	100	NA	30	--	--	--	--	--	--	--	--	--	--
October 2009	ND	U	444	NA	167	ND	U	100	NA	30	ND	U	494	NA	185	ND	U	100	NA	30
January 2010	**1490**		440	NA	165	ND	U	100	NA	30	**322**	J	460	NA	172	ND	U	100	NA	30
April 2010	**288**	J	471	NA	176	ND	U	100	NA	30	ND	U	471	NA	176	ND	U	100	NA	30
July 2010	--	--	--	--	--	--	--	--	--	--	ND	U	426	--	160	ND	U	100	NA	30
October 2010	ND	U	150[b]	80.8	40.4	ND	U	20.0	12.12	6.06	ND	U	150[b]	80.8	40.4	ND	U	20.0	12.12	6.06
DOH Drinking Water EALs for Human Toxicity [a] : TPH-DRO = 210 µg/L; TPH-GRO = 100 µg/L																				
DOH Groundwater Gross Contamination EALs [a] : TPH-DRO = 100 µg/L; TPH-GRO = 100 µg/L																				

Notes:

All units are in micrograms per liter (µg/L)

[a] DOH EALs (DOH, 2009): Table D-1b. Groundwater Action Levels (Groundwater is a current or potential drinking water resource; surface water body is not located within 150 meters of release site).

[b] In the case where an EAL for a specific chemical is less than the LOQ for a commercial laboratory, it is generally acceptable to consider the LOQ in place of the action level (DOH, Evaluation of Environmental Hazards at Sites with ContaminatedSoil and Groundwater 2008, updated March 2009).

-- The monitoring well was not sampled.

DL - detection limit or method detection limit (MDL)

J - Estimated result. Indicates that the compound was identified but the concentration was above the DL and below the LOQ.

LOD - limit of detection

LOQ - limit of quantitation or reporting limit (RL)

NA - not available

ND - not detected

Q - data qualifier

U - Indicates that the compound was analyzed for but not detected. The result is reported as ND.

Bold - Result exceeds one or both DOH EALs.

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Section 4 Summary, Conclusions, and Recommendations

4.1 Summary

In OWDFMW01, acetone (1.4 µg/L) and lead (0.60 µg/L and 0.57 µg/L) were detected. These concentrations were below the DOH Drinking Water EALs (22,000 µg/L for acetone and 15 µg/L for lead) and the DOH Gross Contamination EALs (20,000 µg/L for acetone and 5,000 µg/L for lead) (Table 3-2). No other COPCs were detected in OWDFMW01 during the October 2010 groundwater sampling event.

In HDMW2253-03, lead (0.56 µg/L) was detected at a concentration below the DOH Drinking Water EAL (15 µg/L) and the DOH Gross Contamination EAL (5,000 µg/L) (Table 3-2). No other COPCs were detected in HDMW2253-03 during the October 2010 groundwater sampling event.

4.2 Conclusions

Concentrations of PAHs and VOCs were previously not detected above the EALs during the August 2009, October 2009, January 2010, April 2010, and July 2010 groundwater monitoring events. These constituents were also not detected above the EALs during this groundwater monitoring event.

TPH-DRO (detected at both OWDFMW01 and HDMW2253-03 in January 2010 and only at OWDFMW01 in April 2010) has been the only parameter detected above the DOH Drinking Water EALs during the outside well groundwater sampling events (Table 3-3).

TPH-DRO detected at OWDFMW01 during January 2010 (1,490 µg/L) significantly decreased in April 2010 (288 µg/L) (Table 3-3). OWDFMW01 was not sampled in July 2010, and TPH-DRO was not detected at or above the LOD or LOQ in October 2010 (Table 3-1). TPH-DRO concentrations at this well are decreasing.

The concentration of TPH-DRO at HDMW2253-03 has decreased to non-detect for three consecutive events (Table 3-3). TPH-DRO concentrations at this well are decreasing.

The October 2010 detection of acetone at an estimated concentration below the DOH Drinking Water EAL was the first at monitoring well OWDFMW01. Acetone was also detected at an estimated concentration in the trip blank sample. This suggested that acetone was introduced to the samples during transport to and from the laboratory and is not representative of groundwater at OWDFMW01.

The October 2010 detections of lead at concentrations below the DOH Drinking Water EAL were the first at these two monitoring wells (OWDFMW01 and HDMW2253-03). The contaminant trend for lead cannot be determined at this time.

4.3 Recommendations

Based on the results of the field observations and analytical testing, continuation of the quarterly groundwater monitoring of OWDFMW01 and HDMW2253-03 is recommended to monitor the presence of COPCs in the groundwater surrounding the RHSF.

Section 5 References

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Appendix A
Field Notebook

1327 Lunch break
1343 Leave Site
1357 Drop off FISC Key
- was told that vilma can go to FISC office and get a duplicate key.

1419 Arrive at PCS and pickup 55 gallon drum for outside well sampling
1430 Arrive at Kmart and buy ice chest and blue ice.
1455 Leave Kmart
1515 Back in office.

End of Entry

October 21, 2010

Task: Contine monthly Soil Vapor monitoring and Quarterly Groundwater monitory (outside wells.)
personnel: S. Korde, S. Fineran, M. Solmssen, V. Dupa.
weather: Sunny, light to no breeze
PPE: Level D w/ gloves
Equipment: ppbRAE, Horiba u22, pump, vaccum chamber, Solinst, bailers

0725 Leave Dole office (SK3SF) go to pickup FISC Key
0747 Pickup FISC Key (6)
0808 Arrive at ADIT 5
0810 - Safety meeting
0827 Arrive at SVMP16
Ambient air = 280 ppb
0831 begin purging SV16S (purge 2min)
0834 Collect Sample
0839 begin purging at SV16M
0841 done purging, collect Sample
0846 begin purging at SV16D
0848 done purging, collect Sample
0857 Arrive at SVMP06
0901 begin purging @ SV06S
0903 stop purging, collect Sample.

0905 begin purging at SV06M
0907 Stop purging, collect Sample
0910 mobilize to SVMP03
0913 Arrive at SVMP03
begin purging at SV03S
0915 Done purging, collect Sample
0917 purge at SV03M
0919 Done, Collect~~ing~~ed Sample at SV03M
0922 purge SV03D
0924 done purging, collect Sample @ SV03D
0927 done cleanup
0944 Exit ADIT 5
0947 Check in at Halawa Correctional Facility
1002 Leave Site (SK & SF) to pick up gloves
1004 Sign out
1010 Arrive at Checkers Auto parts and buy leather gloves
1025 Sign-in
1031 Arrive at Halawa Site.
(0910 DTW = 209.39 ft from DLNR)
1055 -bail water Collect Sample = ES006
1129 leave Halawa Site
1139 Arrive at OWDFMWD1
1147 PID = 0.0 ppm
1153 DTW = 121.69 ft

1208 Collect ES007 & MS/MSD and Duplicate ES008
1310 Leave Site - VD & MS go to drop off Samples at FEDEX
1334 Drop off FISC Key (SF, SK)
1415 back in office.
~~VD & MS dropped off~~

End of Entry

Appendix B
Groundwater Sampling Logs

GROUNDWATER SAMPLING LOG

WELL ID: OWDFMW01 LOCATION: Red Hill Bulk Fuel Storage Facility PROJECT NO: 1022-015

INITIAL WATER LEVEL: 121.69 ft bTOC (below top of casing) DATE: 10/21/2010 TIME: 1153

TOTAL DEPTH OF WELL: 142.8 ft bTOC PERSONNEL INVOLVED: V.Dupra, M.Solmssen, S.Fineran, S.Koide

LENGTH OF SATURATED ZONE: 21.11 ft WEATHER CONDITIONS: Sunny, light breeze

VOLUME OF WATER TO BE REMOVED: 156 L (not applicable (N/A)) METHOD OF REMOVAL: 4" bailer

WATER LEVEL AFTER PURGING: 123.84 ft bTOC PUMPING RATE: N/A

WELL PURGE DATA:

TIME	VOLUME REMOVED	pH	COND (S/m)	TURBIDITY (NTU)	DO (mg/l)	TEMP (^{o}C)	SALINITY (%)	REDOX (ORP) (mV)
1158	3 L	9.97	0.323	19.5	8.22	25.1	0.2	-24
1201	6 L	10.66	0.335	239.0	7.56	24.2	0.2	-34
1203	9 L	10.67	0.335	103.0	7.16	24.1	0.2	-29
1204	12 L	10.66	0.336	135.0	7.89	24.0	0.2	-34

SAMPLE RETRIEVAL METHOD: 4" bailer

APPEARANCE OF SAMPLE:
COLOR Clear
TURBIDITY None
SEDIMENT None
OTHER

SAMPLE ID: ES007 (RH-OWDFMW01-GW21)
SAMPLE COLLECTION TIME: 12:08
SAMPLED BY: V. Dupra, M. Solmssen

COMMENTS AND OBSERVATIONS: PID = 0.0 ppm
Collected MS/MSD sample = ES007 MS/MSD
Collected duplicate sample = ES008 (RH-OWDFMW01-GW21 Dup)

LABORATORY ANALYSIS PARAMETERS AND PRESERVATIVES: TPH-GRO (EPA 8260B) & VOCs (EPA 8260B) with hydrochloric acid preservative, TPH-DRO (EPA8015B) & PAHs (EPA 8270C SIM) with no preservative, and dissolved lead (EPA 6020) with nitric acid preservative

NUMBER AND TYPES OF SAMPLE CONTAINERS FILLED: Primary: (4) - 40 mL VOAs, (3) - 1 L amber bottle, (1) - 500 mL polyethylene bottle,
Duplicate: (3) - 40 mL VOAs, (3) - 1 L amber bottle, (1) - 500 mL polyethylene bottle, and MS/MSD: (6) - mL VOAs, (6) - 1 L amber bottle, (2) - 500 mL polyethylene bottle

DECONTAMINATION PROCEDURES: Alconox, triple rinse with distilled water
SAMPLES DELIVERED TO: APPL, Inc. TRANSPORTERS: VD, MS
SAMPLE DELIVERY DATE: 10/21/2010 (shipped via FedEx) SAMPLE DELIVERY TIME: 13:45

CAPACITY OF CASING (GALLONS/LINEAR FOOT)
2"-0.16; 4"-0.65; 6"-1.47; 8"-2.61; 10"-4.08; 12"-5.87

GROUNDWATER SAMPLING LOG

WELL ID: HDMW2253-03 LOCATION: Red Hill Bulk Fuel Storage Facility PROJECT NO: 1022-015

INITIAL WATER LEVEL: 209.39 ft bTOC DATE: 10/21/2010 TIME: 1030

TOTAL DEPTH OF WELL: 1,575 ft bTOC PERSONNEL INVOLVED: M.Solmssen, V.Dupra, S.Fineran, S.Koide

LENGTH OF SATURATED ZONE: N/A WEATHER CONDITIONS: Sunny

VOLUME OF WATER TO BE REMOVED: N/A METHOD OF REMOVAL: 4" bailer

WATER LEVEL AFTER PURGING: N/A PUMPING RATE: N/A

WELL PURGE DATA:

TIME	VOLUME REMOVED	pH	COND (mS/m)	TURBIDITY (NTU)	DO (mg/l)	TEMP (^oC)	SALINITY (%)	REDOX (ORP) (mV)
1035	2 L	5.64	42.3	68.1	2.69	23.0	0.0	-42
1040	7 L	6.00	40.9	68.8	3.98	22.8	0.0	-79
1045	10 L	6.07	41.1	68.3	4.25	22.8	0.0	-78
1050	14 L	6.10	41.1	61.0	4.80	22.6	0.0	-83

SAMPLE RETRIEVAL METHOD: 4" bailer

APPEARANCE OF SAMPLE:

COLOR brownish/greenish

SAMPLE ID: ES006 (RH-HDMW2253-03-GW21)

TURBIDITY high

SAMPLE COLLECTION TIME: 1055

SEDIMENT

SAMPLED BY: V. Dupra, M. Solmssen, S. Fineran

OTHER

COMMENTS AND OBSERVATIONS: PID = 0.0 ppm

Note: depth to water was provided by DLNR (Jeremy)

LABORATORY ANALYSIS PARAMETERS AND PRESERVATIVES: TPH-GRO (EPA 8260B) & VOCs (EPA 8260B) with hydrochloric acid preservative, TPH-DRO (EPA8015B) & PAHs (EPA 8270C SIM) with no preservative, and dissolved lead (EPA 6020) with nitric acid preservative

NUMBER AND TYPES OF SAMPLE CONTAINERS FILLED: (4) - 40 mL VOAs, (3) - 1 L amber bottle, (1) - 500 mL polyethylene bottle

DECONTAMINATION PROCEDURES: Alconox, triple rinse with distilled water

SAMPLES DELIVERED TO: APPL, Inc. TRANSPORTERS: VD, MS

SAMPLE DELIVERY DATE: 10/21/10 (shipped via FedEx) SAMPLE DELIVERY TIME: 13:45

CAPACITY OF CASING (GALLONS/LINEAR FOOT)
2"-0.16; 4"-0.65; 6"-1.47; 8"-2.61; 10"-4.08; 12"-5.87

Appendix C
Laboratory Analytical Results (on CD-ROM)