Third Five-Year Review Report
Harbor Island Superfund Site
Seattle, Washington

September 2010

Prepared for

U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101

Approved by

Daniel D. Opalski, Director
Office of Environmental Cleanup
U.S. EPA Region 10

9/24/2010
Date

CITATION

U.S. Environmental Protection Agency. 2010.
Third Five-Year Review Report
In coordination with the
US Army Corp of Engineers and Parametrix
Harbor Island Superfund Site
Seattle, Washington.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

(Note: Chapter 6 tables are located in a separate section at the end of this report.)

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

FIGURES (ALL FIGURES ARE LOCATED IN A SEPARATE SECTION AT THE END OF THIS REPORT)

TABLE OF CONTENTS (CONTINUED)

CHAPTER 6 TABLES

(Note: Chapter 6 tables are located in a separate section at the end of this report.)

APPENDICES

ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order on Consent
ARARs	Applicable or relevant and appropriate requirements
bgs	below ground surface
BP	BP West Coast Products
CAA	Clean Air Act
CAP	Cleanup Action Plan
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemicals of concern
EBAP	Elliott Bay Action Program
Ecology	Washington Department of Ecology
ENR	Enhanced Natural Recovery
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
EW-OU10	East Waterway Sediments Operable Unit 10
EW	East Waterway
Fish Coordination Plan	Tribal Fishing Coordination Plan
FS	Feasibility Study
HWM	Hazardous Waste Management
ICs	institutional controls
ICS	Institutional Control Study
IRIS	Integrated Risk Information System
KM	Kinder Morgan Liquid Terminals
LDW	Lower Duwamish Waterway
LNAPL	light non-aqueous phase liquid
LSS-OU7	Lockheed Shipyard Sediments Operable Unit 07
LU-OU3	Lockheed Upland Operable Unit 03
mg/kg	milligrams per kilogram
MLLW	mean lower low water
µg/L	micrograms per liter
mS/cm	millisiemens/centimeter
MTCA	Model Toxics Control Act

ACRONYMS AND ABBREVIATIONS (CONTINUED)

NAAQS	National Ambient Air Quality Standards
NAPL	non-aqueous phase liquid
NCP	National Contingency Plan
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
NWQC HH	National Recommended Water Quality Criteria, Human Health
O&M	Operations and Maintenance
OMM	Operations, Maintenance, and Monitoring
OMMP	Operations, Maintenance, and Monitoring Plan
OU	operable unit
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCE	perchloroethylene
ppb	parts per billion
ppm	parts per million
PRP	Potentially Responsible Party
PSAPCA	Puget Sound Air Pollution Control Agency
RA	remedial action
RAOs	Remedial Action Objectives
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
S&G-OU1	Soil and Groundwater Operable Unit 01
SAP	Sampling Analysis Plan
Shell	Shell Oil Products
SMAs	Site Management Areas
SMS	Sediment Management Standards
SQS	sediment quality standards
SRI	supplemental remedial investigation
SVE	soil vapor extraction
SVOCs	semivolatile organic compounds

ACRONYMS AND ABBREVIATIONS (CONTINUED)

SWM	Solid Waste Management
SWPPP	Stormwater Pollution Protection Plan
TBC	To Be Considered
TBT	tributyltin
TCLP	toxicity characteristic leaching procedure
TF-OU2	Tank Farms Operable Unit 02
TPH	total petroleum hydrocarbons
TPH-G	total petroleum hydrocarbons-gasoline
TSCA	Toxic Substances Control Act
TSS-OU9	Todd Shipyards Sediments Operable Unit 09
UECA	Uniform Environmental Covenant Act
USACE	U.S. Army Corps of Engineers
USCG	United States Coast Guard
UST	underground storage tank
VOCs	volatile organic compounds
WA PCS	State of Washington Petroleum-Contaminated Soil
WPCA	Water Pollution Control Act
WRA	Water Resources Act
WWCA	Water Well Construction Act
WW-OU8	West Waterway Sediments Operable Unit 08

EXECUTIVE SUMMARY

This document presents the Five-Year Review for the Harbor Island Superfund site in Seattle, Washington. This National Priorities List (NPL) site is divided into seven Operable Units (OU):

OU No.	Description
01	Soil and Groundwater Operable Unit (S&G-OU1)
02	Tank Farms OU (TF-OU2)
03	Lockheed Upland OU (LU-OU3)
07	Lockheed Shipyard Sediments OU (LSS-OU7)
08	West Waterway Sediments OU (WW-OU8)
09	Todd Shipyards Sediments OU (TSS-OU9
10	East Waterway Sediments OU (EW-OU10)

Harbor Island is a 420-acre island located in the Duwamish River delta in Elliott Bay in the City of Seattle, Washington. The man-made island was constructed on the Duwamish River delta with the addition of bulkheads and fill placed in the early 1900s. The Harbor Island site has evolved from an industrialized upland area into a complex cleanup site involving both the upland area and the offshore sediment. Contaminated media included soils, sediments, and groundwater. Cleanup for the various OUs of the site has included contaminated soil removal and upland capping, dredging of contaminated sediment, capping contaminated material that remains in place, enhanced natural recovery, and groundwater monitoring. The cleanup goals are defined in the various Harbor Island formal decision documents (Records of Decision [ROD], Explanations of Significant Differences, and state Cleanup Action Plans [CAPs]) for each OU. The site is heavily industrialized and is expected to remain industrialized in the future. There are currently no residences on the island. The entire island and associated sediments are designated as the Superfund site. The site is not yet construction complete.

The purpose of a Five-Year Review is to determine whether the remedy at a site is protective of human health and the environment and is a required statutory review for sites having contamination remaining on-site that results in unrestricted use. Contamination remains in both the uplands soil and sediments at concentrations greater than allowable for unrestricted use. Some institutional controls (ICs) are in place, such as restrictions on drilling wells and uncontrolled discharges to surface water. Most of these restricted areas are on properties owned by or under the control of large potentially responsible parties, i.e., Port of Seattle and major oil companies. In addition, Five-Year Review Reports identify issues or deficiencies found during the review, if any, and recommendations to address them.

The upland "hot spot" removals and capping actions addressed the dermal contact pathway for human health risk, which was a major driver of human health risk for the upland portion of the site. The upland capping actions also addressed the inhalation pathway of contaminants, which was a secondary concern. The remedial actions were performed according to the ROD requirements in the decision documents with the exception of ICs, which have not yet been implemented fully. The resulting cleanups have reduced the occupational exposures to the contaminants of concern for the workers on-site. Recovery systems and future sediment cleanups will continue to reduce the risk to the environment on Harbor Island and in the marine waters of Elliott Bay and the Lower Duwamish River.

Ongoing activities include long-term groundwater monitoring, IC implementation, cap inspections and maintenance, and design and construction of air sparging and soil vapor

extraction systems in the Tank Farm OU. Additionally, a supplemental remedial investigation and feasibility study is underway at the East Waterway OU.

Brief descriptions of each OU are summarized below.

SOIL AND GROUNDWATER OPERABLE UNIT 01

The Soil and Groundwater Operable Unit 01 (S&G-OU1) consists of the upland portion of Harbor Island with the exception of the Petroleum Tank Farms and the upland area of Lockheed Yard 1. The selected remedy at S&G-OU1 included excavation of Hot Spot Soils and treatment/disposal off-site, capping of remaining soil contamination exceeding cleanup goals, ICs, removal and treatment of floating product at Todd Shipyards, and implementation of long-term groundwater monitoring.

The remedy is functioning as intended by the ROD; however, several properties are missing restrictive covenants and documentation of the cap maintenance and repairs needs to be more consistent to identify any potential exposure problems. Overall, the long-term groundwater monitoring indicates that the cap is limiting contaminant migration. Groundwater monitoring data shows concentrations of constituents above cleanup goals remain near Todd Shipyard and at inland monitoring well HI-17. Constituents detected slightly above cleanup goals are also found sporadically around the OU. A review of the long-term groundwater monitoring data and the Five-Year Review sampling data event indicate that the groundwater monitoring program may need minor modifications. In addition, a groundwater flow assessment is needed near well HI-17, located in the central part of the uplands, to ensure that contamination is contained on-site. Remedial actions are ongoing at Todd Shipyards and system modifications completed in 2009 should address the remaining contamination near the Aluminum Shop Building. A “hot spot” at Todd Shipyard identified during recent geoprobe investigations still needs to be spatially defined and potentially remediated. There have been no changes in standards, toxicity information, the physical condition of the site, or land use that would affect the protectiveness of the remedy.

The remedy at the S&G-OU1 is protective of human health and the environment in the short-term because a cap is in place to prevent exposure to contaminated soil and limit leaching of soil contaminants. However, in order for the remedy to be protective in the long-term, appropriate restrictive covenants must be recorded, cap inspections and maintenance must be completed annually, light non-aqueous phase liquid (LNAPL) removal must be continued at Todd Shipyard, and the groundwater monitoring program potentially modified. Lastly coordination is needed between the groundwater monitoring program for the S&G OU and the other groundwater monitoring programs managed by the other responsible parties.

TANK FARMS OPERABLE UNIT 02

The Tank Farms Operable Unit 02 (TF-OU2) is being managed by the Washington Department of Ecology (Ecology) under Model Toxic Control Act (MTCA) Cleanup Action Plans (CAPs). The selected remedy at TF-OU2 included excavation of lead and arsenic contaminated shallow surface soil, excavation of total petroleum hydrocarbons (TPH) Hot Spot Soils and treatment/disposal off-site, construction and operation of *in-situ* remedial systems to treat remaining contaminated soil and groundwater, utilization of natural attenuation processes, long-term monitoring, and ICs.

The remedy is currently functioning as intended by the Ecology CAPs. All of the Hot Spot areas identified in the Remedial Investigation (RI) have been removed and in situ remedial systems are in place to treat remaining contamination. Groundwater monitoring data indicate natural attenuation is occurring and is reducing the mass of hydrocarbons. There are several

groundwater contamination areas/issues at TF-OU2 that require additional evaluation in order for EPA to determine that the remedy is protective: (1) an area of elevated benzene concentrations along the shoreline at BP Plant 1 may not be hydraulically contained and there is a likelihood that contamination may be reaching the waterway; (2) a contaminant source and potential for migration outside TF-OU2 boundaries with elevated total petroleum hydrocarbons-gasoline (TPH-G) and benzene concentrations at the intersection of 13th Avenue SW and SW Lander Street requires further evaluation; and (3) a contaminant source and potential for migration of elevated TPH-G concentrations at the northern boundary of the Shell Main Terminal needs further evaluation. There have been no changes in standards, toxicity information, or the physical condition of the site or land use that would affect the protectiveness of the remedy.

A protectiveness determination for TF-OU2 is currently deferred until the following actions have been completed:

- Complete an evaluation of hydraulic containment near the shoreline at the BP West Coast Products (BP) Plant 1 remediation system to determine if the contaminant source is reaching the West Waterway. Modify the system as necessary to remove or contain contaminants in groundwater.
- Evaluate the nature and extent of contamination near the Shell and Kinder Morgan Liquid Terminals (KM) facilities to determine if it is migrating outside the TF-OU2 boundary. Remediate as necessary to meet cleanup goals.
- Evaluate the nature and extent of contamination at the northern boundary of the Shell Main Terminal. Remediate as necessary to meet cleanup goals.

LOCKHEED UPLAND OPERABLE UNIT 03

The selected remedy at Lockheed Upland Operable Unit 03 (LU-OU3) included excavation of Hot Spot Soils and treatment/disposal off-site, capping of remaining soil contamination exceeding cleanup goals, ICs, and, implementation of groundwater monitoring for 30 years.

The remedy appears to be functioning as intended by the ROD. All Hot Spot Soils have been removed and remaining areas of soil contamination have been capped. Cap inspections are completed on an annual basis; however, there are frequent problems with ponding, plant growth, and asphalt cracks. The Port of Seattle is planning to redevelop Terminal 10 and development will include stormwater controls and regrading, which will be imperative to maintaining cap integrity. Long-term groundwater monitoring has been implemented at the site; however, revisions to the program are necessary to ensure that the remedy remains protective. Revisions should be made after an evaluation that includes groundwater flow and tidal influence, appropriate well screen intervals, and effects of Port of Seattle redevelopment. In addition, groundwater monitoring data from the Five-Year Review sampling event indicated that perchloroethylene (PCE) levels are elevated above cleanup standards and that the analyte list should be re-evaluated. There have been no changes in standards, toxicity information, physical condition of the site, or land use that would affect the protectiveness of the remedy.

The remedy at the LU-OU3 is protective of human health and the environment in the short-term because a cap is in place to prevent exposure to contaminated soil and limit leaching of soil contaminants. However, in order for the remedy to be protective in the long-term permanent cap repairs must be completed, appropriate restrictive covenants must be recorded, the potential for PCE to impact the waterway must be evaluated, and the long-term monitoring program must be modified.

LOCKHEED SHIPYARD SEDIMENTS OPERABLE UNIT 07

The selected remedy at the Lockheed Shipyard Sediments Operable Unit 07 (LSS-OU7) included demolition of the existing pier and removal of approximately 6,000 creosote piles, dredging in the open channel area and capping in the nearshore area, and creation of a riparian buffer and a habitat friendly substrate on top of the capped sediments. Based on results from annual sediment monitoring events, the remedy appears to be functioning as intended by the ROD and Explanation of Significant Differences (ESDs). Institutional controls were not identified in the ROD or ESDs and consequently do not exist. An Institutional Control Study is being conducted by the Potentially Responsible Party (PRP) with U.S. Environmental Protection Agency (EPA) oversight and ICs are expected to be fully implemented by September 2012.

There have been no changes in standards, toxicity information, physical condition of the site, or land use that would affect the protectiveness of the remedy. After completion of the ROD for the adjacent LDW Superfund site, and evaluation of long-term monitoring results for this remedy, EPA intends to evaluate PCB and/or mercury data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.4.2).

The remedy at the LSS-OU7 is protective of human health and the environment in the short term because a sediment cap is in place to prevent exposure to contaminated sediments left in place, and other contaminated sediments were dredged to below cleanup numbers. However, in order for the remedy to be protective in the long term, appropriate restrictive covenants must be recorded.

WEST WATERWAY SEDIMENTS OPERABLE UNIT 08

The West Waterway Sediments Operable Unit 08 (WW-OU8) consists of approximately 70 acres of estuarine sediments located in the West Waterway on the western side of Harbor Island. The no action ROD for the WW-OU8 (September 11, 2003) presented the basis for the determination that no Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) action was necessary at this OU to protect human health or the environment and that site conditions allow for unlimited use and unrestricted exposure. The no action ROD did not include institutional controls and did not require long-term monitoring. Since no remedial action was selected, there is no information on remedy implementation or operation, and maintenance activities.

Since EPA made the decision for no action, the statutory requirements of CERCLA Section 121 for remedial actions are not applicable and no statutory or policy five-year reviews are required to be undertaken. The Region is at this time, however, conducting a discretionary review consistent with language in the No Action ROD for the West Waterway Sediments OU. EPA will review the West Waterway Sediments OU in light of Lower Duwamish Waterway Superfund Site data and decisions and new scientific information or methodologies, after the completion of the ROD for the Lower Duwamish Waterway Superfund Site. Further details are provided in Section 7.5.1 of this five-year review.

TODD SHIPYARDS SEDIMENTS OPERABLE UNIT 09

The selected remedy at the Todd Shipyards Sediments Operable Unit 09 (TSS-OU9) included dredging in the open channel area, demolition of certain piers, capping contaminated sediments under the existing piers, and creation of a habitat bench on the surface of a capped nearshore area. Based on results from annual monitoring events, the remedy appears to be

functioning as intended by the ROD and ESDs. Institutional controls were not identified in the ROD or ESDs, and consequently do not exist for this OU. An Institutional Control Study is being conducted by the PRP with oversight from EPA, and ICs are expected to be fully implemented by September 2012. There have been no changes in standards, toxicity information, physical condition of the site, or land use that would affect the protectiveness of the remedy. After completion of the ROD for the adjacent LDW Superfund site, if monitoring data from this OU shows the presence of PCBs or mercury, EPA intends to evaluate the sediment data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.6.2).

The remedy at the TSS-OU9 is protective of human health and the environment in the short term because a cap is in place to prevent exposure to contaminated sediments left in place, and other contaminated sediments were dredged to below cleanup numbers. However, in order for the remedy to be protective in the long term, appropriate restrictive covenants must be recorded.

EAST WATERWAY SEDIMENTS OPERABLE UNIT 10

The East Waterway Sediments Operable Unit 10 (EW-OU10) consists of the East Waterway (EW) adjacent to the east side of Harbor Island and its associated contamination. The southern 1,500-foot section of the EW varies in width from 225 feet to approximately 130 feet near the West Seattle Bridge. The depth of the EW ranges from 29 to 60 feet mean lower low water (MLLW). In 2005 the Port of Seattle dredged 260,000 cubic yards of contaminated sediments from the East Waterway and placed a nominal 9 inch sand layer to prevent adverse exposures to the benthic environment from exposed post dredge chemical concentrations. Recontamination monitoring has confirmed that chemical concentrations greater than state sediment management standards have deposited on the sand layer. A Supplemental RI/FS is currently underway and data from the recontamination effort will be incorporated into the overall cleanup decision.

No ROD has been written for this OU and therefore there was no remedy for review and a protectiveness determination cannot be made as part of this review.

ENVIRONMENTAL INDICATORS/SITE STATUS INDICATORS

In addition to the Five-Year Review protectiveness determinations, EPA has also developed other environmental and site status indicators to measure and report progress and conditions of Superfund sites. These include two Site-wide Environmental Indicators (Human Health Exposure Under Control and Groundwater Migration Under Control) and the Cross-Program Revitalization Measures, which are evaluated by Project Area and Site-wide. Based on the findings of this Five-Year Review, EPA has made updated determinations for those indicators as follows:

- **Human Exposure Environmental Indicator:** The status of the Superfund Human Exposure Environmental Indicator for the Site remains "Not Under Control." While considerable remedial action over the years occurred in the other OUs, no cleanup decision has been made for the EW. More information is needed to ascertain risk to fish consuming populations in the East Waterway and fish consumption advisories issued by the local health department, which limit human exposure remain in effect. These advisories are not enforceable, and there is anecdotal evidence that some people do not follow the consumption advice provided in the advisories.

- **Groundwater Migration Environmental Indicator:** The status of the Groundwater Migration Environmental Indicator for the Site remains "Not Under Control" because contaminated groundwater may be discharging into surface water in some areas. More evaluation on hydraulic control is needed.
- **Cross-Program Revitalization Measure:** The Site has not yet been determined to be "protective for people under current conditions" because of the need to make a site wide remedial action decision for East Waterway and to put additional site wide institutional controls in place as described in this report.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Harbor Island

EPA ID *(from WasteLAN)*: WAD980722839

Region: 10	**State: WA**	**City/County: Seattle/King**

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify)

Remediation status (choose all that apply): ☒ RI/FS ☒ Operating ☐ Complete

Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:** N/A

Has site been put into reuse? ☒ YES ☐ NO Port of Seattle container terminal @ T-18.

REVIEW STATUS

Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Ravi Sanga

Author title: Remedial Project Manager	**Author affiliation: USEPA Region 10**

Review period: May 2009 to September 2010

Date(s) of site inspection:

Type of review:
☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☐ 1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify) _____

Triggering action:
☐ Actual RA On-site Construction at OU ☐ Actual RA Start at OU#____
☐ Construction Completion ☒ Previous Five-Year Review Report
☐ Other (specify)

Triggering action date *(from WasteLAN)*: September 29, 2005

Due date *(five years after triggering action date)*: September 29, 2010

Notes: * "OU" refers to operable unit.

Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.

Five-Year Review Summary Form, cont'd.

Soils and Groundwater Operable Unit 01 (S&G-OU1)

Issues:

1. Cap inspection and maintenance reporting is inconsistent and PRPs have not been identified for all capped areas of the site.
2. Appropriate Restrictive covenants are not in place for all required properties.
3. Hot Spot containing heavy petroleum exists on eastern portion of Todd property.
4. Cyanide is detected sporadically across the site. Currently analyzing for total and available cyanide, both of which have reporting limits above the cleanup goal for cyanide.
5. Groundwater flow in the vicinity of HI-17 has not been confirmed.
6. Long-term groundwater monitoring network may require modification.
7. Five-Year Review sampling event identified several constituents that should be included in the groundwater monitoring analyte list.
8. A potential relationship between constituent concentrations and tidal cycle may exist.
9. ROD groundwater cleanup levels may not be protective of marine sediments.
10. Groundwater monitoring and groundwater flow analysis is not coordinated with other HI-upland OUs.

Recommendations and Follow-up Actions

1. Submit reports for all cap areas on a consistent basis.
2. Record restrictive covenants on required properties and negotiate UECA covenants.
3. Investigate the Hot Spot and evaluate remedial alternatives.
4. Determine the appropriate analytic method and reporting limits for cyanide to determine if waterway is being impacted.
5. Assess the groundwater flow near HI-17, which may include a tidal study.
6. Modify the long-term groundwater monitoring network.
7. Include analyses for PCE at HI-7, bis(2-ethylhexyl)phthalate at HI 5.
8. Consider the tidal cycle in future sampling events.
9. Verify that ROD groundwater cleanup levels are protective of marine sediments.
10. Work with all upland responsible parties to coordinate groundwater monitoring programs between all upland OUs.

Protectiveness Statement(s):

The remedy at the S&G-OU1 is protective of human health and the environment in the short term because a cap is in place to prevent exposure to contaminated soil and limit leaching of soil contaminants. However, in order for the remedy to be protective in the long-term, appropriate restrictive covenants must be recorded, cap inspections and maintenance must be completed annually, LNAPL removal must be continued at Todd Shipyard, and the groundwater monitoring program must be modified and coordinated with groundwater monitoring programs for the other upland OUs.

Five-Year Review Summary Form, cont'd.

Tank Farms Operable Unit 02 (TF-OU2)

Issues:

1. It is uncertain if hydraulic capture at BP Plant 1 remedial system is maintained.
2. Elevated contaminant levels remain near the Shell and KM facilities and it is uncertain if contamination is migrating outside the TF-OU2 boundary.
3. The source of elevated contaminant levels at the northern boundary of the Shell Main Terminal is uncertain.

Recommendations and Follow-up Actions

1. Evaluate hydraulic containment and perform investigations or modify the remediation system as necessary.
2. Evaluate the extent and potential migration pathway outside of the TF-OU2 boundary.
3. Evaluate the extent and nature of the remaining contamination.

Protectiveness Statement(s):

A protectiveness determination for the TF-OU2 is currently deferred until the following actions have been completed:

- Complete an evaluation of hydraulic containment near the shoreline at the BP Plant 1 remediation system to determine if contamination is reaching the West Waterway. Modify the system as necessary.
- Evaluate the nature and extent of contamination near the Shell and KM facilities to determine if it is migrating outside the TF-OU2 boundary. Remediate as necessary.
- Evaluate the nature and extent of contamination at the northern boundary of the Shell Main Terminal. Remediate as necessary.

It is expected that these actions will be completed prior to the next Five-Year Review.

Five-Year Review Summary Form, cont'd.

Lockheed Upland Operable Unit 03 (LU-OU3)

Issues:

1. The cap frequently has ponded water, plant growth, and asphalt cracks.
2. Appropriate restrictive covenants are not in place for all required properties.
3. Groundwater monitoring program needs modification.
4. Five-Year Review sampling event identified several constituents that may need to be included in the groundwater monitoring analyte list.
5. PCE detected above cleanup goals near the waterway.
6. ROD groundwater cleanup levels may not be protective of marine sediments.

Recommendations and Follow-up Actions

1. Permanently repair cap problems and construct stormwater controls consistent with plans for POS redevelopment.
2. Negotiate UECA covenants.
3. Assess groundwater flow direction, tidal influence, and appropriate screen intervals and modify groundwater monitoring network as necessary.
4. Include analyses for PCE and bis(2-ethylhexl)phthalate.
5. Assess groundwater flow and potential for PCE to impact the waterway.
6. Verify that ROD groundwater cleanup levels are protective of marine sediments.

Protectiveness Statement(s):

The remedy at the LU-OU3 is protective of human health and the environment in the short-term because a cap is in place to prevent exposure to contaminated soil and limit leaching of soil contaminants. However, in order for the remedy to be protective in the long term permanent cap repairs must be completed, appropriate restrictive covenants must be recorded, the potential for PCE to impact the waterway must be evaluated, and the long term monitoring program must be modified.

Five-Year Review Summary Form, cont'd.

Lockheed Shipyard Sediment Operable Unit 07 (LSS-OU7)

Issues:

1. Institutional Controls Study needs to be completed and ICs need to be implemented.
2. ICs necessary for protectiveness of the remedy are not included in a decision document.
3. Shoreline wells need evaluation for appropriate screen intervals.
4. Long Term Sediment Monitoring Data requires further evaluation.

Recommendations and Follow-up Actions

1. Conduct IC Study to evaluate the need for ICs. Implement ICs.
2. Include ICs in a decision document.
3. Conduct a geoprobe well screen assessment for the shoreline wells.
4. EPA intends to evaluate the sediment data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.4.2).

Protectiveness Statement(s):

For the LSS-OU7, all remedial actions have been completed, and the remedy is currently protective of human health and the environment. However, in order for the remedy to remain protective in the long-term, institutional controls for the sediment cap must be implemented to ensure long-term protectiveness of the remedy. After completion of the ROD for the adjacent LDW Superfund site, and evaluation of long-term monitoring results for this remedy, EPA intends to evaluate this PCB and/or mercury data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.4.2).

West Waterway Sediments Operable Unit 08 (WW-OU8)

Issues:

There are no issues for the West Waterway Sediments Operable Unit. The No Action ROD for the WW-OU8 presented the basis for the determination that no CERCLA action was necessary to protect human health or the environment.

Recommendations and Follow-up Actions:

There are no associated recommendations or follow-up actions for the West Waterway Sediments Operable Unit. The No Action ROD for the WW-OU8 presented the basis for the determination that no CERCLA action was necessary to protect human health or the environment.

Protectiveness Statement(s):

The No Action ROD for the WW-OU8 (September 11, 2003) presented the basis for the determination that no CERCLA action was necessary at this OU to protect human health or the environment and that site conditions allow for unlimited use and unrestricted exposure. The No Action ROD did not include any requirements for institutional controls and did not require long-term monitoring of sediments in the WW-OU8. Since EPA made the decision for No Action, the statutory requirements of CERCLA Section 121 for remedial actions are not applicable and no statutory or policy five-year reviews are required to be undertaken.

Five-Year Review Summary Form, cont'd.

Todd Shipyards Sediment Operable Unit 09 (TSS-OU9)

Issues:

1. Institutional Controls Study needs to be completed and ICs need to be implemented.
2. ICs necessary for protectiveness of the remedy are not included in a decision document.
3. Long Term Monitoring data needs further evaluation

Recommendations and Follow-up Actions:

1. Conduct IC Study to evaluate the need for and implement ICs.
2. Include ICs in a decision document.
3. EPA intends to evaluate the sediment data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.6.2).

Protectiveness Statement(s):

For the TSS-OU9, all remedial actions have been completed and the remedy is currently protective of human health and the environment. However, in order for the remedy to remain protective in the long-term, institutional controls for the sediment cap must be implemented to ensure long-term protectiveness of the remedy. Also, after completion of the ROD for the adjacent LDW Superfund site, if monitoring data from this OU shows the presence of PCBs and/or mercury, EPA intends to evaluate the sediment data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.6.2).

East Waterway Sediments Operable Unit 10 (EW-OU10)

Issues:

There are no issues because no remedial action has been implemented.

Recommendations and Follow-up Actions:

There are no associated recommendations or follow-up actions because no remedial action has been implemented.

Protectiveness Statement(s):

Since no remedial action has occurred in the EW-OU10, a protective determination cannot be made during this five-year review.

1. INTRODUCTION

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP. CERCLA §121) states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with Section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP at 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii), which states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The U.S. Environmental Protection Agency (EPA), Region 10, and the Washington Department of Ecology (Ecology) conducted the Five-Year Review of the remedy implemented at the Harbor Island Superfund Site in Seattle, Washington. This review was conducted by the Remedial Project Managers (RPMs) for the entire site from September 2009 through September 2010. This report documents the results of the review.

This is the third site-wide five-year review for the Harbor Island site. The triggering action for this statutory review is the second Five-Year Review Report dated September 29, 2005. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

Other related Harbor Island documents may be found on the Web at: <www.epa.gov/r10earth>; click on A-Z Subject Index; Click on “H” for Harbor Island Superfund Site.

2. SITE CHRONOLOGY

2.1 OPERABLE UNIT IDENTIFICATION

The Harbor Island Site began as an investigation of a secondary lead smelter located on the island. The distribution of lead and other metals occurred over the entire island and, therefore, the investigation became island-wide. After the investigation began, it was realized that creating separate operable units (OUs) would be advantageous for managing the cleanup processes (see Figures 2-1 and 2-2 located at the end of this document). Investigations began site wide for soil and groundwater contamination. The Lockheed Upland OU was soon established to facilitate a cleanup of a particular land parcel on a separate time and management schedule. The investigation of contaminated sediments both nearshore and in Elliott Bay were separated and added as new OUs. Part of the island investigation included petroleum tank farms, and management of these parcels was given to Ecology as the Tank Farms OU. The OU number is a database number used to identify each of the OUs and is for reference only as the official OU name does not include a number. The following is a list of the operable units in current use:

OU No.	Description
01	Soil and Groundwater Operable Unit (S&G-OU1)
02	Tank Farms OU (TF-OU2)
03	Lockheed Upland OU (LU-OU3)
04, 05, 06	No longer considered as operable units
07	Lockheed Shipyard Sediments OU (LSS-OU7)
08	West Waterway Sediments OU (WW-OU8)
09	Todd Shipyards Sediments OU (TSS-OU9)
10	East Waterway Sediments OU (EW-OU10)

Post Remedial Activities are occurring at different operable units concurrently. In addition, there are several Potentially Responsible Parties (PRPs) that have interests in particular land parcels on the island and are involved in more than one OU.

2.2 CHRONOLOGY

The following is a listing of significant events that occurred at the Site. The chronology for each OU is listed separately since each has its own specific dates (Tables 2-1 through 2-8).

Table 2-1. Chronology of Site Events – Harbor Island (Initial Site-Wide Actions)

Event	Date
Initial discovery of site under CERCLA	01/01/80
Preliminary Assessment, Site Investigation	03/01/80
NPL Listing, Site-wide	09/08/83

NPL = National Priorities List

Table 2-2. Chronology of Site Events – S&G-OU1

Event	Date
Remedial Investigation/Feasibility Study (RI/FS) start for Island Wide Soil and Groundwater OU (S&G-OU1)	09/07/88
Record of Decision (ROD) for S&G-OU1	09/30/93
Consent Decree with rest of PRPs, for RD/RA, S&G-OU1	08/06/96
Explanation of Significant Differences No. 1	7/26/94
Amended ROD Issued	01/25/96
Explanation of Significant Differences No. 2	09/26/01
"Hot Spot" removals addressed	1996-2002
T-18 Expansion and Capping Completed	04/02

RD = remedial design

RA = remedial action

Table 2-3. Chronology of Site Events – TF-OU2 (Ecology Lead)

Event	Date
RI/FS start for Tank Farms	1994
Completion of RI/FS	1997
Restrictive Covenant Equilon	10/98
CAP[a] issued for Equilon	11/98
Consent Decree, Equilon	04/99
CAP[a] issued for GATX	12/99
CAP[a] issued for ARCO	01/00
Engineering Design Report, Equilon	03/00
Consent Decree, GATX	04/00
Consent Decree, ARCO	04/00
Restrictive Covenant, ARCO	05/00
Restrictive Covenant, GATX	06/00
Engineering Design Report, ARCO	08/00
Soils Excavation Completion Report, ARCO	03/01
Engineering Design Report, Kinder Morgan (GATX)	06/01
Soils Excavation Completion Report - Shoreline Manifold and Main Terminal Areas, Equilon	02/02
Soils Excavation and Groundwater Remedy Construction Completion Report, Kinder Morgan (former GATX)	11/02
Groundwater Remedy Construction Completion Report, BP(ARCO)	09/03
Soils Excavation Completion Report – Main Tank Farm, Shell (Equilon)	11/04

Notes:

GATX facility is now owned and operated by Kinder Morgan Energy Partners.

ARCO facility is now owned and operated by BP West Coast Products.

Equilon facility is now owned and operated by Shell Oil Products U.S.

a Cleanup Action Plan (CAP) is the Ecology equivalent to an EPA ROD.

Table 2-4. Chronology of Site Events – LU-OU3

Event	Date
Administrative Order, RI/FS, with Lockheed, LU-OU3	09/14/90
RI/FS Completion	6/28/94
ROD	6/28/94
Remedial Design/Remedial Action (RD/RA) start at Lockheed Property, LU-OU3	09/30/94
Consent Decree for Cleanup of Lockheed Upland Property, LU-OU3	02/27/95
Completion of Construction for Lockheed Upland Property, LU-OU3	12/27/95
Partial Delisting for Lockheed Upland Property, LU-OU3	11/07/96

Table 2-5. Chronology of Site Events – LSS-OU7

Event	Date
Washington Department of Ecology performed preliminary investigation of the island to determine nature and extent of contamination.	1985
EPA completed an initial Remedial Investigation (RI) of marine sediments around Harbor Island.	1994
Potentially responsible parties completed Supplemental Remedial Investigation to further characterize the extent of contamination in the Harbor Island sediments.	1995
EPA issued a Record of Decision (ROD) selecting the remedy for the Shipyard Sediments Operable Unit (OU) and subdivided the Shipyard Sediments Operable Unit into two separate OUs, Todd Shipyards Sediments Operable Unit 09 and Lockheed Shipyard Sediments Operable Unit 07.	1996
EPA issued an Administrative Order on Consent for Remedial Design (RD)	7/16/1997
EPA issued an Explanation of Significant Differences.	2/22/2002
EPA issued an Explanation of Significant Differences.	3/31/2003
Consent Decree finalizing settlement for responsible party performance of remedy entered by Federal Court.	7/23/2003
EPA approved Potentially Responsible Party (PRP) Remedial Design for demolition.	7/2/2003
Start of Phase 1 remedial action – pier demolition.	7/7/2003
EPA approved PRP Remedial Design for dredging and capping.	10/25/2003
Completion of Phase 1 construction season.	3/10/2004
EPA approved PRP Remedial Design for Phase 2 construction season.	10/18/2004
Start of Phase 2 remedial action – dredging and capping of contaminated sediments.	10/22/04
Completion of Phase 2 remedial action – dredging and capping of contaminated sediments.	2/4/2005

[a] Date under EPA review.

Table 2-6. Chronology of Site Events – WW-OU8

Event	Date
Preliminary Investigation	1984
Completed Storm Drain Cleanup	1989
Initial Remedial Investigation (RI) Sediment Sampling	1990
Completed Sediment RI	1993
Completed Sediment Feasibility Study (FS)	1994
Conducted Supplementary RI Sediment Sampling	1995
Initiate Tributyltin Studies	1996
Human Health Risk Assessment for Sediments in West Waterway OU	1998
Completed Tributyltin Studies	1998
Proposed Plan for West Waterway Sediments OU8	1998
Updated Risk Assessment Information for West Waterway Sediments OU8	2002
No Action ROD for West Waterway Sediments OU8	9/11/03

Table 2-7. Chronology of Site Events – TSS-OU9

Event	Date
EPA completed an initial Remedial Investigation of marine sediments around Harbor Island.	1994
PRPs completed Supplemental Remedial Investigation to further characterize the extent of contamination in the Harbor Island sediments.	1995
EPA issued a Record of Decision selecting the remedy for the Shipyard Sediments Operable Unit and subdivided the Shipyard Sediments Operable Unit into two separate OUs, TSS-OU9 and LSS-OU7.	1996
EPA issued an Explanation of Significant Differences.	12/27/1999
EPA issued Administrative Order on Consent (AOC) for Remedial Design.	4/25/2000
EPA issued an Explanation of Significant Differences.	4/7/2003
Consent Decree finalizing settlement for responsible party performance of remedy entered by Federal Court.	7/21/2003
EPA approved PRP Remedial Design.	5/25/2004
Start of on-site construction for building/structures demolition (First phase of Todd Shipyards Sediments Operating Unit [TSS-OU9] Remedial Action).	7/6/04
Start of contaminated sediment dredging and capping for 2004/5 season.	8/15/04

Table 2-8. Chronology of Site Events – EW-OU10

Event	Date
Initial RI Sediment Sampling	1990
Completed Sediment RI	1993
Completed Sediment FS	1994
Conducted Supplementary RI 1 Sediment Sampling	1995
Conducted Supplementary RI 2 Sediment Sampling	1996
Human Health Risk Assessment for Sediments in West Waterway Sediments OU 08 (this included seafood tissue samples from East Waterway)	1998
Completed Dredge Characterization Study, Terminals 18, 25, 30	1998
Completed Stage 1 Maintenance Dredging	2000
Completed Post Dredge Monitoring of Stage 1 Area	2000
Conducted Supplementary RI Stage 3 Sediment Sampling	2001
Identified 12 Areas for Early Removal Action	2002
Started Phase 1 Removal Action of Contaminated Sediments	2004
Completed Phase 1 Removal Action of Contaminated Sediments	2005
Settlement Agreement for Final Supplemental Remedial Investigation and Feasibility Study Signed	2006
Sediment and Tissue Sampling for SR/FS completed	2009

3. BACKGROUND

3.1 PHYSICAL CHARACTERISTICS

Harbor Island is among the largest man-made islands in the United States and is located approximately one mile southwest of downtown Seattle in King County, Washington. The island lies at the mouth of the Duwamish River on the southern edge of Elliott Bay, in Puget Sound. The 420-acre island was created during the dredging of the lower Duwamish River between 1903 and 1905. The dredge spoils were deposited across the island. Subsequent bulkhead construction and filling has brought the island into its current configuration (Figures 2-1 and 2-2). The former Duwamish River channel and surrounding floodplains were filled and graded to form the present-day topography. Dredging in 1903 to 1905 created the East and West Waterways, and dredged material from the river was used to create Harbor Island. The present urban and developed shoreline is primarily composed of piers, riprap bank lines, and constructed bulkheads for industrial and commercial use.

The island upland is divided into three operable units; Soil and Groundwater OU 01 (S&G-OU1), Tank Farms OU 02 (TF-OU2), and Lockheed Upland OU 03 (LU-OU3). The island is currently over 90 percent covered with impervious surfaces. The island is within the Seattle City Limits. The closest residential properties to Harbor Island are off the island approximately one-half mile away.

The waterway sediment operable units include the Lockheed and Todd Shipyard sediments and the East and West Waterways. The Lockheed Shipyard Sediment OU 07 (LSS-OU7) consists of contaminated nearshore sediments within and adjacent to the former Lockheed Shipyard on Harbor Island out to the edge of the steep slope of the West Waterway, which occurs at approximately the minus 36 (-36) foot mean lower low water (MLLW) contour (Figure 2-2). The Todd Shipyards Sediments Operable Unit 09 (TSS-OU9) consists of contaminated nearshore sediments within and adjacent to the Todd Shipyards on Harbor Island (Figure 2-2). Todd Shipyards is located at the northwest corner of Harbor Island and faces Elliott Bay to the north and the West Waterway of the Duwamish River to the west.

The West Waterway Sediments OU 08 (WW-OU8) includes approximately 70 acres of estuarine sediments located in the West Waterway on the western side of Harbor Island (Figure 2-2). The West Waterway is a dredged navigable channel used extensively for industrial and Port purposes. The waterway consists primarily of subtidal sediments, which remain underwater even at low tides. The shoreline of the West Waterway is predominantly pilings, bulkhead, and riprap. Areas of intertidal sediments along the shorelines adjacent to the WW-OU8 are generally nonexistent. No shoreline public access areas exist in the WW-OU8.

The East Waterway Sediments Operable Unit (EW-OU10) consists of the East Waterway (EW) adjacent to the east side of Harbor Island and its associated contamination. The bed of the EW is owned by the State of Washington and managed by the Department of Natural Resources. The EW is channelized, has a south-to-north orientation, and is approximately 5,800 feet long and 800 feet wide. The southern 1,500-foot section of the EW varies in width from 225 feet to approximately 130 feet near the West Seattle Bridge. The depth of the EW ranges from 29 to 51 feet MLLW. Depths diminish to 7.2 feet MLLW at the southern end, in the vicinity of the West Seattle Bridge.

3.2 LAND AND RESOURCE USE

The island was primarily used for commercial and industrial activities including ocean and rail transport operations, bulk fuel storage and transfer, secondary lead smelting, lead fabrication, shipbuilding, and metal plating. Warehouses, laboratories, and offices also existed historically on the island. The land use on the island is changing from a variety of smaller businesses to large operations: Port of Seattle shipping container handling and storage, bulk fuel storage, and shipbuilding and repair. Marine activities occur around the entire island, and dredging has allowed deep draft (40-foot) vessels to berth along piers on the eastern side of the site. The groundwater has never been used as a domestic water source.

Todd Shipyard, the last remaining shipyard, initiated shipbuilding activities on the island in 1916. Todd Shipyards is currently a ship repair, construction, and conversion facility that services approximately 275 vessels a year including: Navy vessels, Coast Guard vessels, passenger ferries, barges, fishing vessels, cruise ships, tank vessels, and tug boats. The shipyard operates three dry docks at Piers 4, 5, and 6 for vessel repair and maintenance. A west sloping building berth is located on the West Waterway of the Duwamish River at Piers 1A and 1 for construction and launching of new vessels. Moorage berths are located along Piers 1, 2, 3, 4, 5, and 6. The existing facilities at Todd Shipyards include bulkheads, riprap protection of buttress fill slopes, pile-supported piers, floating dry docks, a pile-supported building berth, a pile-supported side launching way, and miscellaneous access ramps.

The TF-OU2 area has been utilized for petroleum bulk storage and transfer operations since the 1940s. There are three adjacent tank-farm facilities, separately owned and operated currently by BP West Coast Products (BP), Kinder Morgan Liquid Terminals (KM), and Shell Oil Products (Shell). The tank farms are a terminus of a major northwest fuel pipeline and include 70 large, vertical aboveground tanks and numerous smaller ones that store a variety of petroleum products. Total storage capacity is nearly 100 million gallons. The tank areas are unpaved and enclosed within concrete dykes. Other infrastructure within the facilities include: extensive distribution pipelines (above and belowground), pumping and manifold stations, fuel-transfer terminals for ships, railroad cars, and tanker trucks; and buildings used for storage, offices, and other purposes.

The Harbor Island waterways are located within the boundaries of the federally-adjudicated Usual and Accustomed Fishing Area for the Muckleshoot and Suquamish Indian Tribes.

3.3 HISTORY OF CONTAMINATION

The Site has been investigated on numerous occasions beginning in 1980. Based on these studies, Harbor Island was listed on the NPL on September 8, 1983, due to elevated concentrations of lead in soil associated with the former lead smelter operations, as well as elevated concentrations of other inorganic and organic substances. The soil on Harbor Island had lead, arsenic, and total petroleum hydrocarbons (TPH) concentrations well above acceptable human health risk levels, which were identified and quantified in the remedial investigation and feasibility studies that have been completed. In addition, spills and leaks of product at the petroleum tank farms have created several areas of localized soil contamination in both TF-OU2 and in S&G-OU1. Active product extraction is occurring both in TF-OU2 and as part of the Todd Shipyards in the S&G-OU1.

General sources of potential contamination to the sediments surrounding Harbor Island were identified as direct discharge of waste, spills, historical disposal practices, atmospheric deposition, groundwater seepage, storm drains, combined sewer overflow systems, and other

nonpoint discharges. Sediment contamination of the estuarine environment surrounding Harbor Island may also have resulted from upstream sources.

Shipbuilding and ship maintenance activities at Lockheed Shipyard and Todd Shipyards resulted in the direct disposal of waste into sediments of the West Waterway and Elliott Bay adjacent to the shipyards. Much of the waste is believed to have originated from sandblasting, which is a process used to remove paint and paint preparations containing copper, lead, mercury, and zinc. Hazardous substances released from both shipyards include: arsenic, copper, lead, mercury, tributyltin (TBT) and zinc, which were additives to marine paints used on ships. Other hazardous substances potentially associated with shipyard activities include polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs). Other sources of contamination at the Lockheed and Todd Shipyards that may have contaminated sediments include: public and private storm drains, non-point surface runoff from contaminated soil, direct waste disposal, floating petroleum product on groundwater and contaminated groundwater. Contaminants in sediments include PCBs, PAHs, TBT, arsenic, copper, lead, mercury, and zinc.

To summarize, the major contaminants found at Harbor Island that have been released to the different media in the environment include:

Soil	Sediments	Groundwater
• Lead • Arsenic • PCBs • Total Petroleum Hydrocarbon (TPH) • Trichloroethylene	• PCBs • PAHs • Arsenic • Copper • Lead • Mercury • TBT • Zinc	• PAH • PCBs • Copper • Trichloroethylene • Tetrachloroethylene • TPH (TPHG, TPHD, TPHO, BTEX, CPAHs) • Arsenic • Lead

3.4 INITIAL RESPONSE

An initial EPA inspection in 1982 of the lead smelter facility formerly located on Harbor Island identified lead-contaminated soil, which resulted in the listing of the entire island on the NPL in 1983, including the sediments in the adjacent waterways. The remedial investigation (RI) goal was to examine the nature and extent of the soil and groundwater contamination and the sediments lying just off-shore. In 1988, the Remedial Investigation began for the upland soil and groundwater part of the site (S&G-OU1). By 1993, the completed Feasibility Study (FS) had identified the type and extent of the soil and groundwater contamination and proposed removal and containment actions.

Significant remedial actions began within TF-OU2 during the early 1990s. Interim remedial systems were installed by facility owners at the time in the two shoreline areas to control release of petroleum to surface water. In 1991, a Memorandum of Agreement between Ecology and EPA established Ecology as the lead agency to oversee and complete cleanup of the TF-OU2. The island-wide RI conducted by the EPA in 1992 included the TF-OU2. Subsequent RIs were conducted under oversight by Ecology for each of the three tank-farm facilities. The RI work identified widespread areas of shallow soil that exceeded screening levels for arsenic and lead. Many localized TPH "hot spots" of various extents exceeding TPH screening levels for soil were identified in subsurface soil throughout TF-OU2. There

were areas of some free product/sheen on groundwater, and broader areas where dissolved petroleum constituents (TPH, BTEX) exceeded screening levels. There were also minor detections of cPAHs and lead in the groundwater. A FS was subsequently done for each tank-farm facility to determine appropriate cleanup actions.

The first investigation of marine sediments around Harbor Island was completed by EPA in 1988 as part of the Elliott Bay Action Program (EBAP). The nature and extent of contamination in Harbor Island sediments was characterized in an RI Report issued by EPA in September 1994. A Supplemental RI, conducted by a group of PRPs in 1996, further characterized the chemical contamination in Harbor Island sediments and reported results of biological effects tests conducted on sediments in the West Waterway of Harbor Island, which included a few locations in the Todd Shipyard, and became the TSS-OU9.

The shipyard operable units were established because the sediments were identified as distinct from other contaminated sediments at Harbor Island. They are predominately contaminated with hazardous substances and shipyard wastes (primarily sandblast grit) released by shipbuilding and maintenance operations from Todd and Lockheed.

The initial RI/FS for sediments associated with this Harbor Island OU was performed as fund-lead, with subsequent investigations performed by Respondents pursuant to Administrative Orders on Consent with EPA.

Numerous sediment investigations were conducted in the West Waterway from 1985 through 2000 to identify potential adverse ecological effects and human health risks associated with marine sediments. Studies included: surface sediment chemistry, sediment toxicity bioassays, tributyltin bulk sediment and porewater analyses, tributyltin laboratory bioaccumulation tests, and crab/sole/perch tissue collection and analysis for the human health risk assessment.

The highest concentrations of chemicals in sediments in the West Waterway were associated with the Shipyard Sediments OU and resulted in a separate ROD for the Lockheed and Todd Shipyard Sediment OUs being signed on November 20, 1996. This ROD divided the Sediment OUs into separate OUs for Lockheed and Todd and describes the basis for taking action with the shipyard sediment due to adverse ecological effects. (See Section 4.4 for a discussion on the subdivision of the Shipyard Sediments OU into two separate OUs: the Todd Shipyards Sediments OU 09 and the Lockheed Shipyard Sediments OU 07.) For the remaining sediments, the results of these studies did not indicate a basis for taking remedial action with the West Waterway, and a No-Action ROD was signed.

In 1996, the Port of Seattle, under EPA oversight, sampled the EW-OU10 as part of a dredging characterization in order to complete dredging as a navigational improvement in East Waterway along Terminals 18, 30, and 25. A summary of dredging activities can be seen in Figure 3-1 (located at the end of this document). This characterization revealed areas of the waterway that contained moderate to high levels of contamination and required moderate to high levels of dredging for navigation. In 1999, the U.S. Army Corps of Engineers (USACE) performed maintenance dredging along T-18 (Stage 1 Dredging). As required by the EPA, post dredge monitoring was completed in 2000, which indicated that contamination at depth in the area was higher than expected, although below the Washington State Sediment Management Standards (SMS) chemical cleanup screening level. Based on these findings, EPA decided that additional environmental dredging should be performed under EPA oversight. In 2005, the Port of Seattle, through an agreed order with the EPA, removed 260,000 cubic yards of material. Of that total, 60,000 cubic yards were suitable for open water disposal. A 9-inch variable sand layer was placed over the post dredge surface in order to prevent exposure to benthic organisms from remaining contamination that existed above State Sediment Management Standards. Current recontamination monitoring indicates

increasing chemical concentrations above State standards. This area will be part of the cleanup decision for the EW-OU10 expected in 2013.

3.5 SUMMARY OF BASIS FOR TAKING ACTION

An assessment of the human health risks at Harbor Island identified people who may incidentally ingest soil or have dermal contact with soil as the population most at risk of adverse health effects. Inhalation was not determined as a significant pathway of exposure to contaminants on the upland of Harbor Island.

Exposure to contaminants in groundwater was not evaluated because there is no current or foreseeable use of groundwater for drinking water purposes. The entire island is serviced by the City of Seattle water system, and the majority of groundwater beneath the island is naturally brackish and not suitable for drinking. EPA and Ecology determined that national ambient water quality standards for surface water would apply as applicable and relevant and appropriate requirements (ARARs) at the shoreline. For Harbor Island, the surface water ARARs are the marine chronic criteria in the "Water Quality Standards for Surface Waters of the State of Washington" and the human health criteria for consumption of marine organisms in "Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; State's Compliance Final Rule."

A habitat evaluation for the upland determined that Harbor Island is unable to sustain a wildlife population or support a functioning wildlife habitat due to the widespread industrial development. Therefore, an ecological risk assessment was not completed for the upland OUs.

The results of these studies did not indicate a basis for taking remedial action with the West Waterway.

4. REMEDIAL ACTIONS – REMEDY SELECTION, REMEDY IMPLEMENTATION, SYSTEM OPERATIONS/OPERATION AND MAINTENANCE

4.1 SOIL AND GROUNDWATER OPERABLE UNIT 01

4.1.1 Remedy Selection

The ROD for the S&G-OU1 was signed on September 30, 1993, and amended on January 25, 1996. The remedial action objectives were to:

1. Protect human health from exposure to contaminants in surface soil that pose a combined risk of greater than $1x10^{-5}$.
2. Protect human health from infrequent exposure to contaminants in the subsurface that pose a risk greater than $1x10^{-5}$ for each contaminant. Prevent release of contaminants into the groundwater where they can be transported to the shoreline, where marine organisms could be exposed.
3. Prevent migration of contaminants to the shoreline where marine organisms could be exposed. Protect human health from consuming contaminated marine organisms that pose a risk greater than $1x10^{-6}$.

The components of the selected remedial action identified in the ROD are listed below.

1. Excavate hot spot soils and treat or dispose off-site. Hot spots are defined as soils with TPH concentrations greater than 10,000 milligrams per kilogram (mg/kg); PCBs greater than 50 mg/kg; and mixed carcinogens with a total risk greater than $1x10^{-4}$. TPH hot spot soil, which was determined to be non-dangerous waste, was disposed of at Roosevelt Regional Landfill in Klickitat County, Washington. PCB and hot spot soil with greater than 10^{-4} risk would be sent off-site for treatment (incineration) or disposed in a hazardous waste landfill.
2. Cap exposed contaminated soil exceeding cleanup goals. The cap would consist of low permeability material such as asphalt or concrete. New pavement is required to have a minimum thickness of 3 inches and a maximum permeability of 1×10^{-5} [c] m/s. Existing asphalt and concrete surfaces that are damaged and located in areas where soils exceed cleanup levels were to be replaced or repaired to prevent infiltration of rainwater.
3. Invoke institutional controls, which would require long-term maintenance of new and existing caps, warn future property owners of remaining contamination under capped areas on their properties, and specify procedures for handling and disposal of excavated contaminated soil from beneath capped areas if future excavation is necessary.
4. Remove and treat floating petroleum product and associated contaminated groundwater at Todd Shipyard.
5. Implement groundwater monitoring for 30 years, with review of groundwater trends every 5 years to assess the effectiveness of the selected remedy.

4.1.2 Remedy Implementation

A Consent Decree for the S&G-OU1 was signed on August 6, 1996, and lists the Settling Defendants responsible for implementing the remedies described in the ROD. The following remedial actions have been completed.

Hot Spot Soils Removal and Capping. All of the Hot Spot Soils that had chemicals of concern (COCs) above on-site containment concentrations have been removed and disposed of off-site or properly treated. In 2003, the Port of Seattle finished expanding their cargo container facility (T18) by acquiring approximately 90 acres within the interior of Harbor Island. Contaminated soils exceeding cleanup criteria on the expansion properties were capped according to the requirements of the Consent Decree.

Institutional Controls. To warn future property owners of the remaining contamination, the Consent Decree required that the Settling Defendants record a certified copy of the Consent Decree in the appropriate King County office. Thereafter, each deed, title, or other instrument conveying an interest in a property included in the S&G-OU1 was required to contain a recorded notice that the property is subjected to the Consent Decree (and any lien retained by the United States) and to reference the recorded location of the Consent Decree and any restrictions applicable to the property. EPA has requested copies of the recorded documents as part of the Institutional Control Study for this Five-Year Review (see Section 6.2.2). EPA has received and is reviewing the information, and further discussion is needed with the PRPs regarding the implementation and finalization of ICs. Long-term maintenance of the cap areas were to be verified through annual cap inspections.

Todd Shipyards LNAPL Recovery. Todd Shipyards has been operating a light non-aqueous phase liquid (LNAPL) recovery system within the facility boundaries since 1998. Several system modifications have been completed since start-up including a vacuum-enhancement system installed in 2001 and installation of additional recovery wells in 2005 and 2009.

Long-Term Groundwater Monitoring. The ROD required semi-annual long-term groundwater monitoring at selected wells across Harbor Island for a period of 30 years. An EPA-approved groundwater monitoring plan was completed in 2009 (ENSR 2008c).

4.1.3 System Operation/Operation and Maintenance

Institutional Controls. As part of institutional controls (ICs), property owners are required to perform annual cap inspections and maintenance to ensure protection of site workers from dermal contact and reduce infiltration from rainwater. Figure 4-1 (located at the end of this document) shows the cap areas within the S&G-OU1. The Cap Inspection and Maintenance Plan for the Design Set 1B properties, which include Union Pacific Railroad Company Parcel A, The Dutchman LLC., King County/Fischer Mills, and Paul M. and Dianne Defaccio, is included in the Capping Remedial Action Implementation Report (RETEC 1998). The Cap Inspection and Maintenance Plan for the Design Set 2 property, which consists of the Port of Seattle T18, is included in the Design Set No. 2 Capping Implementation Report (RETEC 2006b).

The surface conditions and conditions along structures are the two main components of the inspection. The surface is inspected for cracking, damage, settlement, and standing water. It is assumed that if the top surface of the cap is in acceptable condition, then the underlying layers are also acceptable. Criteria for maintenance are:

- Less than 3 Inches of Settlement: Patch the area using standard asphalt to restore the area to the original grade.

- Greater than 3 Inches of Settlement: Remove/replace the asphalt and base course, replace subballast and/or ballast, or replace topsoil.

The Port of Seattle and Fisher Mills/King County have submitted cap inspection reports. Additional discussion of cap inspection and maintenance is presented in Section 6.2.2.

Todd Shipyards LNAPL Recovery. The LNAPL recovery system at Todd Shipyards uses specific-gravity skimmers that are connected to a pneumatically-operated skimmer pump located in each recovery well. The pump withdraws LNAPL from the skimmer inlet and pumps it out to an aboveground storage tank. To induce LNAPL flow, groundwater is extracted separately using electric submersible pumps. The drawdown is set at approximately 1 foot below the typical seasonal low groundwater elevation and is controlled by a transducer set in each well. The extracted groundwater is routed to a central shed where it is treated with carbon prior to discharge to the sanitary sewer.

The original LNAPL system consisted of four recovery wells and a belt skimmer set inside a monitoring well at one location with thick Bunker C type non-aqueous phase liquid (NAPL). Several system improvements have been implemented since operation began in 1998. In April 2001, a vacuum-enhancement system was installed to increase the flow of groundwater and NAPL to the well. The unsaturated soils surrounding each recovery well are put under negative pressure maintained by a blower located in a central shed. The air discharged from the blower contains volatile organic compounds (VOCs) that are treated in a catalytic oxidizer prior to being discharged to the atmosphere. In 2004, the method for extracting groundwater switched from a centrally located jet pump to an independently controlled electric submersible pump to eliminate iron fouling problems. The groundwater treatment system was also switched from an air stripper to liquid phase carbon drums to eliminate iron fouling on the stripper trays.

The following additional changes to LNAPL recovery system network have been made since start-up:

- In 2005, the existing system was adjusted by discontinuing pumping at FW-2 (LNAPL recovery continued by skimming only) and stopping the recovery of viscous product at FW-10. Three new recovery wells were installed, FW-15, FW-16, and FW-17, along with a second recovery system shed for two of those wells.
- In 2006, FW-2 and FW-5 ceased recovering and the wells were taken off-line.
- In early 2008, FW-15 and FW-17 ceased recovering LNAPL.

Performance monitoring for the LNAPL recovery system is described in the Design Set No. 1A, LNAPL Remediation, Report (Landau 1998) and includes 1) determination of individual well LNAPL recovery rates and cumulative recovery volume, 2) determination of total LNAPL recovery rates and cumulative recovery volume, 3) measuring product thicknesses in the recovery wells and monitoring wells, and 4) determination of the hydraulic capture zone of the recovery system. Recovery rates are calculated on a monthly basis, and product thickness is measured on a quarterly basis. Progress reports are submitted to EPA on a quarterly basis.

Long-Term Groundwater Monitoring. Long-term monitoring is required to determine if contaminants are migrating to the shoreline where marine organisms could be exposed and confirm the performance of the soil remedial actions. The monitoring network consists of three components: (1) compliance wells located near the shoreline, (2) early warning wells located inland of the compliance wells, and (3) S&G-OU1 boundary wells where the S&G-OU1 adjoins other OUs rather than surface water. Long-term groundwater monitoring

has been performed since 2005. Reports documenting the monitoring events are submitted annually and can be reviewed at the EPA Region 10 Superfund Records Center (RETEC 2006c, ENSR Corporation 2008d, AECOM 2009c).

4.2 TANK FARMS OPERABLE UNIT (TF-OU2)

4.2.1 Remedy Selection

Information for the TF-OU2 has been provided by Ecology, which is the lead agency overseeing cleanup of this OU.

Consent Decrees and associated Cleanup Action Plans (CAPs), which are the Ecology equivalent of EPA RODs, were established with facility owners during 1999 and 2000. The facility boundaries are shown on Figure 4-2 (located at the end of this document) and include:

- Shell Oil Products Seattle Terminal, Harbor Island (formerly Equilon Enterprises). Comprised of the Shell Main Terminal and Tank Farm, Shell's North Tank Farm area (located 300 feet north of Shell's Main Tank Farm) and Shell's Shoreline Manifold area (located 1,200 feet north of Shell's Main Tank Farm).
- BP West Coast Products (formerly ARCO Bulk Fuel Storage Facility Harbor Island). Comprised of Plant 1 and Plant 2.
- Kinder Morgan (KM) Liquids Terminal, Harbor Island (formerly GATX Terminals). Comprised of Yards A through E.

Indicator Hazardous Substances identified within the Tank Farms OU included:

Soil	Groundwater
• TPH (shallow and subsurface soil)	• Free product/sheen
• Arsenic (shallow soil)	• TPH Gasoline, Diesel, and Oil range
• Lead (shallow soil)	• Benzene, Toluene, Ethylbenzene, Xylenes, Carcinogenic PAHs, Lead

Cleanup levels for these substances were established in the CAPs for each facility within the TF-OU2 and were mostly identical to cleanup levels established in the EPA RODs for S&G-OU1 and LU-OU3. The cleanup levels for soil were considered protective of industrial worker exposure. The cleanup levels in groundwater were considered protective of surface water (aquatic organisms in Elliot Bay).

The objectives of the remedial actions were to remove all accessible contaminated soil and to achieve groundwater cleanup levels at the shoreline areas and inland property boundaries.

The selected remedial components included:

1. Excavate and remove shallow surface soil (6 inches) in areas exceeding 1,000 parts per million (ppm) lead and/or 32 ppm arsenic.
2. Excavate and remove accessible surface and subsurface soil in areas exceeding 10,000 ppm total TPH at identified areas adjacent to the shoreline and inland, where a large release occurred in 1996. Excavate and remove soil exceeding 20,000 ppm total TPH throughout all other inland areas. An overriding consideration regarding

excavation of contaminated soils was to avoid any risk to the petroleum storage tanks and pipelines.

3. Construct and/or operate *In-situ* remedial systems to treat contaminated soil and groundwater. The systems include free product/groundwater recovery, air sparging, and soil vapor extraction (SVE) components and supplemental active free product recovery by passive methods in specific wells as needed.
4. Utilize natural attenuation processes to reduce contaminant levels in soil and groundwater. This was an inherent part of the remedy for inaccessible contaminated soils left in place to avoid risk to infrastructure.
5. Perform long-term groundwater monitoring, examine wells for free product, measure groundwater elevations at wells, and construct seasonal groundwater flow maps. Analyze groundwater samples for contaminants of concern (TPH-G, TPH-D, TPH-O, BTEX, cPAHs, Arsenic, Lead). Also analyze for natural attenuation parameters (DO, ORP, Carbon Dioxide, Methane, Ferrous Iron, Nitrate, Sulfate, Alkalinity) to evaluate natural attenuation processes.
6. Institute Restrictive Covenants. The Restrictive Covenants identified the contamination that existed at each facility, provided for the continued industrial use of the property, prohibited groundwater taken from the property, provided for the safety and notification of site workers, prohibited activities that would release or cause exposure to contamination, provided for continuance of remedial actions given property transference, and provided for Ecology access.

4.2.2 Remedy Implementation

The following remedial actions have been completed at TF-OU2.

Removal of Lead-Arsenic Contaminated Surface Soil. Excavation of near-surface lead-arsenic contaminated soil in areas throughout the main Tank Farm at the Shell facility was completed December 2003 through February 2004. Approximately 2,929 tons of impacted soil were removed and disposed of at the Roosevelt Regional Landfill in Klickitat County, Washington. Soil cleanup standards for lead (1,000 ppm) and arsenic (32 ppm) were achieved throughout this area. A small area of lead-contaminated soil near an oil-water separator at the Shell facility was excavated during October 2001, and approximately 75 tons of impacted soil was removed. Due to structural constraints, some subsurface soil remains above the lead standard in this area and it was capped with 3 inches of low-permeability asphalt.

Excavation of near-surface lead-arsenic contaminated soil throughout large areas in B and C Yards at the KM facility was completed April through May 2002. Approximately 11,094 tons of impacted soil was removed and disposed of at the Waste Management Columbia Ridge Landfill and Recycling Facility in Arlington, Oregon. Soil cleanup standards for lead (1,000 ppm) and arsenic (32 ppm) were achieved throughout these areas.

No removal of lead/arsenic contaminated surface soil was required at the BP facility.

Removal of TPH Contaminated Surface and Subsurface Soil. All TPH "hot spots" identified in the original RI work and CAPs have been addressed. A description of the removals is presented below.

Numerous discrete areas of TPH-contaminated soil above established cleanup standards of either 10,000 ppm or 20,000 ppm were identified throughout all three tank farms. The 10,000-ppm standard applied to areas adjacent to surface water (Shoreline Manifold area at the Shell facility and Plant 1 at the BP facility) and in the area of a 1996 release (C Yard) at

the KM facility. The 20,000-ppm standard applied to inland areas of the tank farms. Impacted soil above applicable standards was mostly removed in these areas and transported to appropriate facilities off-site for treatment or disposal. Some subsurface soil above applicable standards remains in most of these areas because of the safety constraints imposed on excavating by existing structures (primarily the aboveground tanks). Three areas of TPH-impacted soil were excavated at the Shell facility. One area was completed near a former underground storage tank (UST) (20,000 ppm standard) during October 2001 (33 tons). Another area was partially completed in the Shoreline Manifold area (10,000 ppm standard) during November 2001 (111 tons). The third area was completed in the Main Tank Farm (20,000 ppm standard) during February 2004 (57 tons).

Seven areas of TPH-impacted soil were excavated at the KM facility during April and May 2002 (32,948 tons total). One area was in B Yard (20,000 ppm standard) and six areas were in C Yard (10,000 ppm standard). Applicable standards were achieved in four of these areas.

Six major areas of TPH-impacted soil were excavated at the BP facility during September and October 2000 (5,205 tons total). Two areas were in Plant 1 (10,000 ppm standard) and four areas were in Plant 2 (20,000 ppm standard). Oxygen-release compound was emplaced in one excavation at Plant 2 to enhance biodegradation.

Complete removal of an area of TPH-contaminated subsurface soil identified by the RI in the Shoreline Manifold area of the Shell facility had been precluded by a run of several large fuel pipelines in the area. During 2006, a new bulkhead was constructed and these pipelines were removed. Eleven borings were done throughout the previously identified area of remaining subsurface soil exceeding the 10,000 ppm total TPH cleanup standard in this shoreline area. The borings were done to determine current remaining TPH contaminant levels in the soil. Results indicated that total TPH contaminant levels had attenuated to below 10,000 ppm throughout 70 percent of the previously-identified area. The attenuation is probably attributable in part to the former remedial system that operated in this area, and also to natural attenuation over a 12-year period. Soil remaining above 10,000 ppm TPH (40 cubic yards) was removed during October 2009.

The RI work indicated levels of contamination in the subsurface soil in A Yard of the KM facility exceeding the 20,000 ppm total TPH standard applicable in this inland area. The CAP for the facility required further investigation and excavation of these areas to the extent technically practicable after free product in groundwater had been removed from this area. Over the years, free product has mostly disappeared in the area (to the extent of occasional minor sheens in some wells) through both active and passive product-removal remediation actions. During October 2009, seven borings were advanced to investigate the areas where high levels of TPH were previously indicated in subsurface soils. Results indicated that total TPH levels in soil had attenuated in these areas over a 12-year period to levels well below the 20,000 ppm cleanup standard (all values were below 5,000 ppm). No removal of subsurface soil will be required in this area given the results of the investigation.

Additional soil excavation was completed during upgrades to the Shell facility in 2007, when an array of aboveground fuel piping was removed near Tank 80000. Petroleum contaminated soil was observed in this previously inaccessible area. Nine borings were completed to investigate the extent of the contamination. The contamination was Bunker Oil apparently from a historical spill. Subsequent excavation removed 16 cubic yards of contaminated soil. Conformation samples indicated remaining soil was below the 20,000 ppm total TPH standard applicable in this area.

Construction and Operation of In-Situ Remedial Systems. A summary of the remediation systems that have operated or are currently operating at TF-OU2 is as follows:

- A free product recovery and vapor extraction system operated at the shoreline in the Shoreline Manifold area of the Shell facility prior to the Consent Decree until 2005 when product was no longer observed and hydrocarbon recovery through vapor extraction declined.
- A point-source free product recovery at the KM facility A and B Yards operated from October 2002 through 2004 when product was no longer observed.
- An air sparge system consisting of 16 sparge wells at the KM facility C Yard operated from October 2002 through August 2004 when groundwater cleanup standards had been achieved and maintained.
- An SVE/air sparge system at the KM facility A Yard has been operating since 2006. Additional discussion of this system is presented in Section 6.3.2.
- A free product recovery and vapor extraction system at the bulkhead area of BP Plant 1 has been operating since 1992. The system was expanded in 2003 as a requirement of the CAP to include greater capacity for free product/groundwater recovery and add vapor extraction and air sparging components and continues to operate at present. Additional discussion of this system is presented in Section 6.3.2.
- An SVE system at BP Plant 1 southern boundary has been operating since 2008. Additional discussion of this system is presented in Section 6.3.2.
- Minor passive free product recovery is occurring in three wells at the Shell facility and three wells at the KM facility.

Natural Attenuation. Select wells are analyzed for indicator parameters to evaluate natural attenuation processes. These included dissolved oxygen, ferrous iron, methane, sulfate, sulfide, carbon dioxide. Declining contaminant levels in some wells near remaining areas of subsurface TPH contamination provide evidence for natural attenuation in these areas.

Groundwater Monitoring. Numerous monitoring wells at the tank farms were in place prior to the Consent Decrees and additional wells were installed afterwards. Monitoring wells throughout the tank farms were regularly examined for free product and/or sampled for the contaminants of concern and natural attenuation parameters. The wells include approximately 30 at the Shell facility, 80 at the KM facility, and 20 at the BP facility. Wells are sampled quarterly and examined for free product as often as monthly. Wells designated for particular monitoring activities are specified in the Groundwater Compliance Monitoring Plan for each facility. Two compliance monitoring wells in the Shoreline Manifold area at the Shell facility and five compliance monitoring wells in Plant 1 at the BP facility are screened in groundwater at depths below the bottom of each bulkhead to monitor possible discharge of contaminants to surface water. Other monitoring wells are screened at the water table.

Institutional Controls. Institutional Controls were required in the form of Restrictive Covenants for each facility and were required to be written and recorded 10 days after the signing of each Consent Decree. The restrictive covenants for BP, KM, and Shell were filed with King County on August 15, 2000, August 30, 2000, and October 5, 2000, respectively.

4.2.3 System Operation/Operation and Maintenance

In-Situ Remedial Systems. Operation and maintenance of the current operational remedial systems include:

1. The remedial system at the shoreline-bulkhead in BP's Plant 1 facility. The current system expanded upon an earlier groundwater-product recovery interim system that operated since 1992. The current system became operational in early 2003, and was built with capabilities to recover product and groundwater and to perform soil vapor extraction and air sparging. The system was modified to operate in a pulsed mode to enhance performance, and also by adding two additional sparge wells for a time. During recent years, the system has experienced typical maintenance issues, including pump and compressor replacement and clogging of pipes by scale and biofouling. Ongoing clearing of piping by various means, including replacement, has been needed to maintain system operation and resulted in some downtime. Based upon SVE monitoring data indicating lack of further hydrocarbon recovery, the air-sparge and SVE components of the system were discontinued during 2008. The SVE and sparge capability of the system is being maintained in case of future need. The groundwater-product recovery component of the system continues to operate and provides hydraulic control of sheen and groundwater at the bulkhead.
2. The soil-vapor extraction system operating at the southern property boundary of BP's Plant 1 facility. The system has operated since October 2008 and performance monitoring data indicate gasoline-range hydrocarbons are being recovered. There have not been significant maintenance issues or down time with this new system.
3. The air-sparge/soil-vapor extraction system operating at the western property boundary of A Yard in the KM facility. The system has operated since December 2006 and performance monitoring data indicated petroleum hydrocarbons are being recovered. There have not been significant maintenance issues or downtime with this system.

The engineering design and operating components of each of these three remedial systems are documented in Construction Completion Reports and As-Built drawings. The acquisition of appropriate permits is documented. The Operations and Maintenance (O&M) procedures specific to each system are presented in O&M manuals prepared for each system. General system operations and maintenance activities along with the operating and performance parameters for each system are presented in required quarterly reports. Permitted discharge limits have not been significantly exceeded during the operations of these systems.

4.3 LOCKHEED UPLAND OPERABLE UNIT 03

During the site-wide RI/FS, the Lockheed Upland Operable Unit was established to allow the Lockheed Martin Corporation to proceed with the cleanup of their property on a different schedule from the rest of the Site (Figure 2-2). The Lockheed Upland Operable Unit 03 (LU-OU3), RI/FS was begun in 1990 and completed with a ROD signed in 1994. The remedial actions for this OU were completed on December 27, 1995. Part of the LU-OU3 was delisted on November 7, 1996 from the NPL, although site groundwater still remains on the NPL; however, so long as waste remains on-site under caps, Five Year Reviews continue to be required.

4.3.1 Remedy Selection

The ROD for the LU-OU3 was signed in June 1994. The objectives and selected remedial action are consistent with the S&G-OU1. The LU-OU3 remedial action objectives were to:

1. Protect human health from exposure to contaminants in surface soil that pose a combined risk of greater than $1x10^{-5}$.
2. Protect human health from infrequent exposure to contaminants in the subsurface that pose a risk greater than $1x10^{-5}$ for each contaminant. Prevent release of contaminants into the groundwater where they can be transported to the shoreline, where marine organisms could be exposed.
3. Prevent migration of contaminants to the shoreline where marine organisms could be exposed. Protect human health from consuming contaminated marine organisms that pose a risk greater than $1x10^{-6}$.

The components of the selected remedial actions outlined in the ROD are listed below.

1. Excavate and treat hot spot soils. Hot spots are defined as soils with TPH concentrations greater than 10,000 mg/kg. The TPH hot spot soil will be treated on-site by a thermal desorption system with an afterburner.
2. Contain exposed contaminated soil exceeding inorganic and organic cleanup goals. Containment was achieved with a 3-inch asphalt cap designed to reduce infiltration of rainwater and reduce contaminant migration into the environment. Existing asphalt and concrete surfaces that are damaged in areas exceeding cleanup goals were either replaced or repaired. Maintenance of the new and existing caps is required under a Consent Decree for the settling PRPs.
3. Invoke ICs that will warn future property owners of the remaining contamination contained under capped areas on this property, require future owners and operators to maintain these caps, and specify procedures for handling and disposal of excavated contaminated soil from beneath capped areas if future excavation is necessary.
4. Monitor groundwater quality semi-annually for 30 years, or until it has been demonstrated that groundwater contaminants will not reach the shoreline in concentrations exceeding cleanup goals. The groundwater data will be reviewed every 5 years to assess the effectiveness of the selected remedy.

4.3.2 Remedy Implementation

A Consent Decree for LU-OU3 was signed on December 8, 1994, and the remedial actions were completed on December 27, 1995. The LU-OU3 was partially delisted on November 7, 1996. The Port of Seattle purchased a portion of the property in 1997, and sold the northeastern section to BP/ARCO, who developed it into a fueling station. The remaining Port of Seattle property is referred to as Terminal 10.

Hot Spot Soils Removal and Capping. All of the Hot Spot Soils have been removed and areas with organics and inorganics exceeding soil cleanup goals have been capped.

Institutional Controls. To warn future property owners of the remaining contamination, the Consent Decree required that a certified copy of the Consent Decree be recorded in the appropriate King County office. Thereafter, each deed, title, or other instrument conveying an interest in a property included in the LU-OU3 was required to contain a recorded notice that the property is subjected to the Consent Decree (and any lien retained by the United States) and to reference the recorded location of the Consent Decree and any restrictions applicable

to the property. EPA requested copies of the recorded documents as part of the Institutional Control Study (ICS) for this Five-Year Review (see Section 6.4.2) and is currently reviewing these documents. Certified copies of the consent decrees have not been recorded in the appropriate King County records office, and EPA is currently working with Lockheed Martin to completely fulfill the IC requirements set forth in the Consent Decree. Long-term maintenance of the cap areas were to be verified through annual cap inspections.

Long-Term Groundwater Monitoring. Semi-annual groundwater monitoring has been completed since 1996, and these results are discussed in Section 6.4.2.

4.3.3 System Operation/Operation and Maintenance

Institutional Controls. As part of the ICs, annual cap inspections and maintenance is required to ensure protection of site workers from dermal contact and reduce infiltration from rainwater. The integrity of the capped areas are inspected by examining them for cracks, breaches, and the presence of vegetation. These methods were presented in the O&M Plan included as Appendix B of the Remedial Action Work Plan. Due to the sale of the property, the Port of Seattle is responsible for the maintenance of the cap and submits reports annually.

Five cap areas currently require inspection at the LU-OU3 and are shown on Figure 4-3 (located at the end of this document). Soil removals during remediation and construction activities have modified some of the cap areas from the original construction in 1995. These include:

- Railway installation in 2000. The southernmost portions of Cap Areas 1 and 2 were removed. Groundwater monitoring wells LMW-4 and LMW-10 were decommissioned during construction.
- Fueling station constructed in 2002. All of Cap Area 5 and most of Cap Area 4 were completely repaved with 3 feet of asphalt.
- Lockheed Shipyard Sediment Operable Unit Remediation Program in 2003 and 2004. Cap Area 3 removed entirely and removed from the inspection program.

Groundwater Monitoring. The Lockheed uplands groundwater monitoring program consists of semi-annual sampling in April (wet season) and October (dry season). The network was designed to monitor specific contaminated areas. Each area has a monitoring well located near the source and a designated down-gradient well to determine if groundwater contaminants are migrating toward the waterway. Reports are submitted semi-annually.

4.4 LOCKHEED SHIPYARD SEDIMENT OPERABLE UNIT (LSS-OU7)

4.4.1 Remedy Selection

The ROD for the Lockheed and Todd Shipyards Sediment Operable Units was signed on November 30, 1996. This ROD also divided the Sediment OUs into separate OUs for Lockheed and Todd. Remedial Action Objectives (RAOs) were developed as a result of data collected during the RI to aid in the development and screening of remedial alternatives to be considered for the ROD. The RAO for the LSS-OU7 is to reduce concentrations of hazardous substances to levels that will have no adverse effect on marine organisms.

The major components of the remedy selected in the ROD include the following:

1. All sediment exceeding the chemical contaminant screening level of the State of Washington SMS and all shipyard waste will be dredged and disposed of in an appropriate in-water or upland disposal facility.
2. All sediments exceeding the sediment quality standards (SQS) of the SMS will be capped with a minimum of 2 feet of clean sediment.
3. Specification of design criteria for acceptable habitat and to prevent future recontamination.
4. Institution of long-term monitoring and maintenance of the remedy.
5. The extent of dredging of contaminated sediments and waste under piers at the LSS-OU7 will be determined during remedial design based on cost, benefit, and technical feasibility.

Subsequent to the ROD, pre-remedial design studies for the LSS-OU7 better defined the nature and extent of contamination within the OU. The results of these studies indicated that certain elements of the ROD needed to be amended. The February 12, 2002, Explanation of Significant Differences (ESD) summarized the sediment characterization data, specified details regarding the dredge and cap remedy, and defined abrasive grit blast. The March 7, 2003, ESD established confirmation numbers to be used to distinguish contaminants characteristic of the West Waterway from contamination associated with the LSS-OU7; summarized the long-term monitoring, maintenance, and operational parameters; and identified the disposal option for contaminated sediments dredged from the LSS-OU7 as requiring upland disposal.

4.4.2 Remedy Implementation

In an Administrative Order on Consent (AOC) signed with EPA on July 16, 1997, Lockheed Martin agreed to perform the RD for implementing the remedy in conformance with the ROD as modified by the two ESDs. The RD was approved in parts. The RD for:

- Demolition of the wooden piers and piles was approved on July 2, 2003.
- First season dredging and capping was approved on October 25, 2003.
- Second season dredging, capping, and habitat enhancement was approved on May 25, 2004.

A Consent Decree (CD) between EPA and Lockheed was approved by the Court on July 23, 2003, to perform the RA and to pay past costs for cleaning up the site.

The RA was conducted in two phases. Phase 1 was completed on March 10, 2004, and Phase 2 was completed on February 4, 2005. The first phase of remedial construction efforts was focused on pier demolition and dredging of contaminated sediments. The second phase consisted of dredging, capping, and habitat enhancement.

The major components of RA were the following:

- Replace the existing deteriorated bulkhead wall so the upland soils will remain stable during and after remedial activities, including the following:
  - Pier and timber bulkhead removal.
  - Dredging adjacent to the bulkhead.

- Remove all existing pier structures including timber piling and portions of the existing shipway structures from aquatic areas of the site while maintaining the stability of the site.
- Dredge contaminated sediments from the channel and slope areas of the LSS-OU7 while maintaining stable slopes and critical habitat elevations.
- Design the dredge prisms and constructed slopes such that they will be constructible.
- In the Channel Area, remove the depth of sediment exceeding SQS criteria and construct a berm to support the Slope Area and maintain critical habitat elevation.
- Perform post-dredge sediment verification sampling and analysis to confirm achievement of SQS in the Channel Area.
- In the Slope Area, limit changes in the post-remediation of critical habitat elevations (i.e., between -4 to 8 feet MLLW from that of the existing condition while accommodating a 5-foot-thick cap).
- Construct an on-site mitigation area.
- Create intertidal habitat with clean soil in the vicinity of Pier 10 to mitigate habitat losses resulting from the partial filling of the South Shipway.
- Cap the Slope Area such that the cap will provide the following:
  - Chemical and physical isolation of the underlying contaminated sediments.
  - Protection of the chemical isolation portion of the cap from bioturbation and erosional forces.
  - A final cap surface that is compatible with marine organisms.
- Limited dredging and a sand cover boundary line along the offshore perimeter of the site (as a placeholder concept pending the results of further characterization in this area) to provide the following:
  - Partial removal, coverage, and enhanced natural recovery of contaminated off-site sediments located adjacent to the site.
  - A final substrate surface that is habitat compatible for marine organisms.

The LSS-OU7 was subdivided into Site Management Areas (SMAs) for the purposes of remedial design and action. The Channel (or open water) Area, identified as SMA 1, is the area running the length of the piers, outward from the pier face to the edge of the steep slope of the West Waterway at approximately -36 feet (MLLW). SMA 1 consists of unobstructed open water. The enclosed water SMA, SMA 2, is behind Pier 9. This is also an unobstructed area of open water that is bounded by the bank or bulkhead on one side and pier structures on two sides. SMAs 3, 5, and 7 designate sediment areas under the pier structure. Sediments under the shipways are designated as SMAs 4 and 6. Shipways are ramps that are used to move ships out of the water. These ramps contain decking like the pier structures and are held up by closely spaced pilings. SMAs 2 through 7 are collectively referred to as the Slope Area.

Table 4-1 summarizes the amount of material dredged in LSS-OU7 by material type. During this remedial action, 119,064 tons of contaminated sediments were dredged and transported to an approved upland facility for disposal.

Capping was implemented using approximately 100,000 cubic yards of capping material. Table 4-2 below shows the tonnage of each type of capping material placed on the slope area of the LSS-OU7.

Table 4-1. LSS-OU7, Total Tons of Contaminated Sediments and Debris Dredged

Dredging and Disposal Events	Weight in Tons	Notes
FIRST CONSTRUCTION SEASON (2003-2004)		
Dredge and Debris Disposal by Rail	85,096	864 Rail Cars
Soil and Dredge Disposal by Truck	1,118	
Creosote Treated Wood Disposal by Bins	10,660	442 Bins
Wood Salvage for Reuse	205	
Concrete Recycle	121	
Concrete w/Rebar Recycle	1,113	
Steel Recycle	36	
Subtotal:	**98,349**	
SECOND CONSTRUCTION SEASON (2004-2005)		
Dredge and Debris Disposal by Barge	21,107	15 Barges
Rock and Soil Disposal by Truck	586	
Creosote Treated Wood Disposal by Bins	21	1 Bin
Sample Disposal by Bin	1	1 Roll Off
Subtotal:	**21,715**	
TOTAL:	**119,064**	

Table 4-2. LSS-OU7, Tonnage of Capping Material Placed by Type

Capping Event	Weight in Tons	Notes
PHASE 1 CONSTRUCTION SEASON (2003-2004)		
Interim Cap	8,290	Covered entire OU.
Subtotal:	**8,290**	
PHASE 2 CONSTRUCTION SEASON – APPLIED BY MARINE EQUIPMENT (2004-2005)		
Toe Buttress Riprap	4,854	
Armor Riprap	13,501	
Sand Attenuation Cap Layer	21,479	
Filter Layer	5,951	
Rounded Filter/Armor Layer	1,451	1 Barge Load.
Fish Mix	8,667	
Subtotal:	**55,903**	
PHASE 2 CONSTRUCTION SEASON – APPLIED BY UPLAND EQUIPMENT (2004-2005)		
Armor Riprap	2,446	
Sand Attenuation Cap Layer	13,052	Includes Habitat Mix in some areas.
Rounded Filter/Armor Layer	17,018	
Fish Mix – Pit Run	3,001	
Subtotal:	**35,517**	
TOTAL:	**99,710**	

Eight sediment samples were collected from the post-dredge surface of the channel area (SMAs 1 through 7) to evaluate compliance with the design criteria. All analytical results were compared to the SQS chemical criteria to evaluate compliance. Out of 248 chemical analytical results, from eight samples, three samples exceeded the SQS for PCBs only. Three other samples out of eight, or 30 analytical results out of 248, exceeded the SQS for a combination of COCs. Therefore, a total of 33 of 243 analytical results failed the SQS. Table 4-3 summarizes the nature and locations of exceedances and the corresponding remedial action.

Table 4-3. LSS-OU7, Nature and Locations of Exceedances and the Corresponding Remedial Action

Sampling Locations	SQS Compliance Criteria	Sampling Results	Remedial Decisions
SED-200	PCBs – 12 mg/kg	13 mg/kg	Pass
SED-201	PCBs – 130 µg/kg	146.5 µg/kg	ENR
SED-202		no exceedances	Pass
SED-203	As – 57 mg/kg LPAH – 370 mg/kg HPAH – 960 mg/kg PCB – 12 mg/kg	As – 73.4 mg/kg LPAH – 1620 mg/kg HPAH – 1937 mg/kg PCB – 21 mg/kg	ENR
SED-204	As – 57 mg/kg Cu – 370 mg/kg Zn – 960 mg/kg Hg – 0.41 mg/kg PCB – 12 mg/kg	As – 127 mg/kg Cu – 829 mg/kg Zn – 585 mg/kg Hg – 0.618 mg/kg PCB – 20 mg/kg	ENR
SED-205		no exceedances	Pass
SED-206	PCB – 12 mg/kg	PCB – 18 mg/kg	Pass
SED-207	As – 57 mg/kg Cu – 370 mg/kg Zn – 960 mg/kg Hg – 0.41 mg/kg LPAH – 370 mg/kg	As – 139 mg/kg Cu – 553 mg/kg Zn – 912 mg/kg Hg – 1.32 mg/kg LPAH – 1341 mg/kg	ENR

a ENR = Enhanced Natural Recovery

µg/kg = micrograms per kilogram, mg/kg = milligrams per kilogram

The remedial action for portions of the Channel Area, represented by samples SED-201, 203, 204, and 207, that failed to meet the cleanup numbers, was the addition of 6 inches of sand to the sediment surface, namely Enhanced Natural Recovery (ENR). Areas where there was an exceedance of PCBs only, no actions were taken because the exceedances were minor and were below the 90th percentile for PCBs present in the West Waterway based on bioassays.

Water quality monitoring during in-water remedial action was conducted according to the Water Quality Certification. Visual turbidity monitoring was performed during demolition of over-water structures, and intensive and routine water quality monitoring was performed during dredging and barge dewatering and filling/capping operations. Results of these monitoring events indicate that water quality remained within marine quality standards throughout the monitored events.

A Tribal Fishing Coordination Plan (Fish Coordination Plan) was developed by Lockheed in consultation with EPA and affected Indian Tribes. There are two Treaty Indian Tribes that

have reserved fishing rights in the lower Duwamish River including the area of the Lockheed sediment remediation. The Muckleshoot and Suquamish cooperatively fish in these waters. Because in-water demolition, dredging, and capping activities would be occurring at the same time that Tribal fishing would be occurring, a Tribal Fishing Coordination Plan was developed jointly with the affected Tribes and Lockheed. The objectives of the Fish Coordination Plan were to:

1. Reduce the potential for conflicts between in-water construction operations and tribal fishing through effective communications and schedule planning.
2. Rapidly address any fishing equipment damaged as the result of construction operations within or adjacent to the site area.
3. Coordinate future construction activity (as practical) to reduce potential for further damage to fishing equipment.

According to the Fish Coordination Plan, ongoing communications between the Lockheed contractors and the Tribes successfully minimized conflicts between in-water construction and tribal fishing activities despite a high level of fishing activity and record catches in the West Waterway.

Remedial activities were conducted as planned, and cleanup goals were obtained for the first phase of the remedial action. EPA conducted a final inspection on March 7, 2005. The final inspection concluded that construction had been completed in accordance with the remedial design plans and specifications and did not result in the development of a list of uncompleted tasks for the remedial action.

4.4.3 System Operations, Maintenance and Monitoring Plan

The Operations, Maintenance, and Monitoring Plan (OMMP) was approved on September 28, 2006, for LSS-OU7. The goals of the OMMP are to ensure that the remedial actions continue to be protective of human health and the environment. The specific goals are to ensure that:

- The sediment cap continues to isolate toxic concentrations of previously identified COCs in the underlying sediments from marine biota and other biological receptors.
- The sediment cap and the previously dredged open channel area do not become recontaminated with COCs from the underlying sediments or from the uplands adjacent to the LSS-OU7.

The LSS-OU7 is divided into five areas based on characteristics or function. They are the:

- Slope Area
- Open Channel Area
- Beach Area
- Mitigation Area
- Riparian Area

The OMMP requires visual inspections, hydrographic and topographic surveys, and sediment and groundwater monitoring for COCs. Monitoring results will be used to assess cap integrity, sediments quality and source control. Detailed tasks and procedures are described in the OMMP.

Visual inspections are conducted of the riparian buffer, Mitigation Area, and the Beach Area at a very low point in the tidal cycle, approximately -3 feet.

Hydrographic surveys are evaluated to assess the stability of the Slope Area and Open Channel Area. The survey involves creation of a bathymetric map. Isopachs are produced by comparing results from previous and current bathymetric maps. The isopach illustrates changes in the bathymetry from one year to the next.

The topographic survey, also to evaluate stability, involves the creation of a topographic contour map of the Beach Area of the sediment cap and the Mitigation Area. Isopachs are produced by comparing results from previous topographic surveys with the current survey. The isopach illustrates changes in the topography from one year to the next.

Sediment samples are taken and analyzed for COCs to assess the quality of surface sediments. Sediments remaining in the LSS-OU7 must be protective of human health and the environment. Sediment grab samples are taken to evaluate sediment quality in the Open Channel Area, Slope Area, and Beach Area. Sediment traps were placed to evaluate deposition of contamination from the West Waterway. Therefore, if sediments were found to exceed the SQS, EPA could determine whether the contamination was from cap failure or waterway deposition.

There is a limited amount of sediment data. Within 2 years of placement, all sediment traps were lost, probably due to boat activity. Diver visual inspections have found that sediments suitable for sampling are not found in the Slope Area because of heavy rip rapping and tides and currents that prevent fines from settling in that area. Additionally, chemistry data is not available for Beach Area sediments because suitable sediments are not found in the Beach Area. Fines are swept from the Beach Area by tides and currents.

Monitoring wells were installed along the bulkhead on the land side. Results from analyzing groundwater were to be used to assess the quality of the groundwater entering the West Waterway. However, it is currently uncertain if the groundwater data collected near the bulkhead is representative of groundwater entering the waterway. Additional discussion on the groundwater monitoring program for LSS-OU7 and LU-OU3 is discussed in Section 6.4.2.

See Table 4-4 for a summary of monitoring requirements, frequency, location, and early warning triggers.

Remedial action at the LSS-OU7 was completed on February 4, 2005. The OMMP was implemented immediately after the completion of the remedial action to gather monitoring data that would serve as a baseline against which future monitoring results would be compared. The final topographic and hydrographic surveys were taken on February 28, 2005. These surveys demonstrate that the cap met design specifications and will serve as a baseline against comparison to future OMMP surveys. To date, four annual monitoring events have been conducted. The results of the monitoring events are provided in the Table 4-5.

Table 4-4. LSS-OU7, Summary of Monitoring Requirements

Monitoring Method	Monitoring Requirement	Frequency	Management Area	Abnormal Observations
Visual and Photographic	• Inspect bulkheads for instability or breach to upland soil. • Inspect shoreline slopes for erosion. • Inspect beach surface materials. • Probe depth of habitat layer in Mitigation Area. • Photograph from standard locations and any usual observations.	• Annually or more frequently if failure noted, use changes, or in-water construction.	• Beach Mitigation	• Bulkhead leaning or breached. • Shoreline riprap slopes eroded. • Beach materials show unusual changes to surface material or other abnormal observations.
Topographic	• Survey beach with standard upland equipment and provide topographic map with 1-foot contours to 0 feet MLLW.	• Annually or as arranged after consultation.	• Beach Mitigation	• Change in elevation of 1 foot or more (Early Warning Level) from original as-built contours.
Hydrographic	• Muitibeam hydrographic survey from -40 feet MLLW to+1 foot. • Provide contour map with 1-foot contours and combine with topographic survey above to produce isopach.	• Annually for Years 1, 3, and 5. • Every 5 years or as needed for construction or earthquake.	• Slope	• Change in depth of 1 foot or more (Early Warning Level) from original as-built contours. • Change in profile suggesting erosion or slope Instability.
Sediment Quality	• Sample sediment traps and grabs located. • Analyze samples for COCs. • Prepare data table and sample location figure.	• Annually or as arranged after consultation.	• Open Channel • Slope	• COCs above 75% of the SQS (Early Warning Levels).
Groundwater Source Control	• Sample groundwater from wells as per Sampling Analysis Plan (SAP). • Analyze samples as per SAP.	• Per SAP or as arranged after consultation.	• T-10/Yard 1 Upland	• As per SAP.
Reporting	• Reports to include procedure for corrective action to any discrepancies and a discussion of the results of any chemical analysis performed.	• Annually for first 2 years followed by every 5 years.	–	**REPORT EMERGENCIES AND EXCEEDANCES OF EARLY WARNING LEVELS**

Table 4-5. LSS-OU7, Summary of Monitoring Results

Year	Sediment Chemistry – Open Channel	Sediment Chemistry – Cap Slope Area	Sediment Traps – Cap Slope and Open Channel Area	Beach Area Sediment Chemistry	Topographic Survey – Beach and Mitigation Area	Hydrographic Survey – Open Channel and Cap Slope	Upland Source Control
2006	No exceedances of SQS. Two exceeded early warning levels.	Not enough sediment to perform chemical analysis; one trap missing.	Not enough sediment to perform chemical analysis; one trap missing.	No exceedances of SQS or early warning levels in Beach Area.			No data; monitoring wells improperly screened. This will be addressed as part of the issues and recommendations.
2007	One SQS exceedance for Hg but lower than surrounding non-site areas. Two exceeded early warning levels.	One sediment trap sample – no exceedance of SQS, but exceeded early warning level for Hg.	One trap sampled – sediments below SQS; four other traps missing.	No exceedances of SQS or early warning levels.	Not required for Year 2.	Not required for Year 2.	No data; monitoring wells improperly screened
2008	No exceedances of SQS or early warning levels in Open Channel Area.	No data from Cap Slope Area[a]; sediments not suitable for sampling.	No data—all sediment missing; task discontinued.	No data from the Beach Area; sediments not suitable for sampling.	No elevation changes in the Mitigation Area; No significant elevation change in the most of the Beach Area except some elevation gain on the north end of the sediment cap.	No significant change; most areas no change; discrete areas minor fluctuations less than one foot.	No data; monitoring wells improperly screened
2009	No exceedances of SQS or early warning levels in Open Channel Area.	No data from Cap Slope Area[a]; sediments not suitable for sampling.	No data—all sediment missing; task discontinued.	No exceedances of SQS or early warning levels in Beach Area.	Not required for Year 4; required for Year 5.	Not required for Year 4; required for Year 5.	Task discontinued.

[a] Sediment traps were placed to monitor for sediment deposition from the West Waterway. All sediment traps were eventually lost.

Results from the various monitoring events indicate that the cap is stable, that surface sediments in the Open Channel are below the cleanup numbers, and that fine-grained sediments cannot be located for sampling in the Slope and Beach Area. Observations of the Riparian Buffer indicate that the larger shrubs, such as shore pines and alders appear to be healthy, while the smaller vegetation is absent due to damage by geese. Conclusions based on monitoring events are shown below in Table 4-6.

Table 4-6. LSS-OU7, Conclusions Based on Monitoring Events

Year	Open Channel Area	Slope Area	Beach Area	Mitigation Area	Riparian Buffer
2006	No Response Action Required	No Response Action Required	No Response Action Required	No Response Action Required	
2007	No Response Action Required	No Response Action Required	No Response Action Required	No Response Action Required	Larger shrubs appear healthy; smaller vegetation absent.
2008	No Response Action Required	No Response Action Required	No Response Action Required	No Response Action Required	Larger shrubs appear healthy; smaller vegetation absent.
2009	No Response Action Required.	No Response Action Required	No Response Action Required	No Response Action Required	No Response Action Required.

No institutional controls were specified in the ROD, subsequent ESDs, or the CD for the LSS-OU7. Specific institutional controls beyond best management practices and review of permit applications through the USACE have not been implemented nor has an Institutional Controls Study been completed.

4.5 WEST WATERWAY SEDIMENTS OPERABLE UNIT (WW-OU8)

4.5.1 Remedial Actions

The no action ROD for the West Waterway Sediments OU (September 11, 2003) presented the basis for the determination that no CERCLA action was necessary at this OU to protect human health or the environment. The no action ROD did not include any requirements for institutional controls and did not require long-term monitoring. Since no remedial action was selected, there is no information on remedy implementation or operation and maintenance activities.

4.6 TODD SHIPYARDS SEDIMENT OPERABLE UNIT (TSS-OU9)

4.6.1 Remedy Selection

The ROD for the Todd Shipyard Site was signed on November 30, 1996. Remedial Action Objectives were developed as a result of data collected during the Remedial Investigation to aid in the development and screening of remedial alternatives to be considered for the ROD. The RAO for the TSS-OU9 is to reduce concentrations of hazardous substances to levels that will have no adverse effect on marine organisms.

The major components of the remedy selected in the ROD include the following:

1. All sediment exceeding the chemical contaminant screening level of the State of Washington SMS and shipyard waste be dredged and disposed of in an appropriate in-water or upland disposal facility.
2. All sediments exceeding the SQS of the SMS will be capped with a minimum of 2 feet of clean sediment.
3. Specification of design criteria for acceptable habitat and to prevent future recontamination.
4. Institution of long-term monitoring and maintenance of the remedy.
5. The extent of dredging of contaminated sediments and waste under piers at the TSS-OU9 will be determined during remedial design based on cost, benefit, and technical feasibility.

Subsequent to the ROD, pre-remedial design studies for the TSS-OU9 better defined the nature and extent of contamination within the OU. The results of these studies indicated that certain elements of the ROD needed to be amended. EPA issued an ESD on December 27, 1999. The purpose of the ESD is to designate the Todd Shipyards Site as an independent operable unit identified as the TSS-OU9 and to redefine the boundary of the OU identified in the November 1996 ROD based on additional information gathered during two remedial design investigations associated with this OU.

On April 7, 2003, EPA issued a second ESD. The primary changes documented in this ESD were to:

1. Further define the selected remedial action for the under-pier areas;
2. Establish confirmation numbers characteristic of contamination present in the West Waterway for the purpose of defining the TSS-OU9 boundary;
3. Adjust the TSS-OU9 boundary based on the use of confirmation numbers;
4. Summarize the long-term monitoring, maintenance and operational requirements for TSS-OU9;
5. Define “predominately abrasive grit blast”; and
6. Identify the disposal option.

4.6.2 Remedy Implementation

In an AOC signed with EPA on April 25, 2000, Todd Shipyards agreed to perform the RD for implementing the remedy in conformance with the ROD as modified by the 1999 ESD. The RD was approved by EPA on May 25, 2004. A CD between EPA and Todd was approved by the Court on July 21, 2003, to perform the RA.

The RA was conducted in two phases. Phase 1 was completed at the end of February 2005, and Phase 2 was completed in February 2007. The first phase of remedial construction efforts was focused along the north end of the TSS-OU9 and included pier demolition, dredging, and disposal of contaminated sediments and capping. The activities for this phase were initiated on July 5, 2004, and were completed on February 25, 2005. The major components of this phase of the RA were the following:

- Completed demolition and disposal of side-launch shipways located along the Northeast Shoreline of SMA 1 and Pier 2 located in SMA 8.

- Completed dredging and disposal of contaminated sediment and shipyard debris in SMAs 1, 2, 3, 4, and 5, located on the north side of the Todd property.
- Completed placement of in-water fill, including reconstruction of the Northeast Shoreline slope in SMAs 1 and 2; filling of subtidal depressions in SMAs 3, 5, and 7; and placement of boundary sand in SMAs 1 and 5.
- Completed placement of under-pier cap material at Pier 4 North, Pier 5, Pier 6, and Pier 6 Platform.
- Initiated, but did not complete, dredging and disposal of contaminated sediment in SMAs 7, 8, and 9.

During this period, 166,192 cubic yards of contaminated sediments were dredged and transported to an approved upland facility for disposal (see Table 4-7).

Table 4-7. TSS-OU9, Amount of Dredged Material by Sediment Management Area (SMA)

SMA	Dredged Material Weight in Tons	Estimated Dredge Material Volume in Cubic Yards
1 and 2	50,713	35,217
3	77,619	53,902
4	52,524	36,475
5	27,687	19227
6	0	0
7	0	0
8	27,679	19,222
9	3,095	2,149
Total:	**239,317**	**166,192**

Under-pier capping was implemented using special equipment consisting of a throwing conveyor mounted on a series of modular floats, a barge-mounted derrick crane, and a series of flat-decked material barges. Table 4-8 shows the total under-pier square footage capped per pier.

Table 4-8. TSS-OU9, Amount of Cap Material Placed by Pier

Pier	Placement Area in Square Feet
4N	42,488
5	66,015
6	29,700
6P	12,700
Total:	**150,903**

Placement techniques, using the throwing conveyor, were developed through implementation of a test program that took place in SMA 2, on the eastern side of Pier 6. Diver survey results of the underwater areas capped during the test program verified that the placement equipment and techniques met all specified criteria. The design criteria for capping under pier structures with timber piling was to place 1 foot (average thickness) of sand and to place 3 feet (average

thickness) for pier structures supported by concrete piling. The capping test at Pier 6, a timber supported pier, was considered by EPA to be a worse case test because Pier 6 has a much greater density of piles than concrete pile supported piers.

A total of 45 sediment samples were collected from the post-dredge surface of SMAs 1-7 to evaluate compliance with the design criteria. Two of these samples were submitted for bioassay testing and evaluated for compliance using the SMS biological criteria. One of the bioassay locations did not pass the SMS biological criteria; this area has been addressed by placement of a permanent sediment cap. The remaining 43 samples were compared to the SQS chemical criteria to evaluate compliance.

Out of 423 chemical analytical results, from 43 samples, 6 samples exceeded the SQS for mercury only, which represents 98.6 percent of all sample analytical results being less than the SQS chemical criteria (see Table 4-9).

Table 4-9. TSS-OU9, Confirmation Sampling Locations, Results, and Remedial Action for Samples Exceeding the Compliance Criteria

Sampling Locations		Compliance Criteria	Sampling Results	Remedial Action Taken
SMA 1	TSP-01-01	mercury – 0.41 mg/kg	0.68 mg/kg	none
SMA 2	TSP-02-06	mercury – 0.41 mg/kg	0.71 mg/kg	ENR
	TSP-02-08	mercury – 0.41 mg/kg	0.48 mg/kg	ENR
SMA 3	TSP-03-02	mercury – 0.41 mg/kg	0.85 mg/kg	ENR
	TSP-03-06	mercury – 0.41 mg/kg	1.04 mg/kg	ENR
	TSP-03-07	mercury – 0.41 mg/kg	0.66 mg/kg	ENR

All mercury exceedances were below the 90th percentile for mercury present in the West Waterway based on bioassays. A No Action determination was made for the WW-OU8 of the Harbor Island Superfund Site.

Water quality monitoring during in-water remedial action was conducted according to the Water Quality Certification. Visual turbidity monitoring was performed during demolition of over-water structures and intensive and routine water quality monitoring was performed during dredging and barge dewatering and filling/capping operations. Results of these monitoring events indicate that water quality remained within marine quality standards throughout the monitored events.

A Fish Coordination Plan was developed by Todd in consultation with EPA and affected Indian Tribes. There are two Treaty Indian Tribes that have reserved fishing rights in the lower Duwamish River including the area of the Todd sediment remediation. The Muckleshoot and Suquamish cooperatively fish in these waters. Because in-water demolition, dredging, and capping activities would be occurring at the same time that Tribal fishing would be occurring, a Tribal Fishing Coordination Plan (Fish Coordination Plan) was developed jointly with the affected Tribes and Todd. The objectives of the Fish Coordination Plan were to:

1. Reduce the potential for conflicts between in-water construction operations and tribal fishing through effective communications and schedule planning.
2. Rapidly address any fishing equipment damaged as the result of construction operations within or adjacent to the site area.

3. Coordinate future construction activity (as practical) to reduce potential for further damage to fishing equipment.

According to the Fish Coordination Plan, ongoing communications between the Todd contractors and the Tribes successfully minimized conflicts between in-water construction and tribal fishing activities despite a high level of fishing activity and record catches in the Waterway.

Remedial activities were conducted as planned, and cleanup goals were obtained for the first phase of the remedial action. EPA conducted a pre-final inspection on March 7, 2005. The pre-final inspection concluded that construction had been completed in accordance with the remedial design plans and specifications and did not result in the development of a punch list for the first phase of remedial action.

Remedial construction activities for the Phase 2 started on July 5, 2005, and all remedial action construction activities for the TSS-OU9 were completed in spring of 2006. The second phase of remedial construction efforts was focused along the west side of the OU, and included pier demolition, dredging and disposal of contaminated sediments, and capping.

The major components of Phase 2 RA were the following:

- Dredging in SMA 6, SMA 8 (where the initial overburden dredging was conducted in 2004), and SMA 9.
- Demolition of Pier 4S.
- Construction of habitat bench in SMA 6.
- Capping below Piers 1, 2P, 3, and outer reaches of building ways.

4.6.3 System Operation/Operation and Maintenance

An OMMP for the TSS-OU9 was approved by EPA on October 22, 2007. The goals of the OMMP are to ensure that the remedial actions continue to be protective of human health and the environment. The specific goals are to ensure that:

- The sediment cap continues to isolate toxic concentrations of previously identified COCs in the underlying sediments from marine biota and other biological receptors; and
- The sediment cap and the previously dredged open channel area do not become recontaminated with COCs from the underlying sediments or from the uplands adjacent to the TSS-OU9.

For the OMMP, the TSS-OU9 was divided into four areas based on characteristics or function. They are the:

- Under-Pier Capped Area
- Northeast Shoreline Sediment Cap
- Western Shoreline Habitat Bench
- Open Water Dredged Area

Annual monitoring (physical integrity monitoring) will occur at the Under-Pier Capped Areas, the Northeast Shoreline Sediment Cap, and the Western Shoreline Habitat Bench. The Open Water Dredged Area would be evaluated during the Five-Year review. Visual surveys will be conducted to assess the:

- Physical integrity monitoring of under-pier cap areas, with contingencies for maintenance of the caps and potential sampling for COCs in areas adjacent to the piers if erosion of cap material has occurred.

- Physical integrity monitoring of the riprap along the Northeast Shoreline in SMA 2 to ensure stability of the sediment cap, with contingencies for maintenance of the cap if erosion of cap material has occurred.
- Physical integrity monitoring of the habitat bench along the Western Shoreline in SMA 6 to ensure the stability of the habitat mix substrate, with contingencies for maintenance of the habitat mix substrate if erosion of this material has occurred.

Early warning standards were developed to signal potential cap failure. Observations of complete erosion of the sand cap along a transect would trigger additional action to assess the extent of erosion and if necessary additional remedial actions. Tables 4-10 through 4-12 provide descriptions regarding the physical integrity monitoring program for these three general areas. Detailed tasks and procedures are described in the OMMP.

Post-construction sediment sampling and survey data were used to verify that the completed remedial action (dredging and capping) met design specifications. These data were also used to establish a baseline (Year 0) against which future monitoring results would be compared.

Table 4-10. TSS-OU9, Visual Inspections for the Under-pier Capped Area

Type of Monitoring	• Visual diver survey of under-pier sand capped areas. Total of 17 transects to be surveyed.
Schedule/ Frequency	• Baseline survey (Year 0) in fall 2007. • Monitoring surveys in Year 1 (2008), Year 2 (2009), and Year 4 (2011). • Subsequent monitoring survey in Year 9 (2016) if sand cap material remains stable over the first three monitoring surveys. • Supplemental monitoring survey within 60 days after an earthquake that causes liquefaction of soils or building damage, at or near the site (magnitude 6.0 or greater).
Documentation	• Log and audio/video recording of observations such as the substrate type and coverage of sand cap, unusual erosion or accretion of material, presence of debris or unusual materials that are not part of the sand cap. Detailed observations to be made every 10 feet along each transect. • For the Baseline Survey: Data tables including sediment grab sample grain-size distribution results and a figure showing the sample locations. Two samples will be collected along each transect. • For the Monitoring Surveys: Data tables including sediment grab sample grain-size distribution results and a figure showing the sample locations, if collected. Grab samples will only be collected if the diver is unable to visually determine the type of substrate. • Under-Pier Physical Integrity Monitoring Reports after each survey Event. • Written notification to USEPA will be made within 30 days of observations of under-pier capped areas that have complete erosion of the sand cap.
Comparative Data	• Previous observations and video recordings. • Baseline grab sample grain-size distributions.
Threshold for Action	• These under-pier areas have been covered with either a 1-foot layer of sand (Piers 1A, 1, 2P, 3, 6, and 6P and within the over-water areas of the building berth) or a 3-feet layer of sand (Piers 4N and 5). • Movement of the cap material may decrease or increase the cap thickness at various locations. Such movement was expected in the design. Observation of complete erosion of the sand cap along a transect would trigger investigation into the size of the area affected, evaluation of the cause, and potential action.

Table 4-11. TSS-OU9, Visual Inspections for the Northeast Shoreline Sediment Cap Area

Type of Monitoring	• Visual diver/surveyor survey of the Northeast Shoreline Sediment Cap for baseline and routine monitoring surveys. One transect to be surveyed (refer to Figure 3.1). • Visual shoreline survey of the riprap on the cap for supplemental monitoring surveys at low tide.
Schedule/ Frequency	• Baseline survey (Year 0) in fall 2007. • Monitoring surveys in Year 1 (2008), Year 2 (2009), and Year 4 (2011). • Subsequent monitoring survey in Year 9 (2016) if riprap remains stable over the first three monitoring surveys. • Supplemental monitoring survey during a low tide within 60 days after a severe storm or an earthquake or during a tide that is at or below elevation minus 2 feet MLLW during daylight hours, whichever is sooner. Note that the visual shoreline survey may be changed to a visual diver survey if a sufficiently low tide is not available during daylight hours.
Documentation	• Log and audio/video recording of observations such as the substrate type and coverage of the riprap, unusual erosion or accretion of material, presence of debris or unusual materials that are not part of the riprap. Detailed observations to be made every 10 feet along each transect. • Physical Integrity Monitoring Reports after each survey event. • Written notification to USEPA will be made within 30 days of observations of areas of the Northeast Shoreline Sediment Cap that have complete erosion of the riprap.
Comparative Data	• Previous observations and video recordings.
Threshold for Action	• For the Northeast Shoreline Sediment Cap, a 3-foot riprap layer was placed over a minimum 2-foot-thick isolation layer of gravelly sand. • Observation of erosion of the riprap along the transect would trigger investigation into the size of the area affected, evaluation of the cause, and potential action.

Table 4-12. TSS-OU9, Visual Inspections for the Western Shoreline Habitat Bench

Type of Monitoring	• Visual diver survey of the Western Shoreline Habitat Bench for baseline and routine monitoring surveys. Total of 3 transects to be surveyed. • Visual shoreline survey of the habitat bench for supplemental monitoring surveys at low tide.
Schedule/ Frequency	• Baseline survey (Year 0) in fall 2007. • Monitoring surveys in Year 1 (2008), Year 2 (2009), and Year 4 (2011). • Subsequent monitoring survey in Year 9 (2016) if Type 2 Habitat mix remains stable over the first three monitoring surveys. • Supplemental monitoring survey during a low tide within 60 days after a severe storm or an earthquake or during a tide that is at or below elevation minus 2 feet MLLW during daylight hours, whichever is sooner. Note that the visual shoreline survey may be changed to a visual diver survey if a sufficiently low tide is not available during daylight hours.
Documentation	• Log and audio/video recording of observations such as the substrate type and coverage of habitat mix, unusual erosion or accretion of material, presence of debris or unusual materials that are not part of the habitat mix. Detailed observations to be made every 10 feet along each transect. • Physical Integrity Monitoring Reports after each survey event. • Written notification to USEPA will be made within 30 days of observations of areas on the habitat bench that have complete erosion of the habitat mix.
Comparative Data	• Previous observations and video recordings. • Grain-size distribution of the Type 2 Habitat Mix.
Threshold for Action	• At the habitat bench, a 3-foot-deep layer of Type 2 Habitat Mix was placed over a minimum 2-foot-thick sand cover. • Movement of the habitat mix may decrease or increase the thickness of the habitat mix at various locations. Observation of complete erosion of the habitat mix along a transect would trigger investigation into the size of the area affected, evaluation of the cause, and potential action.

The OMMP was approved in August 2007 after completion of the remedial action. The RPM has reviewed the OMMP Baseline Monitoring Report (Year 0) and two annual Operations, Maintenance, and Monitoring (OMM) Reports (Years 1 and 2), compared results with baseline results, and has determined that no Response Actions are necessary because there is no evidence that significant erosion of cap material had occurred. The presence of shell debris and silts indicate that the area has not been subject to erosional forces. The results of the monitoring events are provided in Table 4-13.

Table 4-13. TSS-OU9, Summary of Monitoring Results

Year	Under-Pier Capped Area	Northeast Shoreline Sediment Cap Area	Western Shoreline Habitat Bench
Baseline	Sand cap remained in place; early warning actions not triggered. Grain size assessment verifies the existence of cap material. Shell debris and/or silt are beginning to build up on cap in a number of locations.	No disturbance of riprap and habitat mix. Heavily colonized by algae and plants.	No disturbance of cap and habitat mix. Heavily colonized by algae and plants.
2008	Sand cap remained in place; early warning actions not triggered. Continued shell debris and/or silt build-up on cap in a number of locations.	No disturbance of riprap and habitat mix. Heavily colonized by algae and plants.	No disturbance of cap and habitat mix. Heavily colonized by algae and plants.
2009	Sand cap remained in place; early warning actions not triggered. Continued shell debris and/or silt build-up on cap in a number of locations.	No disturbance of riprap and habitat mix. Heavily colonized by algae and plants.	No disturbance of cap and habitat mix. Heavily colonized by algae and plants.

Results from the various monitoring events indicate that the cap is stable with build-up of shell debris and/or silts over time. Table 4-14 below provides conclusions based on the monitoring events.

Table 4-14. Conclusions Based on Monitoring Events

Year	Under-Pier Capped Area	Northeast Shoreline Sediment Cap Area	Western Shoreline Habitat Bench
2007	No Response Action Required.	No Response Action Required.	No Response Action Required.
2008	No Response Action Required.	No Response Action Required.	No Response Action Required.

EPA has required that chemical sampling of the Open Water Dredged Area be conducted for this five-year review. However, that data will not be available until September 2010. At a minimum, depending on the results of the sampling, chemical monitoring may be needed of the Open Water Dredged Area.

No institutional controls were specified in the ROD, subsequent ESDs, or the CD for the TSS-OU9. Specific institutional controls beyond best management practices and review of permit applications through the USACE have not been implemented nor has an Institutional Controls Study been completed.

4.7 EAST WATERWAY SEDIMENTS OPERABLE UNIT (EW-OU10)

4.7.1 Remedial Actions

No ROD has been written for this OU. In 2004–2005, the Port of Seattle conducted a non-time-critical removal action for highly contaminated sediments on the East Waterway. The removal action was implemented under the authority of an Action Memorandum (2003). The following actions were completed under the Action Memorandum:

1. Dredging 180,000 cubic yards of contaminated sediment unsuitable for open-water disposal and 67,000 cubic yards of sediment suitable for open-water disposal.
2. Dewatering sediments not suitable for open-water disposal at an upland staging area and disposing of the dewatered sediments at an upland landfill.

In 2005, it was determined that the dredging did not reach SQS sediment standards after sediment removal so a 6-inch layer of clean sand was placed over the surface to protect benthic organisms from residual contaminants. Recontamination monitoring in 2006, 2007, and 2008 does reveal the presence of PCBs and Hg above sediment management standards. A supplemental remedial investigation and feasibility study is underway. Currently, sampling has been completed for surface sediment, subsurface sediment, surface water, benthic tissue, clams, geoduck, and fish. Concurrent sediment transport analysis and source evaluation is also underway in order to ascertain the potential for cleanup areas to recontaminate following future remedial action.

5. PROGRESS SINCE THE SECOND FIVE-YEAR REVIEW

5.1 SOIL AND GROUNDWATER OPERABLE UNIT (S&G-OU1)

5.1.1 Protectiveness Statements from Last Review

The protectiveness statement in the last Five-Year Review (2005) stated:

> *The remedy at this OU is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.*

5.1.2 Status of Recommendations and Follow-Up Actions from Last Review

Recommendations presented in the last Five-Year Review (2005):

1. Full Implementation of Phase I long-term groundwater monitoring is scheduled to begin in October 2005. The plan also calls for the integration of several monitoring programs to be coordinated and consolidated among the various PRPs and OUs. Additional groundwater monitoring points are anticipated as the planning for a Phase II gets underway.

   Status: Ongoing. The S&G-OU1 long-term monitoring plan (Revision 3 plan) has been approved by EPA, and new/replacement wells have been installed. The first quarterly monitoring event for the new wells was in June 2009. After four quarters, the data will be evaluated to determine which wells will be included in the final long-term monitoring program. Semi-annual monitoring of the existing wells continues.

2. Continue TPH soil contamination cleanup at Todd Shipyard.

   Status: Ongoing. In 2009, a modification to the LNAPL removal system at Todd Shipyards was completed to address the remaining LNAPL. The revised system will contain six recovery wells (three new and three existing) and focus on extraction near the Aluminum Plant Building. At of the end of February 2009, over 300,000 gallons of LNAPL have been recovered, and it is estimated that 36,000 to 50,000 gallons remain. Since the last Five-Year Review, an additional Geoprobe investigation was implemented to define the extent of remaining LNAPL. The investigation determined that areas of recoverable LNAPL remained near the aluminum shop, and the remedial system was modified. In addition, a soil "Hot Spot" containing a heavy NAPL was identified. Once the nature and extent is determined, remedial options for this "Hot Spot" will be developed.

3. Site specific institutional controls (ICs) need to be developed and implemented.

   Status: Ongoing. As part of this five-year review, an ICS has been received from the Harbor Island Settling Defendants that includes the Todd upland property. More effort is needed to implement ICs that would address contaminated groundwater. EPA is currently working with the Harbor Island Settling Defendants that include Todd Shipyard, to fulfill the terms and conditions in the Consent Decree regarding IC implementation. ICs are expected to be completely implemented in 2012.

5.1.3 Results of Implemented Actions

Results of Implemented Actions:

1. The EPA-approved groundwater monitoring plan is a culmination of numerous discussions and plan revisions between the S&G-OU1 Steering Committee and EPA. The initial monitoring plan, herein called the Revision 1 plan, included a conductivity profile assessment and the installation of 16 new wells in 2005 (RETEC 2004). The Revision 1 plan required quarterly monitoring of the 16 new wells and 4 existing wells for 2 years and began in September 2005. A revised monitoring plan (Revision 2 plan) was developed in 2008 to address EPA concerns regarding (1) the location of well screen intervals and their ability to monitor freshwater emanating from the interior of the island, and (2) the potential for utility backfill to act as a preferential pathway for groundwater to discharge to surface water (ENSR 2008b). After addressing additional comments from EPA concerning well screen locations and installation of monitoring wells in the interior of the island, the Revision 3 plan was approved in 2009 (ENSR 2008c).
2. The LNAPL system modifications were completed in 2009. Data from the new system has not been reviewed to date.
3. An ICS has been submitted to EPA by the Harbor Island Settling Defendants. EPA has reviewed this study and determined that more effort is needed by the Responsible Parties in implementing ICs that address remaining contamination that result in restricted use of the upland properties. EPA will work with the Responsible Parties to ensure that the appropriate restrictive covenants are in place on all parcels. This effort is expected to continue into 2012.

5.1.4 Status of Other Prior Issues

There are no other prior issues.

5.2 TANK FARMS OPERABLE UNIT (TF-OU2)

5.2.1 Protectiveness Statements from Last Review

The protectiveness statement in the last Five-Year Review (2005) stated:

> *The remedy at this OU is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.*

5.2.2 Status of Recommendations and Follow-Up Actions from Last Review

The following information was developed with information provided by Ecology that has the lead regulatory authority for this OU.

Recommendations presented in the last Five-Year Review (2005):

1. Remedial actions not determined at this time could be implemented in localized areas of the TF-OU2 where minor free product and/or dissolved contaminant levels persist above standards.

   Status: Ongoing. Additional remedial actions have been completed at TF-OU2 since the last Five-Year review. These include “hot spot” removals and the design and

construction of an air sparging and SVE system at the KM facility and an SVE system at the BP facility.

5.2.3 Results of Implemented Actions

Results of Implemented Actions:

1. TPH contaminated soil was removed at the Shell facility during site upgrades and construction. Access to TPH contaminated soil identified during the RI was allowed due to the removal of several large fuel pipelines at the Shoreline Manifold area and the removal of above-ground piping near Tank 80000. An air sparging and SVE system was installed along the western boundary of A Yard in the KM facility to prevent migration of petroleum contaminated groundwater outside of the property boundaries. An SVE system was also installed along the southern property boundary of Plant 1 at the BP facility.

5.2.4 Status of Other Prior Issues

Status of Other Prior Issues:

1. Continue groundwater monitoring. The number of wells monitored and the frequency will be reduced as appropriate.

Monitoring requirements, including the frequency and numbers of analytes, are reduced on an individual well basis. Analytes are dropped if cleanup levels have been met for a significant time. Since 2005, no wells have been dropped from the monitoring program and five new wells have been installed.

5.3 LOCKHEED UPLAND OPERABLE UNIT (LU-OU3)

5.3.1 Protectiveness Statements from Last Review

The protectiveness statement in the last Five-Year Review (2005) stated:

The ROD remedy for this OU has been completed and the OU deleted from the NPL. The protective surface soil cap upgrade by diverting surface runoff will provide additional protection to the marine environment. The remedy at this OU is expected to be protective of human health and the environmental when maintenance issues are addressed, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

5.3.2 Status of Recommendations and Follow-Up Actions from Last Review

Recommendations presented in the last Five-Year Review (2005):

1. The PRP for the Lockheed Upland area needs to establish positive run-on/run-off controls for the property. Plans have been drafted, but the construction has not yet occurred.

   Status: Ongoing. The Port of Seattle has been approved to redevelop the site. The Terminal 10 Utility Infrastructure Upgrade Project includes regrading the entire site and installing a storm sewer system, which will be connected to the City of Seattle storm sewer system.

5.3.3 Results of Implemented Actions

Results of Implemented Actions:

1. In 2008, the Port of Seattle was approved to redevelop the site. The Terminal 10 Utility Infrastructure Upgrade Project includes demolishing pavement in some areas and removal of any contaminated soil identified in those areas, regrading the entire site, and installing a storm sewer system, which will be connected to the City of Seattle storm sewer system. After the completion of this work, the entire site will be paved and lighting and fencing will be installed. If any contamination remains on-site above containment levels identified in the ROD following the completion of the redevelopment, a revised inspection and maintenance plan will be required. As of May 2010, these facility upgrades are still in the 60 percent design phase.

5.3.4 Status of Other Prior Issues

There are no other prior issues.

5.4 LOCKHEED SHIPYARD SEDIMENT OPERABLE UNIT (LSS-OU7)

5.4.1 Protectiveness Statements from Last Review

The Protectiveness Statement made in the 2005 five-year review stated that upon completion of the remedy EPA expected that the LSS-OU7 would be protective of human health and the environment. The remedy has now been constructed.

5.4.2 Status of Recommendations and Follow-Up Actions from Last Review

There were no recommendations.

5.4.3 Results of Implemented Actions

There were no follow-up actions.

5.4.4 Status of Other Prior Issues

There are no prior issues.

5.5 WEST WATERWAY SEDIMENTS OPERABLE UNIT (WW-OU8)

5.5.1 Protectiveness Statements from Last Review

The protectiveness statement in the last five-year review was:

> *This OU is considered protective of human health and the environment and a No Action ROD was written for this OU.*

5.5.2 Status of Recommendations and Follow-Up Actions from Last Review

The no action ROD for the WW-OU8 (September 11, 2003) presented the basis for the determination that no CERCLA action was necessary at this OU to protect human health or the environment. The no action ROD did not include any requirements for ICs and did not require long-term monitoring. Since no remedial action was selected, a five-year review is not required. Thus, the second five-year review for the Harbor Island Superfund site did not

include any recommendations or follow-up actions for the WW-OU8, and there is no relevant information for this section.

5.5.3 Results of Implemented Actions

Due to the No Action ROD, no actions were implemented.

5.5.4 Status of Other Prior Issues

Due to the No Action ROD, no prior issues were identified.

5.6 TODD SHIPYARDS SEDIMENTS OPERABLE UNIT (TSS-OU9)

5.6.1 Protectiveness Statements from Last Review

The Protectiveness Statement made in the 2005 five-year review stated that upon completion of the remedy EPA expected that the TSS-OU9 would be protective of human health and the environment. The remedy has now been constructed.

5.6.2 Status of Recommendations and Follow-Up Actions from Last Review

There were no recommendations.

5.6.3 Results of Implemented Actions

There were no follow-up actions.

5.6.4 Status of Other Prior Issues

There are no prior issues.

5.7 EAST WATERWAY SEDIMENTS OPERABLE UNIT (EW-OU10)

Since the last five-year review, a supplemental remedial investigation (SRI) and FS is underway. This SRI/FS includes sampling for sediments and tissue, surface sediment, sediment transport and source evaluation. In addition, the United States Coast Guard (USCG) has submitted an Environmental Assessment for the Berth Bravo in Slip 36. More information on how this action will impact existing contaminated sediments and future remedial actions is necessary before the USCG can proceed with the replacement of the Berth Bravo pier.

All field sampling has been completed, which includes sediment, fish, and shell fish tissue. The SRI/FS is expected to be completed in 2012, and a cleanup decision for East Waterway made in 2013. The next five-year review is expected to include the East Waterway cleanup decision with the protectiveness evaluation.

6. FIVE-YEAR REVIEW PROCESS

6.1 ADMINISTRATIVE COMPONENTS

The PRPs were notified of the initiation of the Five-Year Review in summer 2009. Separate meetings occurred with the Harbor Island Settling Defendants and Lockheed Martin Corp. The Five-Year Review team was led by Ravi Sanga of EPA, RPM. Sharon Gelinas, Hydrogeologist from the USACE, Seattle District, assisted with the S&G-OU1 and LU-OU3. Reviews for the other OUs were as follows: LSS-OU7 and TSS-OU9: Lynda Priddy, EPA Project Manager; WW-OU8: Karen Keeley, EPA Project Manager; EW-OU10: Ravi Sanga; and TF-OU2: Roger Nye with Ecology.

EPA met with the S&G-OU1 Steering Committee on October 5, 2009, and LU-OU3 representatives on October 26, 2009, to discuss data needs for the Five-Year Review.

From August 2009 to July 2010, the review team established the review schedule. Those components included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

6.2 COMMUNITY/STAKEHOLDER INVOLVEMENT

Activities to involve the community in the Five-Year Review included preparing and running a public notification of the Five-Year Review in the Seattle Times, August 31, 2009.

On November 16, 2009, a briefing on the Harbor Island Five-Year Review was given to the affected federally recognized Native American tribes (Muckleshoot and Suquamish Indian Tribes) who use the East Waterway and West Waterway as part of their tribal usual and accustomed fishing area.

In addition, a Stakeholder Meeting on the Harbor Island Five-Year Review was held on December 17, 2009, for the Public Interest Groups and Natural Resource Trustees.

6.3 SOIL AND GROUNDWATER OPERABLE UNIT (S&G-OU1)

6.3.1 Document Review

This Five-Year Review consisted of a review of relevant documents as summarized in the References section at the end of this report. Documents can be reviewed at EPA Region 10 Superfund Records Center. Applicable groundwater and surface water cleanup standards were also reviewed.

6.3.2 Data Review

Institutional Controls. As stated in the ROD, ICs were required to (1) provide long-term maintenance of new and existing caps, (2) warn future property owners of remaining contamination under capped areas on their property, and (3) specify procedures for handling and disposal of excavated contaminated soil if future excavation is necessary.

A review of ICs associated with each property within the S&G-OU1 was conducted by TechSolv, the consultant for the S&G-OU1 Settling Defendants. The purpose of this review was to ensure that ICs are appropriate, in place, and are effective across the site. EPA requested the following information to document the ICs:

1. Documentation of all ICs in place for the S&G-OU1.
2. Copies of all instruments that conveyed any interest in any portion of the S&G-OU1 since 15 days of entry of the Consent Decree, with the required provision of access and necessary restrictions or covenants.
3. Figures showing parcel boundaries and survey information.
4. Current information about all lessees or users of the S&G-OU1.
5. An ICS that must provide, at a minimum: a title search; copies of encumbrances; evaluation of whether encumbrances negatively impact existing controls; evaluation of compliance with ICs; evaluation of any current human or potential human or ecological exposures; evaluation of any threatened or existing inconsistencies that could lead to exposures; evaluation of the protectiveness and effectiveness of all ICs; evaluation of all instruments, any proposed additional controls; certification that each CD and all other instruments were properly recorded; certification that all property transfer deeds contain obligation to provide access and maintain ICs and require all future transfers to do so; and recommendations.

EPA has reviewed the ICS submitted by the Harbor Island Settling Defendants and concluded that more work is needed from the Responsible Parties in establishing restrictive covenants that account from the contamination left behind on the upland and that address (1 through 5) above. Currently, only two parcels contain covenants that address the contamination left behind on the upland properties. Additionally, ICs that restrict groundwater use need to be addressed.

Cap Inspections and Maintenance

The Harbor Island Settling Defendants are responsible for annual inspection and maintenance of all upland asphalt caps on Harbor Island with the exception of the asphalt cap on Lockheed Upland that is the responsibility of Lockheed Martin. The main objective for the cap is to protect site workers from contaminated soil; a secondary objective is to reduce infiltration of rainwater, thus limiting contaminant transport to ecological receptors in the waterways. Consistent inspections and maintenance are necessary to ensure that the cap remains protective of human health and the environment. Of the six properties within the S&G-OU1 that contain environmental caps, only two have submitted reports on a consistent basis. The Port of Seattle inspections for Terminal 18 have been completed annually since 2007 in accordance with the Design Set No. 2 Capping Implementation Report (RETEC 2006). Fisher Mills/King County has submitted inspections in accordance with Design Set 1B Capping Remedial Action Implementation Report (RETEC 1998) since 2001. The remaining properties, the Dutchman, LLC; Harbor Island Machine Works, Inc.; Duwamish Properties LLC; and Union Pacific Railroad Company do not currently have inspection reports on file.

Duwamish Properties LLC is planning an expansion of their existing facility. EPA was contacted in October 2009 to discuss the project and will review the Stormwater Pollution Protection Plan (SWPPP) to ensure that human health and the environment are protected during construction.

A summary of the reported cap inspections and maintenance is as follows:

- The first cap inspection in 2007 for Terminal 18 noted several areas in need of repair, including potential cap settlement in an area of standing water and potholing/cracking. A limited-scope inspection was completed in 2008 in the areas previously identified as needing repairs prior to the completion of the repairs (AECOM 2008b). The 2009 report identified the same areas as needing repairs. Repairs are to be completed prior to the 2010 inspection.
- Cap inspections at the Fisher Mills/King County revealed a sinkhole that was repaired in 2005 and a depression that was repaired in 2006. There has been no reported damage to the cap since then.

Todd Shipyards LNAPL Recovery. In 2008, a Geoprobe investigation was completed to define the extent of the remaining LNAPL, particularly near/beneath the Aluminum Shop Building, and to correlate the concentration of LNAPL found in the unsaturated zone with soil observations made during the investigation. The findings as presented in the Geoprobe Investigation Results Report (Floyd | Snider 2008) are as follows:

- Heavy petroleum was identified in three soil borings on the eastern portion of the property. Additional investigations are necessary to determine the extent of the petroleum and potential remedial actions for this unsaturated soil "hot spot."
- Areas of recoverable LNAPL remain, with the main portion in the vicinity of the west portion of the aluminum shop. The remaining volume of LNAPL was estimated to be between 36,000 and 50,000 gallons using a percent saturation between 25 and 35 percent (Floyd | Snyder, 2009b).
- Variability of LNAPL saturation within a soil core in combination with tidal effect leads to a poor correlation between the "true" thickness of the LNAPL as observed in the soil cores and that observed in the adjacent wells or piezometers.

An LNAPL system modification was designed to focus on the removal of the remaining LNAPL beneath the Aluminum Shop Building. The modified LNAPL system includes installation of three new recovery wells, FW-19, FW-20, and FW-21, and continued operation of three existing wells FW-3, FW-17, and FW-18. This modified extraction system is shown on Figure 6-1 (located at the end of this document) and the areal extent of the remaining LNAPL is shown on Figure 6-2 (located at the end of this document). The new recovery wells were installed in late 2009. More data expected in 2010 will ascertain the performance of these wells on the ultimate performance of the extraction system as a whole.

The new system modification will address the remaining LNAPL at Todd Shipyards. Historically, LNAPL thickness in monitoring wells has been used to determine when recoverable LNAPL is no longer present. The endpoint for recovery is related to the saturation of remaining LNAPL and can be defined as the point at which the LNAPL saturation has declined to a point in which the remaining LNAPL is immobile and unrecoverable even under steep hydraulic gradients" (i.e. residual saturation). After discussion with EPA, Todd Shipyards has proposed the following procedure to determine when LNAPL recovery will cease:

- Evaluation will occur on a well by well basis based on the LNAPL recovery rates over the life of the well.
- Active recovery will cease when recovery reaches an asymptote or rates are low enough to begin causing excessive maintenance issues for a period exceeding 6 months. The asymptote has typically been reached when the LNAPL thickness is less than 0.25 foot. When this level is achieved, Todd Shipyards will begin an additional evaluation.
- The additional evaluation includes attempting to increase recovery rates by altering water levels and vacuum rates for 3 months. If no increase occurs, then Todd Shipyards will implement passive recovery if feasible. If an increase occurs, then the well will be operated using the new conditions.
- After recovery is complete, Todd Shipyards will begin rebound monitoring.

Long-Term Groundwater Monitoring

Groundwater Flow

The conceptual model of groundwater flow on Harbor Island was based on data collected during the RI in the mid-1990s. The current site conceptual model, while similar to the original, has led to modifications of the groundwater monitoring program on the island. The most important components of the conceptual model along with modifications based on recent characterization work are listed below:

Original Conceptual Model (1990s)	Modifications
Groundwater behaves as a single hydrostratigraphic unit of freshwater floating on a base of saline water.	A shallow saline water interval has been identified at the margins of the island where bulkheads are not present (or fail to significantly impede flow). Freshwater from the interior of the island discharges below this shallow saline interface.
Recharge occurs primarily through precipitation and infiltration from utility lines.	Recharge has likely decreased substantially due to the increase in impervious surface at Terminal 18.
Groundwater flows mainly outward from the interior of the island in a radial pattern and discharges to the waterways.	The center of the island appears to be drained by a major sewer line, which has caused a groundwater low. Where bulkheads are present, groundwater may discharge below the barrier.
A groundwater low was identified in the southern portion of the island.	The low covered an extensive area along the islands center into the region under the Tank Farms. Due to the removal of most of the monitoring locations in the island center, the extent of the area contributing to this sewer line is unknown.
Groundwater levels are tidally influenced. In general, monitoring wells near the shoreline show a larger influence than interior wells.	A recent tidal study by Lockheed indicated that in some areas the net groundwater flow direction may be toward the interior of the island.

Monitoring Well Network

The long-term groundwater monitoring well network has three components: (1) compliance wells located near the shoreline, (2) early warning wells located inland of the compliance wells, and (3) S&G-OU1 boundary wells. The monitoring well network is shown on Figure 6-3 (located at the end of this document), and the wells are listed in Table 6-1 (Chapter 6 Tables are located in a separate section at the end of this report). The current monitoring locations are the result of several revisions to the groundwater monitoring plan; the most recent version is referred to as Revision 3 (ENSR 2008c).

Compliance monitoring well screen depths vary depending on whether or not a bulkhead is present and the location of the freshwater/saltwater interface. A pre-installation profile assessment was completed at well locations HI-5, HI-6, HI-9, HI-10, HI-11, and HI-12, to determine the appropriate well screen interval in areas where information on the bulkhead was unknown and to verify that screened intervals were representative of freshwater emanating from inland areas. Direct-push technology was used to generate a vertical profile of the groundwater conditions by collecting samples every 5 feet. The assessment indicated that the freshwater/saline water interface was at 20 to 30 feet below ground surface (bgs). In addition, a second, shallow, higher salinity zone was found from 9 to 15 feet bgs, indicating tidal mixing influences (RETEC 2005).

The results of the conductivity assessment lead to the replacement of monitoring wells HI-2, HI-6, HI-9, HI-10, HI-12, and FW-1 with a deeper screen interval. Table 6-2 (Chapter 6 Tables are located in a separate section at the end of this report) shows the conductivity values collected during the profile assessments and the selected screen interval. Following four quarters of sampling these new deeper wells, the long-term groundwater monitoring well network will be finalized.

The groundwater low identified during the RI on the southern half of the island has been associated with utility lines running north to south down the approximate center of the island. EPA has had some concern that potentially contaminated groundwater will also preferentially follow the backfill of the utilities and discharge to waterway. For this reason, a report on the location and integrity of the utility lines on the island was provided in the Revision 3 Groundwater Monitoring Plan (ENSR 2008c). Due to the age and reported leakage rates into the utilities, groundwater infiltration into the utilities was determined to be highly likely. To monitor the quality of groundwater discharging into the sewer lines or the backfill, two monitoring wells (HI-17 and HI-18) were installed along the sanitary sewer line in the southern portion of the island near the groundwater low identified during the RI as required in the Revision 3 groundwater monitoring plan.

Long-Term Monitoring Analytical Data

The long-term groundwater sampling schedule is presented in Table 6-1 (Chapter 6 Tables are located in a separate section at the end of this report). Existing monitoring wells were sampled on a quarterly basis from September 2005 through September 2007; sampling at these wells is currently on a semi-annual basis. Samples are analyzed for benzene, total and available cyanide, and metals (total arsenic, cadmium, copper, lead, mercury, nickel, silver, thallium, and zinc). The reductive precipitation method (Method 1640) is used to prepare groundwater samples for metals analysis when the water is brackish, or when conductivities are greater than 2 millisiemens/centimeter (mS/cm). PCBs and VOCs other than benzene were removed from the analysis after they were not detected during the first year (four quarters of sampling).

The five new replacement Revision 3 wells and two new interior wells are to be sampled quarterly for one year. The first round of quarterly sampling for the new/replacement wells was completed in June 2009. During this time period, the shallower wells that were replaced by deeper wells will not be sampled. Following the first year of sampling, one of the wells (shallow or deep) will be selected for long-term monitoring. The two new wells in the interior of the island will also be sampled quarterly for one year. If concentrations are below cleanup goals, then sampling of these two wells will cease. All new monitoring wells will be analyzed for metals, cyanide, and selected VOCs (carbon tetrachloride, benzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and tetrachloroethene). If VOCs are not detected during the first year, they will be dropped from the analyte list.

Analytical data for the S&G-OU1 long-term monitoring network collected during the last 5 years is presented in Table 6-3 (Chapter 6 Tables are located in a separate section at the end of this report). A brief summary of the data is as follows:

- The maximum benzene concentration was 1.4 micrograms per liter (µg/L) and detected at HI-16, which is well below the cleanup goal of 71 µg/L. PCBs; 1,1,1-TCA; 1,1,2-TCA; carbon tetrachloride; and PCE have not been detected.
- With the exception of HI-17 (see below), arsenic, cadmium, lead, silver, and thallium have not been detected at concentrations above their respective cleanup goals. Nickel has not been detected above the cleanup goal since June 2006 and copper has not been detected above the cleanup goal since December 2007.
- Concentrations of total zinc have historically been detected above the cleanup goal at monitoring wells FW-1, HI-12, MW-1, and MW-213. Dissolved zinc concentrations have been below the cleanup goal. Figure 6-4 (located at the end of this document) presents the concentrations of total zinc concentrations at each well. Replacement wells installed in 2009 for FW-1 and HI-12 did not contain concentrations of zinc above cleanup goals. MW-1 and MW-213 are compliance wells located near the ongoing LNAPL remediation at Todd Shipyards and likely represent impacts from this area.
- Concentrations of total mercury were historically detected above the cleanup goal at monitoring wells FW-1 and HI-6. Dissolved concentrations of mercury have been below the cleanup goal. Replacement wells installed in 2009 for FW-1 and HI-12 did not contain concentrations of mercury above cleanup goals. Upward trends in mercury concentrations were noted in the 2008/2009 monitoring report (AECOM 2009c) at wells HI-7 and HI-9; however, the concentrations are an order of magnitude below the cleanup level.

Monitoring well HI-17 was installed in 2009 near the sanitary sewer line in the center of the island. Concentrations of arsenic, cadmium, lead, nickel, and zinc were detected above ROD cleanup goals. HI-17 is located near the historical groundwater low in the southern portion of the island where water is thought to flow toward the sanitary sewer system and not outward toward the waterways. The well is also located near the former secondary smelter where elevated metals concentrations were detected during the RI. Since groundwater flow has not been evaluated since the RI in the 1990s, an additional groundwater flow assessment should be completed to confirm that groundwater near HI-17 is contained on the island. This assessment may need to include a tidal study.

Figure 6-5 (located at the end of this document) shows the concentration of cyanide at the site. Total cyanide has been consistently detected at monitoring wells HI-1, HI-7, HI-10, and HI-14, and sporadically at monitoring wells HI-2, HI-8, HI-9, HI-11, HI-13, HI-15, HI-16, and FW-1 at concentrations ranging from 1.15 to 345 µg/L. It should be noted that the reporting limit for total cyanide is 5 µg/L, which is higher than the ROD cleanup goal of 1 µg/L. Starting in December 2006, cyanide was also analyzed using the available cyanide method, which has a reporting limit of 2 µg/L and measures both free and weak acid dissociable cyanide. The available cyanide method provides a better approximation of the more toxic free cyanide than the total cyanide analytical method. Available cyanide was detected just above the reporting limit at monitoring wells AC-06A, HI-3, HI-16, HI-12, and HI-5 and at concentrations ranging from non-detect to 170 µg/L at Well FW-1. It has not been detected above the reporting limit of 2 µg/L during the last two rounds of sampling. Total cyanide concentrations indicate cyanide may be migrating into the waterway; however, it is not in the more toxic free cyanide form. The S&G-OU1 Steering Committee has requested that total cyanide be removed from the analytical list; however, EPA

has no approved the request. A determination on the appropriate cyanide analysis method and the potential to impact the waterway should be completed.

Five-Year Review Sampling Event

As part of the Five-Year Review, EPA requested sampling of all monitoring wells at S&G-OU1 and analysis for the full list of COCs identified in the ROD. In addition, VOCs, semivolatile organic compounds (SVOCs), and additional metals (antimony and chromium) were analyzed at the point of compliance wells to determine if the remedy is functioning as intended. EPA requested that the sampling be conducted during a period of low tides to confirm that the samples are representative of fresh groundwater emanating from the interior of the island.

Table 6-4 (Chapter 6 Tables are located in a separate section at the end of this report) presents the results of the Five-Year Review sampling event. COCs were compared to the cleanup goals presented in the 1993 ROD. All additional constituents were compared to National Recommended Water Quality Criteria (NRWQC) for marine acute and chronic exposures and for human consumption of organisms. Generally, the results of the low-tide sampling event show detected concentrations of constituents are slightly higher than those historically detected. This indicates that there could be a relationship between the tidal cycle and constituent concentration that future sampling events should take into consideration.

A brief summary of the results follows.

- Several metals and cyanide were detected above the ROD cleanup goals. These detections are consistent with concentrations historically observed. Copper was detected above the ROD cleanup goal at monitoring well FW-1, which is located in the Todd Shipyard area. This well is near an active petroleum remediation system, which likely alters geochemical conditions in groundwater and increases solubility of heavy metals. Concentrations of copper in HI-10 and concentrations of mercury in HI-6 slightly exceeded the ROD cleanup goals. This is consistent with concentrations historically observed. Concentrations of arsenic, cadmium, lead, nickel, and zinc at monitoring well HI-17 were also observed above ROD cleanup goals. This is consistent with previously detected concentrations as discussed above.
- PCE, a ROD constituent, was detected at a concentration of 1.7 µg/L at HI-7. Although this concentration is below the ROD cleanup goal of 8.8 µg/L, the well is near the LU-OU3 boundary where PCE has been detected in several monitoring wells (see Section 6.4.2). If the groundwater flow direction in this area is inland, then HI-7 is directly downgradient from this PCE contaminated area. Therefore, future sampling events should include PCE at HI-7 to monitor potential on-site migration.
- Of the additional constituents requested as part of the Five-Year Review sampling event, only one was found above NRWQC values. Bis(2-ethylhexyl)phthalate was detected at HI-5 at a concentration of 7.3 µg/L, which slightly exceeds the NRWQC of 2.2 µg/L. This analyte should be included in future sampling events to determine if it represents a potential remedy problem.

6.3.3 Site Inspection

No site inspection was conducted.

6.3.4 Site Interview

No interviews were performed.

6.4 TANK FARMS OPERABLE UNIT (TF-OU2)

6.4.1 Document Review

This Five-Year Review consisted of a review of relevant documents as summarized in the References section at the end of this report. Documents can be reviewed at the Ecology, Northwest Regional Office. Applicable groundwater and surface water cleanup standards were also reviewed. All information was provided by Ecology who is the lead regulatory agency for the site.

6.4.2 Data Review

Institutional Controls. As part of the remedial action for each facility, restrictive covenants were required to be filed with King County. The covenants were to follow the MTCA Cleanup Regulations and identify the contamination that existed at each facility, provide for continued industrial use of the property, prohibit groundwater taken from the property, provide for safety and notification of site workers, prohibit activities that would release or cause exposure to contamination, provide for continuance of remedial actions given property transference, and provide for Ecology access.

All three facilities' restrictive covenants are on file with King County. Since contamination remains at each of these facilities, the objectives of the covenants are still applicable.

In-Situ Remedial Systems

Design and construction of an air sparging and SVE system was completed along the western property boundary of A Yard in the KM facility during 2006. The KM system is shown on Figure 6-6 (located at the end of this document). The purpose of this remedial system was to function as a bio-sparge barrier to prevent migration of petroleum contamination in groundwater outside property boundaries. It is a requirement in the CAP for this facility to install a barrier to prevent off-property migration of contamination in groundwater at this location. The system consists of five air sparging wells spaced along a 250-foot section of the property boundary installed to approximately 15 feet below ground surface. Trenches with horizontal soil-vapor extraction piping were constructed coincident with the sparge wells. The system has operated continuously since December 2006.

Design and construction of an SVE system was completed as a contingency action along the southern property boundary of Plant 1 in the BP facility during 2007 and 2008. The BP system is shown on Figure 6-7 (located at the end of this document). Installation of this system was initially prompted by stable contaminant levels persisting above standards in a "sentry" monitoring well (AR-03). It is a requirement in the CAPs for the facilities that contingency actions be taken in situations that could affect timely achievement of cleanup standards. Twelve borings were completed to further characterize contamination in the area. A previously-unidentified area of weathered hydrocarbon soil contamination from historic spills was discovered. Four additional monitoring wells were subsequently installed. The identified area of contaminated soil was not accessible for excavation and in situ treatment was required. The SVE system consists of ten horizontal extraction wells located in parallel trenches extending for about 240 feet along the property boundary. The system was built with the capacity to include air sparging if required, and has operated continuously since October 2008.

During 2002, an extensive remediation system was constructed in the BP facility's Plant 1 along the shoreline of the West Waterway. (The BP Plant 1 system is shown on Figure 6-8 [located at the end of this document]). The system was designed to remediate a large area of inaccessible soil, free product, and groundwater contamination behind the bulkhead and beneath a warehouse and loading rack. It also provided hydraulic control to prevent sheen and

contaminated groundwater from entering surface water. The system includes 10 product/groundwater recovery wells, 12 sparge wells, and 22 horizontal vapor recovery wells. Operation of the system began in early 2003 and it continues to operate at present. The air sparging component was altered to operate in a rapid on-off pulsed mode to increase groundwater movement and enhance oxygen dissolution. Two sparge wells were added to the system for two years in an attempt to address benzene levels above the standard (71 parts per billion [ppb]) in a nearby compliance monitoring well (AMW-01). All air sparging and SVE components of the system were discontinued during 2008 because performance data from the system indicated the bulk of available hydrocarbons had been recovered and that continued operation of these components was no longer beneficial. Benzene concentrations remain elevated at two monitoring wells adjacent to the shoreline. Capture zone analyses performed during the remedial system design indicate that the hydraulic containment was met. Since concentrations remain elevated, it is uncertain if hydraulic containment is currently maintained. Additional data analysis should be performed and the system modified as necessary.

Passive product recovery (absorbent socks) was completed in six wells, where measureable free product occasionally occurred.

Natural Attenuation

As previously described, subsurface TPH "hot spots" in two separate areas (Shoreline Manifold Area at Shell and A Yard at KM) had previously been identified above applicable total TPH soil standards during RI work during the mid-1990s and were re-sampled in 2009. Total TPH levels were significantly reduced in both areas, which is direct evidence that natural attenuation is taking place. Data from wells throughout the TF-OU2 indicate hydrocarbon concentrations are stable or declining, which is also evidence that ongoing natural attenuation is actively reducing the hydrocarbon mass. Geochemical parameter data indicative of natural attenuation (DO, nitrate, dissolved iron, sulfate, methane) were analyzed in select wells at the KM facility. The analyses indicated both aerobic and anaerobic biodegradation are occurring, and that the complete range of degradation processes have been and are active at the site.

Groundwater Monitoring

Groundwater data is provided quarterly from each facility. Figure 6-9 (located at the end of this document) shows the location of monitoring wells at TF-OU2. The Groundwater Compliance Monitoring Plans included within the CAPs for each facility provide for reducing monitoring requirements given declining contaminant levels. Based on long-term data, the numbers of analytes and the sampling frequency have been reduced in many select wells throughout the TF-OU2.

Groundwater elevation measurements were historically collected quarterly and groundwater flow maps produced for each separate facility. In general, an area of higher groundwater elevation coincides with the unpaved areas within the BP, Shell, and KM facilities, where most of the large bulk fuel storage tanks are located. Shallow groundwater flows radially outward from the area of higher elevations. Groundwater flow maps produced quarterly over many years for the individual facilities have shown minor seasonal variations within the facilities, but that the overall groundwater flow pattern within TF-OU2 is very consistent.

Since the quarterly groundwater flow maps are no longer produced, a combined groundwater flow map for the entire TF-OU2 was produced using elevations acquired during November 2009 from wells within each facility. The new map showed that groundwater flow in the north-central part of Harbor Island is generally the same as was indicated in a map produced during the early 1990s. This recent groundwater flow map is presented in Figure 6-10.

A summary of groundwater data collected since 2005 is presented in Tables 6-5 through 6-8 (Chapter 6 Tables are located in a separate section at the end of this report). Monitoring wells are analyzed for TPH-G,-D,-O (gasoline, diesel, oil range), BTEX, cPAHS, arsenic and lead. CPAHs are currently only sampled for in compliance wells screened below bulkheads in the two shoreline areas. Figures 6-11 through 6-14 (located at the end of this document) show the monitoring wells located at each facility. A brief summary of the water quality at TF-OU2 is as follows:

- BP Plant 1 (Figure 6-11):
  - Monitoring well GM-18S was installed in the northeast part of the property as part of the RI. The well has not been monitored and apparently no contamination was identified in the northern area of BP's Plant 1. There is no indication that groundwater contamination interior to Plant 1 migrates towards the northern area.
  - Monitoring wells GM-15S and GM-16S are long-established wells and have been below applicable cleanup levels for many years.
  - MW-3-T9, MW-4-T9, and MW-1-T9 are newer wells monitored since 2006. Data from these wells indicates contaminant levels below applicable cleanup levels since then.
  - Monitoring well AR-03 is located near the southern property boundary of BP's Plant 1. Levels of TPH-G and benzene slightly exceed applicable cleanup standards on occasion. A soil-vapor-extraction system operates immediately upgradient from this well, and contaminant levels appear to be declining.
  - The western boundary of TF-OU2 is a 700-foot area adjacent to the West Water Way at BP's Plant 1. Monitoring wells near the shoreline in this area include AMW-05, AMW-04, AMW-03, AMW-02, and AMW-01. These wells are screened below the bulkhead structures to monitor groundwater flowing beneath to surface water. The cleanup level for benzene has been exceeded in AMW-01 since 2005 and in AMW-02 since 2007. These wells are the southernmost wells along the bulkhead. Average benzene levels since September 2005 are 280 µg/L (AMW-01) and 92 µg/L (AMW-02). The data are variable, but appear to be generally stable with no observed increase. Contaminant levels in the other three shoreline wells (AMW-03, AMW-04, and AMW-05) have been below cleanup levels for many years.
  - As described above, stable but persistent levels of benzene above the cleanup level persist in two compliance monitoring wells, AMW-01 and AMW-02. An investigation was completed to determine a possible localized source of benzene affecting these wells but a source was not found. Two additional air sparge wells were added to the remediation system proximate to these wells, but this had little effect on the benzene levels.
  - It is uncertain if the groundwater recovery component of the remediation system at the bulkhead area continues to operate optimally as per the capture zone analyses conducted during the Engineering Design. The only known source of benzene is in the area of the operating SVE system to the southeast. Additional data analysis or investigation should be performed and the system modified as necessary.

- BP Plant 2 (Figure 6-12):
  - Monitoring wells GM-20S, GM-21S, GM-22S, GM-23S, and MW-03R were installed as confirmation monitoring wells after extensive excavation and removal of TPH-contaminated soil in Plant 2 during 2000. Monitoring was discontinued in these wells during 2003–2004 after many quarters of sampling results indicated petroleum constituents were and remained below cleanup levels.
  - Monitoring well GM-20S was installed as part of the RI and indicated that contamination was not present in the northwest area of Plant 2. GM-20S was not monitored after the RI; however, data from KM interior wells south of Plant 2 are below cleanup levels indicating there is no impact to Plant 2 from the south.
  - An interior monitoring well, GM-19S, at the southern extent of Plant 2 was impacted by an unknown off-property release during 2000. This interior well currently exceeds the cleanup level for benzene, but the level is declining.
- Kinder Morgan (Figure 6-13):
  - Monitoring wells along the eastern boundary, MW-1, SH-02R, MW-13R, MW-4, MW-12R, MW-07R, and SH-05R, contain petroleum constituents that have been below cleanup levels for 5 years or longer. Total lead levels slightly above the cleanup level are exceeded occasionally in some of these wells.
  - Monitoring wells A-28R, MW-24, and MW23 are proximate to each other near the intersection of 13th Avenue SW and SW Lander Street on the southwest property line of A Yard. Contaminant levels for TPH-G and benzene are stable, but have persisted above cleanup levels during 2005–2010. Contaminant levels in monitoring well A-23R (near MW-23) have been below appropriate cleanup levels since 2007. An air-sparge\SVE system operates in the near vicinity upgradient from these wells (excepting A-28R).
  - Well MW-21 is located on the southeastern boundary of B Yard near remaining inaccessible soil at a former TPH "hot spot." Contaminant levels have been below applicable cleanup levels in this well since 2006.
  - Monitoring wells A-21, A-14R, A-10, MW-25, and A-8 are along the southern and southeastern boundaries of A Yard and have been below applicable cleanup levels for many years.
  - Four additional monitoring wells were installed in C Yard in the KM facility to augment the existing well coverage in this area. During 1996, a 48,000-gallon gasoline spill occurred in C Yard. Interim actions during 1996 and 1997 addressed the bulk of the spill, but remnant contamination was subsequently addressed in the CAP for this facility. Even though this area is inland, the total TPH soil cleanup standard was established at 10,000 ppm (the shoreline area standard). Cleanup actions were implemented prior to 2005 and included excavation of seven areas of subsurface soil above 10,000 ppm TPH, and the operation of an air-sparging system throughout the yard for 2 years. The new wells were installed to confirm the long-term effectiveness of the cleanup action for the spill. Analytical data from all wells in C Yard indicated contaminant levels in groundwater throughout the yard are below groundwater cleanup levels.

- Shell Main Terminal/Tank Farm (Figure 6-14):
  - Monitoring wells TES-MW-1, MW-101, MW-105, MW-102, MW-111, MW-112, and TX-06 have been below cleanup levels for petroleum constituents and metals for 5 years or longer. MW-105 occasionally exceeds the cleanup level for total lead.
  - TX-03 is located north of and downgradient from the Main Tank Farm, and contaminant levels persist above cleanup levels for total petroleum hydrocarbons as gasoline (TPH-G) and benzene. As a contingency action, five borings were done in the vicinity of the well to investigate. Elevated levels of gasoline contamination in groundwater were found in two borings, but a consistent area of groundwater contamination was not apparent. There was no associated area of subsurface soil contamination. Further evaluation of the data and situation is warranted.
  - Monitoring data from a Sentry Well (SH-04) at the eastern property boundary of Shell's Main Tank Farm demonstrated stable contaminant levels persisting above groundwater standards. As a contingency action, eight borings were done in the vicinity of the well to investigate. An area of gasoline-impacted groundwater was found primarily in 13th Avenue SW (the street separating the Shell and KM facilities). This area of contamination merged with a known area of groundwater contamination in 13th Avenue outside the western boundary of A Yard in the KM facility. Forensic analyses of groundwater contamination within A Yard and in the adjacent street indicated the contamination in the street could be of a different nature. An additional monitoring well was installed and confirmed that contaminant levels were above standards in the street. There are large fuel pipelines beneath the street, but the nature of the contamination does not indicate an ongoing source. There was no area of subsurface soil contamination found associated with the area groundwater contamination. The source of the contamination in 13th Avenue is unknown, and further evaluation of this area is warranted.
- Shell North Tank Farm Area (Figure 6-14):
  - Contaminant levels in monitoring wells MW-201, MW-203, MNW204 have been below applicable cleanup levels since 2007.
  - Monitoring well MW-202 is in the southern interior of the North Tank Farm Area. Contaminant levels for TPH-G above cleanup levels persist in this well.
- Shell Shoreline Manifold Area (Figure 6-14):
  - This area includes a 200-foot shoreline area along Elliot Bay. Two monitoring wells in this area (Wells MW-213 and MW-214) are screened as appropriate below a bulkhead to monitor groundwater flow beneath to surface water. Contaminant levels in these wells have been below applicable cleanup levels for many years.

6.4.3 Site Inspection

No site inspection for this Five-Year Review was conducted.

6.4.4 Site Interview

No interviews for this Five-Year Review were performed.

6.5 LOCKHEED UPLAND OPERABLE UNIT (LU-OU3)

6.5.1 Document Review

This Five-Year Review consisted of a review of relevant documents as summarized in the References at the end of this report. Documents can be reviewed at EPA Region 10 Superfund Records Center. Applicable groundwater and surface water cleanup standards were also reviewed.

6.5.2 Data Review

Institutional Controls. The objectives of the ICs required in the ROD were to (1) warn future property owners of remaining contamination under capped areas on their property, (2) require future owners and operators to maintain these caps, and (3) specify procedures for handling and disposal of excavated contaminated soil in future excavation is necessary.

A review of ICs associated with the LU-OU3 was conducted by Tetra Tech, Inc., the consultant for Lockheed Martin Corporation. The purpose of this review was to ensure that ICs are appropriate, in place, and are effective across the site. The following information was requested by EPA:

1. Documentation of all ICs in place for the LU-OU3.
2. Copies of all instruments that conveyed any interest in any portion of the LU-OU3 since 15 days of entry of the CD, with the required provision of access and necessary restrictions or covenants.
3. Figures showing parcel boundaries and survey information.
4. Current information about all lessees or users of the LU-OU3.
5. An ICS that must provide, at a minimum, a title search; copies of encumbrances; evaluation of whether encumbrances negatively impact existing controls; evaluation of compliance with ICs; evaluation of any current human or potential human or ecological exposures; evaluation of any threatened or existing inconsistencies that could lead to exposures; evaluation of the protectiveness and effectiveness of all ICs; evaluation of all instruments, any proposed additional controls; certification that each CD and all other instruments were properly recorded; certification that all property transfer deeds contain obligation to provide access and maintain ICs and require all future transfers to do so; and recommendations.

EPA is currently in the process of reviewing the above data. An initial evaluation of the submitted documentation indicates the objectives are still appropriate. Potential issues with the existing ICs include: (1) proper conveyances may not have been completed for the lease agreement for the ARCO property and (2) the future integrity of the cap is dependent on the Port of Seattle completing the Terminal 10 Utility Infrastructure Upgrade Project (discussed below). In addition, EPA noted several deficiencies in the documentation and requested the following in a letter dated February 12, 2010:

- Consider establishing a restrictive covenant under the recently enacted Washington variation of the Uniform Environmental Covenant Act (UECA). This would obligate all future property interests and give EPA direct enforcement rights to prohibit excavation without written EPA approval.
- Provide further justification to support the ICS memo statement that there are no exposures.

Cap Inspections and Maintenance. The Port of Seattle is responsible for maintaining the integrity of the cap.

Problems with ponded water, asphalt cracks, and plant growth through cracks are frequently reported at the LU-OU3. The ponded water also limits the access to two of the monitoring wells, LMW3 and LMW25.

Inspection reports for 2006 and 2007 cited numerous cracks in the asphalt and concrete at Cap Area 2. Subsequently in 2008, an Interim Maintenance Plan for Terminal 10 (Windward Environmental 2008) was developed to repair these problems and support routine maintenance of the cap areas. The following criteria are currently used for determining required maintenance:

Observed Asphalt Cap Condition	Required Repair Action
Cracks over a 5-square-foot area and observed to be penetrating the cap cross section and causing asphalt breakage or exfoliation.	Crack cleaning and sealing or, if not feasible, asphalt section replacement (paving).
Series of parallel cracks >2 feet long; i.e., indicative of slumping and pavement separation on sloped areas.	Crack cleaning and sealing or section replacement.
Cracks >1/8-inch wide and not penetrating the cap cross section. No plant growth present.	No action. Continue to monitor.
Cracks >1/8-inch wide and determined to penetrate the cap cross section or providing a substrate for plant/weed growth.	Crack cleaning and sealing (routing not required).

All of the cap repairs were complete by the summer of 2008. The July 2008 annual cap inspection noted that the repairs were complete with the exception of sediment that had accumulated in previously pooled areas of the site. The Port of Seattle performed some additional repairs/maintenance to resolve this and other issues identified in the July 2008 report. The cap inspection completed in 2009 recommended plant growth be removed and asphalt cracks be patched. These repairs are to be completed prior to the 2010 inspection.

The repairs described above did not address the larger problem of ponded water at the site. This ponded water may increase the potential for infiltration and mobilization of soil contamination. Completion of the Port of Seattle's Terminal 10 Utility Infrastructure Upgrade Project, which would upgrade the existing storm water system, proposed redevelopment and cap improvements, which includes stormwater controls, is necessary to ensure the future integrity of the cap and protect ecological receptors in the waterway.

Long-Term Groundwater Monitoring

Figure 4-3 shows the monitoring wells at the LU-OU3. Eleven monitoring wells were originally included in the program and are listed in Table 6-9 (Chapter 6 Tables are located in a separate section at the end of this report). Chemical analyses are specific to the impacted area and are also listed in Table 6-9.

Due to construction and remediation activities at the site, several of the original wells in the monitoring well network have been damaged and subsequently decommissioned or removed (LMW4, LMW10, and LMW-15). In addition, monitoring wells LMW3 and LMW25, located in the central portion of the site are periodically inaccessible due to standing water.

In 2005 and 2006, nine new monitoring wells were installed at the site to address source control for the LSS-OU7. Six of the wells are located adjacent to the existing bulkhead (LMW30, LMW31, LMW32S, LMW32D, LMW33, and LMW34) and three wells are located along the eastern edge of the property (BG-01, BG-02, and BG-03). Reporting for the two groundwater monitoring programs is currently provided under separate cover, and each has separate objectives. Lockheed proposed consolidation of the monitoring programs in 2007; however, the plan was never approved. The following groundwater issues should be addressed prior to the programs consolidation:

- A tidal study was completed in 2006 following the installation of the new 40-foot-deep bulkhead wall. The tidal study concluded the net groundwater flow direction was away from the West Waterway. All wells showed a tidal response including those located over 300 feet inland. Wells located along the shoreline below the bulkhead (LMW32D) and south of the bulkhead (LMW30) showed a larger tidal response than those directly behind the bulkhead. The results of the tidal study indicate that the bulkhead may be influencing the direction of groundwater flow. The groundwater flow direction and influence of the bulkhead should be verified prior to consolidating the monitoring programs.
- An evaluation of the conductivity/total dissolved solids was used to determine if monitoring wells are appropriately screened (Lockheed Martin Corporation 2008a). It was determined that wells in the original network, LMW3, LMW7, and LMW18, are screened in freshwater, and LMW9, LMW12, LMW27, and LMW26 are screened in slightly brackish water. Monitoring wells installed as part of the LSS-OU7 behind the bulkhead showed conductivity/total dissolved solids ranging from slightly brackish to slightly saline. One deep well (LMW-32D) was installed below the bulkhead and shows salinity values typical of saltwater. Lockheed concluded that the well screens were appropriate; however, EPA has not concurred.
- The LU-OU3 and LSS-OU7 have different groundwater monitoring objectives. The objective of the LU-OU3 monitoring program is to monitor contaminants at and downgradient of the source area. A shallow well screen interval may be appropriate for this objective regardless of the salinity present in the well. The objective of the LSS-OU7 monitoring program is to demonstrate source control so that the sediment cap will not be re-contaminated. Monitoring wells for this purpose should be designed to intercept groundwater that is discharging to the waterway. At other areas around the island, monitoring wells are screened below bulkheads. At the LU-OU3, the new bulkhead is 40 feet deep and wells screened below the bulkhead will likely be within the saltwater zone (e.g., LMW-32D screened from 40 to 55 feet bgs) and not indicative of freshwater emanating from inland areas. An evaluation of the well screen location necessary to meet each objective should be completed.
- Monitoring wells LMW3 and LMW25 are frequently inaccessible due to standing water. The Port of Seattle is currently designing a Utility Infrastructure Upgrade Project that will mitigate problems with standing water. Following completion of this project, monitoring well requirements for remaining source areas should be re-assessed.

Five-Year Review Sampling Event

As part of the Five-Year Review, EPA has requested that all monitoring wells at the LU-OU3 are sampled for a comprehensive list of analytes including VOCs, SVOCs, chlorinated pesticides, PCBs, TPH, metals, and cyanide. EPA requested that the sampling be conducted during a period of low tides to confirm that the samples are representative of fresh groundwater emanating from the interior of the island.

Table 6-10 (Chapter 6 Tables are located in a separate section at the end of this report) presents the results of the Five-Year Review comprehensive sampling event. COCs were compared to the cleanup goals presented in the 1994 ROD and the NRWQC for marine and chronic exposures and for human consumption of organisms. A brief summary of the results follows:

- LMW25 was not sampled because it was inaccessible.
- Arsenic, copper, nickel, zinc, bis(2-ethylhexl)phthalate, and PCE were detected above screening levels or ROD cleanup goals.
- Several pesticides (4,4'-DDD; 4,4'-DDE; dieldrin; and heptachlor epoxide) were detected at estimatible quantities.

The current analyte list for the groundwater monitoring program at the LU-OU3 is based on COCs historically identified in impacted areas. The results of the Five-Year Review sampling event indicate that the area specific analyte lists may be not adequate. For example, copper, nickel, and zinc were detected at elevated concentrations at LMW27 where only VOCs are analyzed for the long-term monitoring program. Therefore, the groundwater monitoring analyte list for each well and remaining source should be re-evaluated to ensure the remedy remains protective.

Long-Term Monitoring Analytical Data

The analytical data for the LU-OU3 long-term groundwater monitoring is presented in Table 6-11 (Chapter 6 Tables are located in a separate section at the end of this report). The analytes for each well are listed in Table 6-10. As discussed above, the net groundwater flow direction could be inland rather than radially outward as described in the RI. Therefore, the following summary assumes that groundwater flow could occur either toward or away from the West Waterway. Results from the LSS-OU7 groundwater monitoring program are also considered as they relate to source area constituents.

- Benzene has not been detected above the cleanup goal of 71 µg/L since April 1999.
- Lead was detected once above the cleanup level of 5.8 µg/L at a concentration of 7.39 (total lead) in the last 5 years at monitoring well LMW18.
- Zinc was detected once above the cleanup level of 76.6 µg/L at monitoring wells LMW3 and LMW25. The maximum concentration detected was 373 µg/L (dissolved zinc). It should be noted that LMW25 was inaccessible for all but two sampling events during the last 5 years.
- PCE was detected above the cleanup level of 8.8 µg/L in the last five years at monitoring well LMW3. PCE appeared to be decreasing; however, the Five-Year Review sampling event in March 2010 detected it just above the cleanup goal. Figure 6-15 (located at the end of this document) shows the PCE concentrations over time at impacted area well LMW3 and potential down-gradient wells LMW25 (groundwater flow toward waterway) and BG-02 (groundwater flow away from

waterway). LMW25 has not detected PCE in the last five years and BG-02 has consistently detected PCE, but at low concentrations. The data indicate that although PCE contamination remains near LMW3, it has not migrated away from the source.

- PCE was detected above the cleanup level of 8.8 µg/L in the last five years at monitoring wells LMW12, LMW27, and LMW26. These wells are located along a transect at the northern portion of the site. Figure 6-16 (located at the end of this document) shows the PCE concentration over time at these wells along with potential down-gradient well LMW9 (away from waterway). LMW12, LMW27, and LMW26 all have had an increasing trend since 2002. There is also an indication of seasonal influence since concentrations in April (wet season) tend to be much higher than in October (dry season). The 2006 tidal study indicated that groundwater flow is inland. Confirmation of the groundwater flow direction is necessary to determine if PCE has the potential to impact the waterway. Additional evaluation of the source may also be required.
- Copper was detected above the cleanup level of 2.9 µg/L in the last five years at monitoring wells LMW3 and LMW25. Figure 6-17 (located at the end of this document) shows the concentrations of total copper over time at impacted area well LMW3 and potential down-gradient wells LMW25 (groundwater flow toward waterway) and BG-02 (groundwater flow away from waterway). The data do not indicate any trends; however, wells LMW3 and LMW25 are frequently inaccessible.
- Copper was detected above the cleanup level of 2.9 µg/L in the last five years at monitoring well LMW18. Figure 6-18 (located at the end of this document) shows the concentrations of copper over time at the impacted area well LMW18 and the potential down-gradient well LMW15 (groundwater flow toward the waterway), which was abandoned in 2003. LMW7 is a potential down-gradient well if groundwater flows away from the waterway; however, copper is not analyzed at this well. Due to this lack of down-gradient data, it cannot be determined if contaminants have migrated from the impacted areas.

6.5.3 Site Inspection

An inspection of the site was conducted on March 4, 2010, by the EPA RPM, Ravi Sanga, and USACE hydrogeologist, Sharon Gelinas. Site photographs are presented in Appendix A. The purpose of the inspection was to observe the condition of the capped areas.

Hay bales were observed at the boundary of the LU-OU3 and West Waterway to prevent sediment-laden stormwater flows from entering the waterway. Ponded water was also observed in several areas; however, it was difficult to determine if the water was located over the designated Cap Areas.

6.5.4 Site Interview

No interviews were performed.

6.6 LOCKHEED SHIPYARD SEDIMENT OPERABLE UNIT (LSS-OU7)

6.6.1 Document Review

The remedial action at the LSS-OU7 was completed on February 4, 2005. The OMMP was approved in September 2006. Final post-remedy sampling and survey data was used to serve

as a baseline of COC concentrations remaining after remediation against which future monitoring results would be compared. Future monitoring results would be used to determine whether the remedy is functioning as required and/or if the surrounding area is causing or contributing to recontamination of the LSS-OU7. The first OMM activities and results cover the time from establishment of the baseline in March 2005 through August 2006 (Year 1). OMM Reports have been submitted annually. This five-year review includes all post-remedy monitoring through 2009.

The RPM has reviewed the four annual OMM Reports (Years 1 – 4), compared results with baseline results and has determined that no Response Actions are necessary, except for the some replacement plantings for the Riparian Buffer. Additional plantings were installed in the Fall of 2009 to fill the void of small plantings. Even with the absence of the small plantings, the larger shrubs and small trees serve as a cover for birds and provide a buffer area between the industrial area and the Habitat Beach.

6.6.2 Data Review

The RPM reviewed the sediment chemistry and survey data from each annual OMMP report and concluded that no response actions were necessary because the COCs that were detected were below the SQS cleanup numbers designated as cleanup goals in the ROD, and there were no significant elevation changes in the dredged or capped areas of the LSS-OU7. The results of the monitoring events are provided in Table 4-5.

Results from the various monitoring events indicate that the cap is stable, that surface sediments in the Open Channel are below the cleanup numbers, and that fine-grained sediments cannot be located for sampling in the Slope and Beach Area. Observations of the Riparian Buffer indicate that the larger shrubs, such as shore pines and alders appear to be healthy, while the smaller vegetation is absent due to damage by geese. Conclusions based on monitoring events are shown in Table 4-6.

No ICs were specified in the ROD, subsequent ESDs, or the CD for the LSS-OU7. Specific institutional controls beyond best management practices and review of permit applications through the USACE have not been implemented nor has an Institutional Controls Study been completed.

6.6.3 Site Inspection

The RPM inspected the LSS-OU7 on October 1, 2009, during a low tide and found the site to be consistent with previous inspections.

6.6.4 Site Interview

The RPM met with Glen St. Amant of the Muckleshoot Tribe on January 20, 2010, to discuss whether the Tribe had any concerns or questions regarding the LSS-OU7 cleanup. The Tribe does not have any concerns regarding the protectiveness of the cleanup as completed for ecological risk. Also, Mr. St. Amant agreed that a risk to Tribal fishers and consumers of seafood from the LSS-OU7 area was not a concern because the completed remedy was based on dredging to native material and a containment cap over in-place contaminated sediments. The only detected chemicals (still under levels of concern for ecological risk) are from deposition of contaminated sediments outside the LSS-OU7. EPA determined that the deposition was from outside the LSS-OU7 because of the nature of the sediments observed during sampling (were finer and fluffier) and the results of the chemical analysis of the deposited material. The area subject to deposition of contaminated sediments is about 5 acres in the open waterway.

6.7 WEST WATERWAY SEDIMENTS OPERABLE UNIT (WW-OU8)

Since there was no remedial action for the WW-OU8, a five-year review is not required.

6.8 TODD SHIPYARDS SEDIMENTS OPERABLE UNIT (TSS-OU9)

6.8.1 Document Review

The remedial action at the TSS-OU9 was completed in February 2007. The OMMP was approved in August 2007. Final post-remedy sampling and survey data was used to serve as a baseline (Year 0) against which future monitoring results would be compared. The OMMP Baseline Monitoring Report was submitted to EPA in December 2007. Future monitoring results would be used to determine whether the remedy is functioning as required and/or if the surrounding area is causing or contributing to recontamination of the TSS-OU9. The first OMM activities and results cover the time from establishment of the baseline in October 2007 through October 2008 (Year 1). OMM Reports have been submitted annually. This five-year review includes all post-remedy monitoring through 2009.

The RPM has reviewed the OMMP Baseline Monitoring Report (Year 0) and two annual OMM Reports (Years 1 and 2), compared results with baseline results and has determined that no Response Actions are necessary.

6.8.2 Data Review

The baseline cap integrity monitoring consisted of diver surveys along 17 specified transects in the capped areas. These transects are located at Piers 1, 2P, 3, 4N, 5, and 6 at the over-water area at the building berth. Detailed diver observations and comments (documented on audio/video recordings) were made at 10-foot increments along each transect and included a determination of whether the substrate is a sand cap, or sediment previously capped but uncovered due to erosion or downslope movement of cap material. Two surface samples of in-place cap material were collected from each of the 17 capped area transects using diver cores. These samples were tested to determine grain-size distribution of the cap material for future comparison. The sand cap consisted of medium to coarse sand.

The RPM reviewed the diver visual survey data from the baseline and each annual OMM report and concluded that no additional response actions were necessary because there is no evidence that significant erosion of cap material has occurred. The presence of shell debris and silts indicate that the area has not been subject to erosional forces. Results from the various monitoring events indicate that the cap is stable with build-up of shell debris and/or silts over time.

No ICs were specified in the ROD, subsequent ESDs, or the CD for the TSS-OU9. Specific ICs beyond best management practices and review of permit applications through the USACE have not been implemented; however, Todd submitted information on ICs per EPA's request. EPA has determined that the PRPs need to conduct an Institutional Control Study to specifically identify what ICs are needed and the process for implementing them.

6.8.3 Site Inspection

A site inspection is not necessary because the remedial action, which was comprised of dredging and capping contaminated sediments, is not visible. However, annual monitoring includes diver's video surveys of the capped sediments. Diver observations during these

annual inspections are included in the annual OMM report, which were reviewed as part of this Five-Year Review.

6.8.4 Site Interview

The RPM met with Glen St. Amant of the Muckleshoot Tribe on January 20, 2010, to discuss whether the Tribe had any concerns or questions regarding the TSS-OU9 cleanup. The Tribe does not have any concerns regarding the protectiveness of the cleanup as completed for ecological risk. Also, Mr. St. Amant agreed that a risk to Tribal fishers and consumers of seafood from the TSS-OU9 area was not a concern because the completed remedy was based on dredging to native material or placement of cap over in-place contaminated sediments.

6.9 EAST WATERWAY SEDIMENTS OPERABLE UNIT (EW-OU10)

Since there was no remedial action for the East Waterway Sediments OU, a five-year review is not required.

7. TECHNICAL ASSESSMENT

7.1 SOIL AND GROUNDWATER OPERABLE UNIT (S&G-OU1)

7.1.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy has been fully implemented with the exception of recording some of the institutional controls. All of the Hot Spot Soils have been removed and disposed of off-site or properly treated. Remaining areas that contain concentrations of COCs above the ROD cleanup goals have been capped. LNAPL removal is ongoing at Todd Shipyard. A long-term groundwater monitoring program has been developed. Institutional controls have been implemented; however, several of the properties do have not restrictive covenants in place and have not been completing annual cap inspections.

Remedial Action Performance and Monitoring

Groundwater monitoring is used to verify that the low permeability cap is limiting infiltration of rainwater and thus limiting contaminant migration. A long-term groundwater monitoring program has been developed for S&G-OU1, and the well network is currently being evaluated to ensure that freshwater emanating from the center of the island is monitored. Several conductivity assessments have been completed to determine the appropriate screen intervals, and new, deeper wells have been installed. A decision on the final groundwater monitoring network is pending one year of quarterly sampling of these new wells.

Overall, groundwater monitoring data indicate that the cap is limiting contaminant migration. The long-term groundwater monitoring data show that VOCs have not been detected above ROD cleanup goals. Concentrations of metals above cleanup goals are limited to an area near Todd Shipyard, which contains an active petroleum remediation system, a newly installed interior well (HI-17), and sporadic detections that slightly exceed cleanup goals. Total cyanide is frequently detected throughout the island; however, the more toxic free cyanide (analyzed using the available cyanide method) has not been detected since June 2009. The Five-Year Review sampling event, which was completed during a low-tide cycle, showed higher concentrations of metals at several wells and a detected concentration of PCE at one well (HI-7), which has historically not contained VOCs.

To ensure that the remedy remains protective, the following groundwater monitoring program modifications should be completed:

- Consider the impacts of a correlation between tidal cycle and constituent concentration in nearshore wells during future sampling events.
- Add analysis of PCE at HI-7 to determine if there is on-site contaminant migration from the LU-OU3.
- Add analysis of bis(2-ethylhexl)phthalate at HI-5 to determine if there are potential remedy problems.
- Complete an additional groundwater flow assessment near HI-17 to verify that groundwater is being captured by the sanitary sewer and not migrating toward the waterway.
- Determine the appropriate cyanide analytic method and evaluate the potential for cyanide to impact the waterway.

Systems Operations/Operations and Maintenance

LNAPL removal is ongoing at Todd Shipyard and has removed over 300,000 gallons of product. A geoprobe investigation in 2008 identified areas of remaining LNAPL at the site and estimated the remaining volume between 36,000 and 50,000 gallons. A system modification was subsequently proposed that included installation of three new extraction wells in late 2009 to focus remediation efforts on the remaining contamination near the Aluminum Shop Building. In addition, a revised procedure to determine when LNAPL recovery will cease has been developed. This procedure will be completed on a well by well basis to verify that all recoverable LNAPL is removed.

Costs of Systems Operations/O&M

Costs for system operations and O&M were not reviewed.

Opportunities for Optimization

The LNAPL system has recently been modified to recover the remaining LNAPL at the site. A review of the new recovery well data has not been completed to determine if the system is optimized. A soil "hot spot" containing heavy NAPL was also identified at Todd Shipyard during the 2008 geoprobe investigation. The extent of this "hot spot" should be determined and remedial options evaluated.

As stated above, the long-term groundwater monitoring program well network will be finalized after a review of the data collected from the newly installed monitoring wells. Additional modifications to the groundwater monitoring program are also listed above.

Indicators of Potential Remedy Problems

Detections of metals concentrations above ROD cleanup goals at the inland well HI-17 indicate that groundwater contamination remains at isolated locations in the interior of the island. To verify that this contamination is contained on the island, a groundwater flow assessment near HI-17 should be conducted. This assessment may include a tidal study.

PCE was detected at HI-7 during the Five-Year Review sampling event at concentrations below the ROD cleanup goals. This well is located near the LU-OU3 boundary in an area that contains PCE in groundwater. Lockheed performed a tidal study in 2006 that showed groundwater flows inland in this area. PCE has historically not been detected at HI-7 and may indicate on-site migration of contaminants.

Implementation of Institutional Controls and other Measures

The ROD required the following ICs to warn future property owners of the remaining contamination:

- A certified copy of the Consent Decree be filed in the appropriate King County office;
- Instruments conveying interest in a property were required to contain a recorded notice that the property is subject to the Consent Decree and list applicable restrictions; and
- Long-term maintenance of the cap areas to be verified through annual cap inspections.

As part of this Five Year Review, EPA requested documentation of the ICs for each property on S&G-OU1 to ensure that they are appropriate, in place, and effective across the site. An initial review of this documentation indicates that the objectives of the ICs are still appropriate; however, several properties do not have restrictive covenants in place and have

not been conducting annual cap inspections. To ensure that EPA continues to have enforcement rights, restrictive covenants should be established under the recently enacted UECA.

The ROD did not require an Institutional Control Plan, but cap inspection and maintenance plans have been prepared for the Design Set 1B and Design Set 2 properties. All property owners should follow the inspection and maintenance plans to ensure the remedy remains protective.

7.1.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?

Yes.

There have been no changes in the assumptions, toxicity, and cleanup levels that would affect the protectiveness of the remedy and the assumptions, toxicity, selected cleanup levels and RAOs for this OU are still valid.

Changes in Standards and To Be Considered

ARARs cited in the ROD were reviewed to evaluate changes since the ROD was signed in 1993. In addition, requirements promulgated after the 1993 ROD were also evaluated to determine if there were ARARs or To Be Considered (TBCs) necessary to ensure that the remedy is protective of human health and the environment. A summary of the evaluation of each ARAR is presented in Table 7-1.

Cleanup goals specified in the ROD along with changes in the standards are shown on Table 7-2. Cleanup goals for soil were primarily based on criteria contained in the State of Washington MTCA. The more stringent MTCA Method C for industrial soil, which specifies cleanup goals based on a total risk of 1×10^{-5} from all carcinogens or a hazard index of 1.0 for all non-carcinogens, was applied to the surface soil (depth less than 0.5 feet) where the potential for human exposure is greater. Goals for subsurface soil (depth greater than 0.5 feet) were primarily based on MTCA Method A, which specifies cleanup goals based on a risk of 1×10^{-5} for individual carcinogens or a hazard quotient of 1.0 for non-carcinogens. In 2001, MTCA amendments reduced the MTCA Method A soil criteria for TPH-G, cadmium, PAHs, arsenic, benzene, ethylbenzene, toluene, and xylenes (see Table 7-2). The revised criteria for TPH-G, cadmium, PAHs, and arsenic are within one order of magnitude of the ROD cleanup goals; therefore, resultant risk calculations would not question the validity of the selected remedy. The revised benzene, ethylbenzene, toluene, and xylenes values may result in risk greater than 1×10^{-4}; however, the selected remedy limits the exposure to these soils through a low permeability cap and ICs.

Groundwater cleanup goals were based on the protection of marine organisms or human health from consumption of organisms. Since the 1993 ROD, there have been revisions to the national recommended water quality criteria (NRWQC) for marine waters that have decreased groundwater standards for thallium, benzene, carbon tetrachloride, trichloroethane, and PCE. Carbon tetrachloride, trichloroethane, and PCE were not detected during the first year of groundwater monitoring and were subsequently dropped. Detected concentrations of benzene and thallium have been below the current standards of 51 µg/L and 0.47 µg/L, respectively. Therefore, the reduction in NRWQC criteria does not call into question the validity of the remedy.

Once sediment cleanup levels have been finalized for the Lower Duwamish Waterway and the East Waterway, the ROD groundwater cleanup levels should be reviewed to verify that they are also protective of marine sediments.

Table 7-1. S&G-OU1 ARAR Analysis Summary

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Air/Clean Air Act (CAA); WA CAA	Federal – CAA – National Ambient Air Quality Standards (NAAQS) (42 USC 7401); State – General Regulations for Air Pollution Sources (WAC 173-400, -460)	Relevant or Appropriate	Remedial action that would result in major sources of emissions will be designed to meet federal ambient air quality standards.	LNAPL vacuum-enhancement system at Todd Shipyards discharges air, treated by a catalytic oxidizer, to the atmosphere.
Air/Puget Sound Air Pollution Control Agency (PSAPCA)	Local – PSAPCA (Regulations I, III)	Applicable	Remedial action that could involve releases of contaminants to air will be performed in compliance with substantive requirements of a permit from PSAPCA.	LNAPL vacuum-enhancement system at Todd Shipyards discharges air, treated by a catalytic oxidizer, to the atmosphere.
Surface Waters/Washington Water Pollution Control Act (WPCA); Washington State Water Quality Standards for Surface Water	State- WPCA – Water Pollution Control (RCW 90.48); WPCA-Water Quality Standards for Surface Waters (WAC 173-201A)	Applicable	Remedial action will achieve water quality standards for surface waters consistent with public health and protection of fish, shellfish and wildlife.	Hot spot removal, cap, and LNAPL removal will achieve water quality standards for protection of marine organisms.
Water/Washington State Water Resources Act (WRA)	State- WRA – Water Resources Act (RCW 90.54)	Relevant or Appropriate	Selected remediation methods should promote proper utilization of water resources, public health, economic well-being, and preservation of water's natural resources and aesthetic values.	The determination of all known, available, and reasonable technologies for achieving surface water goals was performed during the feasibility study.
Groundwater/State Water Code; Water Rights	State – Water Code (RCW 90.03); Water Rights (RCW 90.14)	Applicable	Specifications for the extraction of groundwater will be met during remedial activities; groundwater remediation will be consistent with beneficial uses of the resources and will not be wasteful.	Groundwater extraction and remediation processes at Todd Shipyards will follow specifications and will be consistent with beneficial uses.
Soil/Model Toxics Control Act (MTCA)	State – MTCA (RCW 70.105D; WAC 173-340)	Relevant or Appropriate	MTCA soil cleanup standards for protection of human health in an industrial setting and for protection of groundwater from contaminants leaching from soil will be met.	Soil remediation is no longer active.
Hazardous Waste/Toxic Substances Control Act (TSCA)	Federal – TSCA (15 U.S.C. 2601-2671; 40 CFR Part 761.60)	Relevant or Appropriate	PCBs at concentrations exceeding 50 mg/kg are required to be destroyed by incineration or be disposed in a hazardous waste disposal facility.	Remediation involving PCB contaminated soil is complete.

Table 7-1. S&G-OU1 ARAR Analysis Summary (continued)

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Dangerous Waste/Washington State Dangerous Waste Regulations	State – Dangerous Waste Regulations (WAC 173-303)	Relevant or Appropriate	Disposal specifications will be met for soils contaminated with PCBs in the concentration range of 1 to 50 mg/kg and for inorganics that fail the toxicity characteristic leaching procedure (TCLP) test and are a RCRA characteristic waste.	Remediation involving PCB contaminated soil is complete.
Well Design/Water Well Construction Act (WWCA)	State – WWCA Standards for construction and maintenance of water wells (WAC 173-160)	Applicable	Standards for construction, testing, and abandonment of water and resource protection wells will be met during remediation and monitoring.	Standards must be met for monitoring wells.
Hazardous Waste/Resource Conservation and Recovery Act (RCRA)	Federal – Solid Waste Disposal Act, also known as the Resource Conservation and Recovery Act, Subchapter III, (42 U.S.C. 6921-6939; 40 CFR Parts 261, 264, and 268)	Relevant or Appropriate	Regulations for the disposal in which RCRA contaminants are present. The only RCRA characteristic waste was soil contaminated with high concentrations of lead that failed the TCLP leachate test conducted during the Remedial Investigation.	Remediation involving RCRA characteristic waste soil is complete.
Surface Water/Clean Water Act (CWA)	Federal – CWA (33 U.S.C. 1251; 40 CFR Part 131)	Applicable	Standards for protection of marine organisms and human health from ingestion of marine organisms will be achieved through removal of hot spots from both soil and groundwater, capping, and natural biodegradation of remaining low level organics in the groundwater.	Removal of the floating petroleum product at Todd Shipyards and cap will achieve CWA standards.

Table 7-2. S&G-OU1, Changes in Standards

Medium	Contaminant	Cleanup Goal per 1993 ROD		Current Standards	
		Goal	Basis of Goal	Standard	Source of Standard
Soil - Surface	Lead	1,000 mg/kg	MTCA A	1,000 mg/kg	MTCA A
	Arsenic	3.60 to 32.6 mg/kg	1 x 10^{-5} risk	See Table 7-3	N/A
	Antimony	180 to 677 mg/kg	1 x 10^{-5} risk	See Table 7-3	N/A
	Carcinogenic PAHs	0.1 to 36.5 mg/kg	1 x 10^{-5} risk	See Table 7-3	N/A
	PCBs	0.18 to 2.99 mg/kg	1 x 10^{-5} risk	See Table 7-3	N/A
Soil - Subsurface	Lead	1,000 mg/kg	MTCA A	1,000 mg/kg	MTCA A
	TPH (diesel)	600 mg/kg	WA PCS Matrix	2,000 mg/kg	MTCA A
	TPH (gas)	400 mg/kg	WA PCS Matrix	100 mg/kg (without benzene) 30 mg/kg (all other mixtures)	MTCA A
	Cadmium	10 mg/kg	MTCA A	2 mg/kg	MTCA A
	Chromium	500 mg/kg	MTCA A	19 mg/kg (Chromium VI) 2,000 mg/kg (Chromium III)	MTCA A
	Mercury	1.0 mg/kg	MTCA A	2 mg/kg	MTCA A
	PAHs	20 mg/kg	MTCA A	2 mg/kg[a]	MTCA A
	Arsenic	200 mg/kg	MTCA A	20 mg/kg	MTCA A
	Benzene	1.0 mg/kg	WA PCS Matrix	0.03 mg/kg	MTCA A
	Ethylbenzene	200 mg/kg	WA PCS Matrix	6 mg/kg	MTCA A
	Toluene	100 mg/kg	WA PCS Matrix	7 mg/kg	MTCA A
	Xylenes	150 mg/kg	WA PCS Matrix	9 mg/kg	MTCA A

Table 7-2. S&G-OU1, Changes in Standards (continued)

Medium	Contaminant	Cleanup Goal per 1993 ROD		Current Standards	
		Goal	Basis of Goal	Standard	Source of Standard
Groundwater	Carbon Tetrachloride	4.4 µg/L	Protect Organisms	1.6 µg/L	NWQC HH-Organism Only
	Benzene	71 µg/L	Protect Organisms	51 µg/L	NWQC HH-Organism Only
	Trichloroethane	42 µg/L	Protect Organisms	16 µg/L (1,1,2-Trichloroethane)	NWQC HH-Organism Only
	Tetrachloroethylene	8.8 µg/L	Protect Organisms	3.3 µg/L	NWQC HH-Organism Only
	PCBs	0.03 µg/L	Protect Organisms	0.03 µg/L	NWQC Marine Chronic
	Arsenic	36 µg/L	Protect Organisms	36.0 µg/L	NWQC Marine Chronic
	Cadmium	8.0 µg/L	Protect Organisms	9.3 µg/L	WAC 173-201A-240
	Copper	2.9 µg/L	Protect Organisms	3.1 µg/L	NWQC Marine Chronic
	Lead	5.8 µg/L	Protect Organisms	8.1 µg/L	NWQC Marine Chronic
	Mercury	0.025 µg/L	Protect Organisms	0.025 µg/L	NWQC Marine Chronic
	Nickel	7.9 µg/L	Protect Organisms	8.2 µg/L	NWQC Marine Chronic
	Silver	1.2 µg/L	Protect Organisms	1.9 µg/L	NWQC Marine Acute
	Thallium	6.3 µg/L	Protect Organisms	0.47 µg/L	NWQC HH-Organism Only
	Zinc	76.6 µg/L	Protect Organisms	81.0 µg/L	NWQC Marine Chronic
	Cyanide	1.0 µg/L	Protect Organisms	1.0 µg/L	NWQC Marine Chronic

Notes:

Highlight indicates current standard is less than that used in the 1993 ROD.

MTCA A – Method A Soil Cleanup Levels for Industrial Properties (MTCA Table 745-1).

1×10^{-5} risk –Total 1×10^{-5} excess cancer risk or Hazard Index equal to 1.

WA PCS Matrix – State of Washington Petroleum-Contaminated Soil Matrix Rating Method.

Protect Organisms – Protection of marine organisms or human health from consumption of organisms.

NWQC HH-Organism Only – National Recommended Water Quality Criteria, Human Health for Consumption of Organism only.

NWQC Marine Chronic – National Recommended Water Quality Criteria, marine, chronic (also WAC 173-201A-240).

NWQC Marine Acute – National Recommended Water Quality Criteria, marine, acute (also WAC 173-201A-240).

WAC 173-201A-240 – Toxics Substances Criteria for Marine Water (WAC 173-201A-240).

[a] The latest MTCA promulgated in 2007 uses this value as the toxicity equivalent to benzo(a)pyrene.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

The exposure assumptions used to develop the Human Health Risk Assessment remain valid. Assumptions included industrial worker incidental ingestion and dermal contact with contaminated soil. Inhalation was not identified as a significant pathway of exposure. Human health exposure to contaminants in groundwater was not evaluated because there was no current or foreseeable use of groundwater for drinking water. Capping of the site has reduced exposure to the remaining contaminated soils and ICs were required to document the location of remaining soil contamination at each property and procedures for handling and disposal of excavated soil from beneath the capped areas. Land use at the site remains industrial and there are no expected land use changes in the future.

Toxicity criteria used in the calculation of risk based soil cleanup goals for arsenic, antimony, PAHs, and PCBs have changed since the ROD was signed (Table 7-3). These changes are relatively small and do not change the estimated risk to the extent that would call into question the protectiveness of the selected remedy.

7.1.3 Question C: Has other information come to light that could call into question the protectiveness of the remedy?

No. Current and potential future land use remains consistent with the assumptions used in and implementation of the selected remedy, and there is no other information that calls into question the protectiveness of the remedy.

7.1.4 Technical Assessment Summary

The remedy appears to be functioning as intended by the ROD; however, several properties are missing restrictive covenants and documentation of the cap maintenance, and repairs need to be more consistent to identify any potential exposure problems. Overall, the long-term groundwater monitoring indicates that the cap is limiting contaminant migration. Groundwater monitoring data shows concentrations of constituents above cleanup goals remain near Todd Shipyard and at inland monitoring well HI-17. Constituents detected slightly above cleanup goals are also found sporadically around the OU. A review of the long-term groundwater monitoring data and the Five-Year Review sampling data event indicate that the groundwater monitoring program may need minor modifications. In addition, a groundwater flow assessment is needed near HI-17 to ensure that contamination is contained on-site. Remedial actions are ongoing at Todd Shipyards and system modifications completed in 2009 should address the remaining contamination near Aluminum Shop Building. A “hot spot” at Todd Shipyard identified during geoprobe investigations still needs to be spatially defined and potentially remediated. There have been no changes in standards, toxicity information, the physical condition of the site, or land use that would affect the protectiveness of the remedy.

Table 7-3. S&G-OU1, Changes in Toxicity Criteria

Contaminant	Toxicity Criteria Type	Toxicity Per 1993 ROD		Current Toxicity Criteria	
		Criteria	Source	Criteria	Source
Arsenic (noncancerous)	Oral Reference Dose	3.0 E-4	IRIS	3.0 E-4	IRIS
Antimony	Oral Reference Dose	4.0 E-4	IRIS	4.0 E-4	IRIS
Arsenic (cancerous)	Oral Slope Factor	1.8 $(mg/kg\text{-}day)^{-1}$	IRIS	1.5 $(mg/kg\text{-}day)^{-1}$	IRIS
Carcinogenic PAHs	Oral Slope Factor	5.8 $(mg/kg\text{-}day)^{-1}$	EPA ECAO	7.3 $(mg/kg\text{-}day)^{-1}$	IRIS
PCBs	Oral Slope Factor	7.7 $(mg/kg\text{-}day)^{-1}$	IRIS	0.04 to 2.0 $(mg/kg\text{-}day)^{-1}$	IRIS

Notes:

Highlight indicates current toxicity criteria is less than that used in the 1993 ROD.

IRIS – USEPA Integrated Risk Information System.

EPA ECAO – USEPA Environmental Criteria and Assessment Office

7.2 TANK FARMS OPERABLE UNIT (TF-OU2)

7.2.1 Question A: Is the remedy functioning as intended by the decision documents?

No. Groundwater contamination near the shoreline may be entering Elliot Bay. Additional data analysis or investigation is necessary to determine if contamination near the shoreline at BP Plant 1 is entering the West Waterway and if contamination near the Shell and Kinder Morgan facilities is migrating outside the TF-OU2 boundary.

However, all of the "hot spot" areas identified in the original RI have been removed and in situ remedial systems are in place to treat remaining contamination. As previously inaccessible areas become accessible due to construction and facility upgrades, observed petroleum contaminated soils are investigated and, if necessary, removed. The remedial system continues to remove remaining contamination, however, modifications may be necessary to meet CAP standards within a reasonable timeframe. ICs in the form of restrictive covenants have been filed for all three facilities.

Remedial Action Performance and Monitoring

Groundwater monitoring is conducted quarterly at each facility. Each monitoring program is individually evaluated to determine when monitoring frequency or analytes may be reduced. Groundwater monitoring data indicate that remaining areas of contamination at TF-OU2 contain persistent, but stable, concentrations of contaminants. Natural attenuation is occurring at TF-OU2 and is actively reducing the hydrocarbon mass.

Areas of groundwater contamination remaining at TF-OU2 include:

- BP Plant 1 Shoreline. The cleanup level for benzene is exceeded at monitoring wells AMW-01 and AMW-02, which are adjacent to the West Waterway. A remediation system is present in this area and has been operating since 1992. Two air sparge wells were added near AMW-01 and AMW-02 and operated for two years; however, benzene concentrations did not decline to below cleanup levels. The SVE and air sparge system components have been shut down; only the groundwater recovery system remains operational. The only known source of benzene is in the area of the SVE system to the southeast. Investigations to determine the source of the benzene have been inconclusive. Since concentrations of benzene remain elevated, it is uncertain if hydraulic containment is currently maintained. Additional data analysis should be performed and the system modified as necessary.
- Southern Boundary of BP Plant 1. Concentrations of TPH-G and benzene exceed cleanup levels at monitoring well AR-03. An SVE system operates immediately upgradient of this well and contaminant levels appear to be declining.
- BP Plant 2. Monitoring well GM-19S was impacted by an unknown property release during 2000. Concentrations of benzene currently exceed the cleanup level, but the levels are declining.
- Shell and Kinder Morgan at the intersection of 13th Avenue SW and SW Lander Street. Concentrations of TPH-G and benzene exceed cleanup levels at KM monitoring wells A-28R, MW-24, and MW 23. An air sparge/SVE system operates near these wells. Monitoring well SH-04 at the Shell Main Terminal also contains elevated concentrations of TPH-G and benzene. As a contingency action, Shell completed eight borings near SH-04. The investigation determined that the

contamination on the Shell merged with that on the KM property, although forensic analyses indicate the groundwater contamination could be of a different nature. Further evaluation of this area is warranted to determine the source and potential for migration outside the TF-OU2 boundaries.

- Northern Boundary of Shell Main Terminal. Concentrations of TPH-G and benzene exceed cleanup levels at monitoring well TX-03. Five borings were completed as a contingency action to delineate the contamination. Elevated levels of TPH-G were detected in two borings, but a consistent area of groundwater contamination was not apparent. There was no associated subsurface soil contamination. Further evaluation should be completed in this area.
- Shell North Tank Farm. Monitoring well MW-202 contains persistent concentrations of TPH-G above cleanup levels.

Systems Operations/Operations and Maintenance

Three in-situ remedial systems are currently in operation at TF-OU2. Passive recovery is ongoing at six wells. Monitoring and maintenance procedures are in place to ensure that these systems are operating efficiently. As discussed above, remedial system modifications may be necessary at the BP Plant 1 system to ensure hydraulic containment is maintained.

Costs of Systems Operations/O&M

Costs for system operations and O&M were not reviewed.

Opportunities for Optimization

As stated above, further analysis of the hydraulic capture for the remediation system along the shoreline of BP Plant 1 should be conducted. System modifications should be completed as necessary to contain and treat the remaining benzene contamination.

Indicators of Potential Remedy Problems

Groundwater data indicate that there are several areas of contamination remaining at TF-OU2 that require additional evaluation to ensure that contamination is not impacting the waterway or migrating off-site.

Implementation of Institutional Controls and other Measures

Institutional Controls were required in the form of Restrictive Covenants for each facility and were required to be written and recorded 10 days after the signing of each Consent Decree. The restrictive covenants for BP, KM, and Shell were filed with King County on August 15, 2000, August 30, 2000, and October 5, 2000, respectively. The covenants follow MTCA regulations and identify the contamination that existed at each facility, provide for continued industrial use of the property, prohibit groundwater taken from the property, provide for safety and notification of site workers, prohibit activities that would release or cause exposure to contamination, provide for continuance of remedial actions given property transference, and provide for Ecology access. Since contamination remains at each of these facilities, the objectives of the covenants are still applicable.

7.2.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?

Yes. There have been no changes in the assumptions, toxicity, and cleanup levels that would affect the protectiveness of the remedy.

Changes in Standards and To Be Considered

ARARs cited in the CAPs were reviewed to evaluate changes since they were completed in 1999 and 2000. A summary of the evaluation of each ARAR is presented in Table 7-4.

Table 7-5 presents cleanup levels listed in the CAPs along with changes in standards. Soil cleanup levels for the TF-OU2 are similar to those in the EPA cleanup goals for the S&G-OU1 and LU-OU3, which were established unique to Harbor Island. There are no changes in soil cleanup levels that would question the validity of the selected remedy.

Groundwater was declared non-potable in the EPA RODs and in the Ecology CAPs. Groundwater cleanup levels were for "the chronic criteria for protection of aquatic organisms (WAC 173-201A) and Section 304 of the Clean Water Act" and were similar to the EPA cleanup goals the S&G-OU1 and LU-OU3. Since the CAPs have been completed, NRWQC for benzene, ethylbenzene, toluene, and cPAHs have decreased. Ethylbenzene and toluene concentrations at TF-OU2 are below the revised standards. Remaining elevated concentrations of benzene and cPAHs are in areas of active and passive remediation. Therefore, the reduction in NRWQC criteria does not call into question the validity of the remedy.

Surface water standards are not available for TPH. The CAPs selected groundwater cleanup levels for TPH-G, TPH-D, and TPH-O to be protective of surface water. In 2001, MTCA revisions lowered the MTCA Method A groundwater cleanup levels for TPH-G, TPH-D, and TPH-O. These lower standards may not be applicable to TF-OU2.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

Exposure assumptions used in the CAPs remain valid. Assumptions included industrial zoning of the site and the determination that there is no planned future use of the groundwater for drinking purposes.

Toxicity criteria for arsenic have changed since the CAPs were completed (see S&G-OU1 Table 7-3). The change is relatively small and does not change the estimated risk to the extent that would call into question the protectiveness of the selected remedy.

Table 7-4. TF-OU2, ARAR Analysis Summary[a]

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Air/Washington Clean Air Act (WA CAA)	State – General Regulations for Air Pollution Sources (WAC 173-400, -460); WA CAA (RCW 70.94)	Applicable	Remedial action that would result in major sources of emissions will be designed to meet state air quality standards.	Three soil vapor extraction/air sparging systems are currently operating with air emissions meeting air quality standards.
Surface Waters/Washington Water Pollution Control Act (WPCA); Washington State Water Quality Standards for Surface Water; Construction projects in State Waters	State- WPCA – Water Pollution Control (RCW 90.48); WPCA-Water Quality Standards for Surface Waters (WAC 173-201A); Construction projects in state waters (RCW 75.20)	Applicable and Relevant or Appropriate	Remedial action will achieve water quality standards for surface waters consistent with public health and protection of fish, shellfish, and wildlife. Remedial action component construction along the shoreline will follow the substantive requirements.	Remedial actions are specific to the cleanup of site groundwater. The groundwater cleanup goals are surface water standards that are protective of aquatic organisms. Much of RCW 75.20 was recodified to RCW 77.55. All remedial construction has been completed. Should additional remedial construction occur along the shoreline and in the adjacent waters RCW 75.20 would be applicable.
Water/Washington State Water Resources Act (WRA)	State- WRA – Water Resources Act (RCW 90.54)	Relevant or Appropriate	Selected remediation methods should promote proper utilization of water resources, public health, economic well-being, and preservation of water's natural resources and aesthetic values.	Remedial actions to cleanup site groundwater indirectly achieves surface water goals presented in this ARAR.
Shoreline/Washington Shoreline Management	State – Shoreline Management Act of 1971 (RCW 70.95);	Applicable	The remedial actions will ensure that nearby water resources are protected and wisely managed.	One remediation system is located on the shoreline bulkhead.
Groundwater/Washington Model Toxics Control Act (MTCA)	State – MTCA (WAC 173-340)	Applicable	MTCA cleanup regulations provide that cleanup actions must comply with cleanup levels for selected hazardous substances, points of compliance and ARARs.	Three soil vapor extraction/air sparging systems are currently operating to meet cleanup levels especially for total petroleum hydrocarbons.
Solid Wastes/Washington Solid Waste Management (SWM)	State – SWM (WAC 173-304) (RCW 70.95)	Applicable	The remedial actions will follow a comprehensive program for solid waste handling, and solid waste recovery and/or recycling that will prevent land, air, and water pollution.	Solid wastes are potentially generated as part of the remedial actions.
Hazardous Wastes/Washington Hazardous Waste Management (HWM)	State – HWM (RCW 70.105); Dangerous Waste Regulations (WAC 173-303)	Applicable	The remedial action will provide for the control and management of hazardous waste that will prevent land, air, and water pollution.	Hazardous wastes are potentially generated as part of the remedial actions.

[a] This table presents only the ARARs specifically identified in the Cleanup Action Plans.

Table 7-5. TF-OU2, Changes in Standards

Medium	Contaminant	Cleanup Levels per Ecology CAP		Current Standards	
		Goal	Basis of Goal	Standard	Source of Standard
Soil - Surface	Lead	1,000 mg/kg	MTCA A	1,000 mg/kg	MTCA A
	Arsenic	32.6 mg/kg	1 x 10^{-5} risk	See Table 7-3	N/A
Soil - Subsurface	Total TPH (Primary Areas of Concern)	10,000 mg/kg	Protection of Surface Water at Boundary	10,000 mg/kg	Protection of Surface Water at Boundary
	Total TPH (Secondary Areas of Concern)	20,000 mg/kg	Protection of Surface Water at Boundary	20,000 mg/kg	Protection of Surface Water at Boundary
Groundwater	Benzene	71 µg/L	Protect Organisms	51 µg/L	NWQC HH-Organism Only
	Ethylbenzene	29,000 µg/L	Protect Organisms	2,100 µg/L	NWQC HH-Organism Only
	Toluene	200,000 µg/L	Protect Organisms	15,000 µg/L	NWQC HH-Organism Only
	cPAHs*	0.031 µg/L	Protect Organisms	0.018 µg/L	NWQC HH-Organism Only
	Copper	2.9 µg/L	Protect Organisms	3.1 µg/L	NWQC Marine Chronic
	Lead	5.8 µg/L	Protect Organisms	8.1 µg/L	NWQC Marine Chronic
	TPH-G	1,000 µg/L	Protect Groundwater	1,000/800	MTCA A
	TPH-D	10,000 µg/L	Protect Groundwater	500	MTCA A
	TPH-O	10,000 µg/L	Protect Groundwater	500	MTCA A

Notes:

Highlight indicates current standard is less than that used in CAPs.

MTCA A – Method A Soil Cleanup Levels for Industrial Properties (MTCA Table 745-1) or Method A Groundwater Cleanup Levels (MTCA Table 720-1).

1 x 10^{-5} risk – Total 1 x 10^{-5} excess cancer risk or Hazard Index equal to 1.

Protect Organisms – Protection of marine organisms or human health from consumption of organisms.

Protect Groundwater – Surface water cleanup level not available, based on protection of groundwater for total TPH

NWQC HH-Organism Only – National Recommended Water Quality Criteria, Human Health for Consumption of Organism only.

NWQC Marine Chronic – National Recommended Water Quality Criteria, marine, chronic (also WAC 173-201A-240).

WAC 173-201A-240 – Toxics Substances Criteria for Marine Water (WAC 173-201A-240).

[a] The latest MTCA promulgated in 2007 uses this value as the toxicity equivalent to benzo(a)pyrene.

7.2.3 Question C: Has other information come to light that could call into question the protectiveness of the remedy?

No. Current and potential future land use remains consistent with the assumptions used in and implementation of the selected remedy, and there is no other information that calls into question the protectiveness of the remedy.

7.2.4 Technical Assessment Summary

The current remedy may not be functioning as intended by the CAPs because groundwater contamination near the shoreline may be entering Elliot Bay. All of the "hot spot" areas identified in the RI have been removed and in situ remedial systems are in place to treat remaining contamination. Groundwater monitoring data indicate natural attenuation is occurring and is reducing the mass of hydrocarbons. There are several groundwater contamination areas/issues at TF-OU2 that require additional evaluation for the remedy to be protective: (1) area of elevated benzene concentrations along the shoreline at BP Plant 1 may not be hydraulically contained and contamination may be reaching the waterway; (2) a source and potential for migration outside TF-OU2 boundaries at the area of elevated TPH-G and benzene concentrations at the intersection of 13th Avenue SW and SW Lander Street has not been determined; and (3) a source and potential for migration of elevated TPH-G concentrations at the northern boundary of the Shell Main Terminal has not been determined. Required ICS are in place for the facilities. There have been no changes in standards, toxicity information, the physical condition of the site, or land use that would affect the protectiveness of the remedy.

7.3 LOCKHEED UPLAND OPERABLE UNIT (LU-OU3)

7.3.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy has been fully implemented. All of the Hot Spot Soils have been removed and disposed of off-site or properly treated. Remaining areas that contain concentrations of COCs above the ROD cleanup goals have been capped. Cap inspections are completed on an annual basis; however, ponded water is a frequent problem. Implementation of the Port of Seattle's Terminal 10 redevelopment plan, which includes stormwater controls and regrading, is imperative in maintaining cap integrity. The institutional controls required by the ROD to prevent exposure to contaminated soil are in place; however, UECA restrictive covenants may be needed.

Remedial Action Performance Monitoring

A long-term groundwater monitoring program has been developed for the LU-OU3 to monitor source areas and their potential for downgradient contaminant migration. Eleven monitoring wells were originally included in the program; however, due to construction activities, only eight remain. In addition, two of the remaining wells are frequently inaccessible due to standing water. The LSS-OU7 also has a groundwater monitoring program with nine monitoring wells to demonstrate upland source control and to ensure that the sediment cap will not be recontaminated. Wells are located adjacent to the bulkhead and along the eastern edge of the property line.

Lockheed proposed consolidation of the LU-OU3 and LSS-OU7 monitoring programs in 2007, but the plan was never approved. Several issues should be resolved prior to consolidation of the programs. These include:

- Evaluate tidal influence to confirm the groundwater flow direction and provide clarity on which flow directions are dominant most of the time.
- Determine the influence of the bulkhead on groundwater flow and the appropriate screened interval for monitoring wells near the bulkhead.
- Effects of redevelopment of the Terminal 10 area on the future accessibility of Wells LMW3 and LMW25.
- Following the evaluation of tidal influence/groundwater flow direction and remaining areas of contamination, confirm that wells are located appropriately to monitor areas of concern.
- Groundwater monitoring data from the Five-Year Review sampling event detected arsenic, copper, nickel, zinc, bis(2-ethylnexl)phthalate, PCE, and chlorinated pesticides above screening levels. Of these constituents, only copper, zinc, and PCE are ROD groundwater COCs. For this reason, the analyte list for the groundwater monitoring program should be re-evaluated.

Groundwater monitoring data from the past 5 years of long-term monitoring indicate one area of potential concern at the northern portion of the site where PCE has been detected above cleanup goals near the waterway. PCE concentrations at monitoring wells LMW26, LMW27, and MNW12 show an increasing trend. A confirmation of the groundwater flow direction near this area is necessary to verify that the waterway is not being impacted. Additional evaluation of the source may also be required.

Systems Operations/Operations and Maintenance

There are no active remediation systems at the LU-OU3.

Costs of Systems Operations/O&M

Costs for system operations and O&M were not reviewed.

Opportunities for Optimization

As discussed above, the groundwater monitoring program for the LU-OU3 and the LSS-OU7 should be consolidated following further evaluation of the groundwater flow direction, appropriate screen intervals, and location of remaining areas of contamination.

Indicators of Potential Remedy Problems

PCE concentrations at monitoring wells in the northeastern section of the OU show an increasing trend. The groundwater flow direction and source of PCE should be evaluated to determine if the contamination is migrating to the waterway.

Implementation of Institutional Controls and other Measures

The ROD required the following ICs to warn future property owners of the remaining contamination, provide long-term maintenance of caps, and specify procedures for handling and disposal of excavated contaminated soil:

- A certified copy of the Consent Decree be filed in the appropriate King County office;
- Instruments conveying interest in a property were required to contain a recorded notice that the property is subject to the Consent Decree and list applicable restrictions; and

- Long-term maintenance of the cap areas to be verified through annual cap inspections.

As part of this Five-Year Review, EPA requested documentation of the ICs for the LU-OU3 to ensure that they are appropriate, in place and effective across the site. An initial review of this documentation indicates that the objectives of the ICs are still appropriate; however, the type of covenant may not be appropriate. To ensure that EPA continues to have enforcement rights, restrictive covenants should be established under the recently enacted UECA.

The ROD did not require an Institutional Control Plan, but cap inspection and maintenance plans have been prepared. There are frequent problems with ponded water, asphalt cracks, and plant growth on the cap observed during annual inspections. The Port of Seattle has submitted plans and designs to redevelop Terminal 10 including regrading and installing a storm sewer system. These changes in run-on/run-off controls are necessary to ensure cap integrity in the future.

7.3.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?

Yes. There have been no changes in the assumptions, toxicity, and cleanup levels that would affect the protectiveness of the remedy. The assumptions, toxicity, selected cleanup levels and RAOs for this OU are still valid.

Changes in Standards and To Be Considered

ARARs cited in the ROD were reviewed to evaluate changes since the ROD was signed in 1994. In addition, requirements promulgated after the 1994 ROD were also evaluated to determine if there were ARARs or TBCs necessary to ensure that the remedy is protective of human health and the environment. A summary of the evaluation of each ARAR is presented in Table 7-6.

Cleanup goals specified in the ROD along with changes in the standards are shown on Table 7-7. Cleanup goals for soil are similar to the S&G-OU1: MTCA Method C for industrial soil was applied to the surface soil (depth less than 0.5 foot) and MTCA Method A for subsurface soil (depth greater than 0.5 foot). In 2001, MTCA amendments reduced the MTCA Method A soil criteria for cPAHs, arsenic, benzene, ethylbenzene, toluene, and xylenes (see Table 7-7). The revised criteria for cPAHs, and arsenic are within one order of magnitude of the ROD cleanup goals; therefore, resultant risk calculations would not question the validity of the selected remedy. The revised benzene, ethylbenzene, toluene, and xylenes values may result in risk greater than 1×10^{-4}; however, the selected remedy limits the exposure to these soils through a low permeability cap and institutional controls.

Groundwater cleanup goals were based on the protection of marine organisms or human health from consumption of organisms. Since the 1994 ROD, there have been revisions to the NRWQC for marine waters that have decreased groundwater standards for benzene and PCE. Detected concentrations of benzene have been below the revised standard of 51 µg/L; therefore, this revision does not call into question the validity of the remedy. PCE has been detected above the revised standard of 3.3 µg/L at several wells (LMW3, LMW7, LMW12, LMW26, LMW27, and LMW34). Most of these wells also slightly exceed the ROD cleanup goal of 8.8 µg/L. Therefore, using the lower, revised PCE standard would not result in a change to the remedy.

Table 7-6. LU-OU3, ARAR Analysis Summary

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Air/Clean Air Act (CAA); WA CAA	Federal – CAA – National Ambient Air Quality Standards (NAAQS) (42 USC 7401); State – General Regulations for Air Pollution Sources (WAC 173-400, -460)	N/A	Remedial actions that would result in major sources of emissions will be designed to meet federal and state ambient air quality standards.	No actions are taking place that could result in major sources of emissions.
Air/Puget Sound Air Pollution Control Agency (PSAPCA)	Local – PSAPCA (Regulations I, III)	N/A	Remedial action that could involve releases of contaminants to air will be performed in compliance with substantive requirements of a permit from PSAPCA.	No actions are taking place that could result in major sources of emissions.
Surface Waters/Washington Water Pollution Control Act (WPCA); Washington State Water Quality Standards for Surface Water	State – WPCA – Water Pollution Control (RCW 90.48); WPCA Water Quality Standards for Surface Waters (WAC 173-201A)	Applicable	These require that surface water quality standards for protection of marine organisms will be achieved at the point of compliance, which is at the shoreline.	Groundwater is being monitored to assess the effectiveness of the remediation to meet water quality cleanup goals.
Surface Water/Model Toxics Control Act (MTCA)	State – MTCA (RCW 70.105D; WAC 173-340)	Applicable	MTCA identifies cleanup standards for surface water and the point of compliance for these standards.	Groundwater is being monitored to assess the effectiveness of the remediation to meet water quality cleanup goals.
Surface Water/Clean Water Act (CWA)	Federal – CWA (33 U.S.C. 1251; 40 CFR Part 131)	Applicable	These identify federal marine and fresh surface water standards for protection of marine organisms and human health from ingestion of marine organisms. Only the marine water standards apply.	Groundwater is being monitored to assess the effectiveness of the remediation to meet water quality cleanup goals.
Well Design/Water Well Construction Act (WWCA)	State – WWCA – Standards for construction and maintenance of water wells (WAC 173-160)	Applicable	Standards for construction, testing, and abandonment of water and resource protection wells will be met during remediation and monitoring.	Standards must be met for monitoring wells.
Surface Water/Model Toxics Control Act (MTCA)	State – MTCA (RCW 70.105D; WAC 173-340)	Applicable	MTCA specifies numerical cleanup goals for soil and risk based calculation methods for determining cleanup goals in soil.	Groundwater is being monitored to assess the effectiveness of the remediation to meet water quality cleanup goals.

Table 7-7. LU-OU3, Changes in Standards

Medium	Contaminant	MCLG per 1993 ROD		Current MCL	
		Goal	Basis of Goal	Standard	Source of Standard
Soil – Surface	Lead	1,000 mg/kg	MTCA A	1,000 mg/kg	MTCA A
	Arsenic	3.60 to 32.6 mg/kg	1 x 10^{-5} risk	See Table 7-8	N/A
	Carcinogenic PAHs	0.1 to 36.5 mg/kg	1 x 10^{-5} risk	See Table 7-8	N/A
Soil – Subsurface	Lead	1,000 mg/kg	MTCA A	1,000 mg/kg	MTCA A
	TPH (diesel)	600 mg/kg	WA PCS Matrix	2,000 mg/kg	MTCA A
	PAHs	20 mg/kg	MTCA A	2 mg/kg	MTCA A
	Arsenic	200 mg/kg	MTCA A	20 mg/kg	MTCA A
	Benzene	1.0 mg/kg	WA PCS Matrix	0.03 mg/kg	MTCA A
	Ethylbenzene	200 mg/kg	WA PCS Matrix	6 mg/kg	MTCA A
	Toluene	100 mg/kg	WA PCS Matrix	7 mg/kg	MTCA A
	Xylenes	150 mg/kg	WA PCS Matrix	9 mg/kg	MTCA A
Groundwater	Benzene	71 µg/L	Protect Organisms	51 µg/L	NWQC HH-Organism Only
	Tetrachloroethylene	8.8 µg/L	Protect Organisms	3.3 µg/L	NWQC HH-Organism Only
	Copper	2.9 µg/L	Protect Organisms	3.1 µg/L	NWQC Marine Chronic
	Lead	5.8 µg/L	Protect Organisms	8.1 µg/L	NWQC Marine Chronic
	Zinc	76.6 µg/L	Protect Organisms	81.0 µg/L	NWQC Marine Chronic

Notes:

Highlight indicates current standard is less than that used in the 1993 ROD.

MTCA A – Method A Soil Cleanup Levels for Industrial Properties (MTCA Table 745-1).

1 x 10^{-5} risk - 1 x 10^{-5} excess cancer risk or Hazard Index equal to 1.

WA PCS Matrix – State of Washington Petroleum-Contaminated Soil Matrix Rating Method.

Protect Organisms – Protection of marine organisms or human health from consumption of organisms.

NWQC HH-Organism Only – National Recommended Water Quality Criteria, Human Health for Consumption of Organism only.

NWQC Marine Chronic – National Recommended Water Quality Criteria, marine, chronic (also WAC 173-201A-240).

Human Health exposure to contaminants in groundwater was not evaluated because there was no current or foreseeable use of groundwater for drinking water. Groundwater cleanup levels in the ROD have been based on the protection of marine organisms and human ingestion of marine organisms. Once sediment standards have been finalized for the East Waterway and the Lower Duwamish Waterway, the ROD groundwater cleanup levels should be reviewed to verify that they are also protective of marine sediments.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

The exposure assumptions used to develop the Human Health Risk Assessment remain valid. Assumptions included industrial worker incidental ingestion and dermal contact with contaminated soil. Inhalation was not identified as a significant pathway of exposure. Human Health exposure to contaminants in groundwater was not evaluated because there was no current or foreseeable use of groundwater for drinking water. Capping of the site has reduced the exposure to the remaining contaminated soils and ICs were required to document the location of remaining soil contamination and procedures for handling and disposal of excavated soil from beneath the capped areas. Land use at the site remains industrial and there are no expected land use changes in the future.

The potential for groundwater containing VOCs to act as a source of contamination to soil gas that may impact indoor air was not fully evaluated at the time the original risk evaluation was prepared. Low concentrations of VOCs have been detected in groundwater at the northern portion of the site near the gas station. The asphalt cap in this area provides a barrier for vapors and lowers the risk of vapor intrusion into the enclosed buildings at the gas station.

Toxicity criteria used in the calculation of risk based soil cleanup goals for arsenic and PAHs have been changed since the ROD was signed (Table 7-8). These changes are relatively small and do not change the estimated risk to the extent that would call into question the protectiveness of the selected remedy.

7.3.3 Question C: Has other information come to light that could call into question the protectiveness of the remedy?

No. There is no other information that calls into question the protectiveness of the remedy.

7.3.4 Technical Assessment Summary

The remedy appears to be functioning as intended by the ROD. All Hot Spot Soils have been removed and remaining areas of soil contamination have been capped. Cap inspections are completed on an annual basis; however, there are frequent problems with ponding, plant growth, and asphalt cracks. The Port of Seattle is planning to redevelop Terminal 10, which includes stormwater controls and regrading, and is imperative to maintaining cap integrity. Long-term groundwater monitoring has been implemented at the site; however, revisions to the program are necessary to ensure that the remedy remains protective. Revisions should be made after an evaluation of the groundwater flow and tidal influence, appropriate screen intervals, and effects of Port of Seattle redevelopment. In addition, groundwater monitoring data from the Five-Year Review sampling event indicate that the analyte list should be re-evaluated. There have been no changes in standards, toxicity information, the physical condition of the site, or land use that would affect the protectiveness of the remedy.

Table 7-8. LU-OU3, Changes in Toxicity Criteria

	Toxicity Per 1993 ROD		Current Toxicity Criteria	
Contaminant	**Oral Slope Factor**	**Source**	**Oral Slope Factor**	**Source**
Arsenic	1.8 $(mg/kg\text{-}day)^{-1}$	IRIS	1.5 $(mg/kg\text{-}day)^{-1}$	IRIS
Carcinogenic PAHs	5.8 $(mg/kg\text{-}day)^{-1}$	EPA ECAO	7.3 $(mg/kg\text{-}day)^{-1}$	IRIS

Notes:

Highlight indicates current toxicity criteria are less than that used in the 1993 ROD.

IRIS – USEPA Integrated Risk Information System (IRIS).

EPA ECAO – USEPA Environmental Criteria and Assessment Office.

7.4 LOCKHEED SHIPYARD SEDIMENTS OPERABLE UNIT (LSS-OU7)

7.4.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. Results from the baseline and four annual monitoring events indicate that the remedy is functioning as intended by the decision documents for both the dredged and capped areas. The baseline monitoring event, which was completed immediately after the completion of remedial action, indicates that the remedy is functioning as expected and is effective. No exceedances of cleanup numbers were detected for all chemicals of concern. The annual monitoring events verify that the implemented remedy is continuing to function as expected and is still effective. Annual monitoring data indicate that there are no exceedances of cleanup numbers for all chemicals of concern.

The Operations, Maintenance, and Monitoring Plan have "early warning" monitoring requirements and standards that serve as an indicator that remedial problems may occur in the future. There have been no exceedances of these standards.

Refer to the subsection Data Review (Section 6.5.2) for monitoring requirements, data collection, analysis, and summary of results.

Institutional Controls were not specified in the original ROD for the LSS but need to be added to ensure long term functioning and protectiveness of the remedy. An IC study should be completed and ICs need to be implemented, maintained, and run with the land for the capped areas of sediments.

The objectives for sediment ICs should be to:

- Protect the integrity of the cap(s) from disturbance by dredging, and/or anchoring so as to keep buried contamination isolated and to prevent release or migration of contamination;
- Inform future property owners and lessees of the residual contamination under the cap and the corresponding O&M requirements.
- Require prior notification and EPA approval in event of a proposed construction activity in the area of the capped sediment.

7.4.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?

Yes. The remedial action required for the LSS-OU7 was based on the presence of unacceptable risks to benthic organisms. Cleanup numbers for the protection of benthic organisms were derived from Ecology regulations for sediment cleanups. The exposure assumptions and toxicity data have not changed, and the cleanup levels required by Ecology remain the same.

The ROD and the subsequent ESDs did not identify RAOs. However, in reading the decision documents, it is clear that the remedial action was meant to accomplish the following:

- Reduce concentrations of hazardous substances to levels that will have no adverse effect on marine organisms; and

- To the extent practicable, the marine habitat must be restored to its most productive condition.

The human health risks, assessed based on exposure scenarios including Tribal consumption of seafood and direct contact and accidental ingestion by fishers, were below the level of concern that would require further investigation to determine whether remedial action for protection of human health should be taken. This risk assessment was based on data from the West Waterway as a whole, which included the LSS-OU7 and TSS-OU9.

The exposure assumptions and toxicity data used to assess human health risks have changed. There were no human health cleanup numbers, but appropriate cleanup numbers may be needed if risks to human health are determined to be of concern. Additionally, because the ROD and subsequent ESDs did not identify a concern for human health, RAOs were not developed.

Note that a summary of the evaluation of each ARAR for LSS-OU7 is presented in Table 7-9.

Human Health: Changes in Assessing Risk to Tribes from Seafood Consumption

In August 2007, EPA Region 10 issued a "Framework for Selecting and Using Tribal Fish and Shellfish Consumption Rates for Risk-Based Decision Making at CERCLA and RCRA Cleanup Sites in Puget Sound and the Strait of Georgia" (EPA 2007; hereinafter referred to as the Framework). The Framework was designed to assist EPA Region 10 with managing hazardous waste cleanup sites with Tribal seafood consumption exposures and concerns.

The primary focus of the Framework is on the performance of risk assessments and their input into risk-based cleanup decisions. The Framework also addresses how five-year reviews will consider and incorporate tenets of the Framework. In part, the Framework concluded:

> "Based on EPA's knowledge of sediment cleanup sites in Puget Sound, the Framework may have limited application for those CERCLA and RCRA sites where the remedy has already been selected…As part of the five-year review process, Tribes can provide new information to be considered or request that the lead federal agency evaluate particular aspects of a remedy relative to Tribal interests…Such requests would be evaluated on a site-specific basis consistent with EPA's five-year review guidance...In determining whether a recalculation of site risks or any other detailed analysis is needed as part of the five-year review, EPA would review the basis of the selection of the remedial action and cleanup levels and other relevant information to determine whether further analysis of such updated information is appropriate, and focus our analysis on matters that would help assess the protectiveness of the selected remedy."

The human health risk assumptions made in the ROD for the Shipyard Sediments Operable Unit and applicable to the LSS-OU7 were based on a tribal consumption scenario determined prior to EPA Region 10's development of the Framework. The Framework provides more location-specific consumption survey data for tribal consumption of seafood. The tribal consumption rates used for the risk assessment applicable to the LSS-OU7 represented national consumption rates, which are lower than the rates determined by the consumption survey data. Therefore, the risk to Tribal consumers of seafood may be greater than the risk levels presented in the RODs for the West Waterway and the Shipyard Sediment OUs. The Framework also emphasizes consultation with affected Tribes, whose fish consumption patterns can differ markedly. Formal consultation occurred with affected Tribes on November 16, 2009. At that meeting, representatives of the Muckleshoot Indian Tribe and Suquamish Tribe expressed that the Tribal Framework be brought into the Agency's decision

regarding protectiveness. Tribal exposures will be considered again in subsequent statutory reviews or if new information that affects tribal consumption becomes available.

The Tribal Framework is being incorporated into the risk assessment for the Remedial Investigation report for the Lower Duwamish Waterway (LDW) Superfund site. However, the RI/FS for the LDW site is still underway, and future cleanup criteria and decisions have not been determined for the LDW site, EPA intends to consider the results of the LDW risk assessment and its relationship to the LSS-OU7 after the completion of the ROD for the LDW site. For further information see Section 7.5.1 of the West Waterway Sediments OU.

At the Lockheed Shipyard OU, contaminated sediments were either dredged to native clean sediments or capped. Both remedial actions prevent exposure to humans, fish, shellfish, etc., either by removing the contaminated sediments or capping contaminated sediments remaining in place, and absent deposition of contaminated sediments from outside the remedial action area, should be fully protective over its lateral extent. Based on post-cleanup sediment sampling of the cap and dredged area, all COCs, except mercury and PCBs, were undetected. Sediment concentrations of mercury and PCBs were below the SQS. Therefore, although consumption rates may have increased as depicted by the EPA Tribal Framework, the remedy has been successfully implemented, and seafood is not exposed to in-place capped sediment contamination.

7.4.3 Question C: Has other information come to light that could call into question the protectiveness of the remedy?

No, other than the new information regarding the Tribal framework described in Section 7.4.2.

7.4.4 Technical Assessment Summary

Data, specifically visual inspections, bathymetric, and topographic surveys, and analytical chemistry data, has been collected annually. Results from the baseline and four annual monitoring events indicate that the remedy is functioning as specified in the decision documents for both the dredged and capped areas. Survey data did not indicate any significant changes, and results from the analytical data showed that cleanup levels have not been exceeded. Refer to the Data Review (Section 6.5.2), for details regarding monitoring requirements, data collection, analysis, and summary of results.

Institutional Controls were not specified in the original ROD for the LSS-OU7 but need to be added to ensure long term functioning and protectiveness of the remedy.

New fish consumption rates have been identified in the Tribal Framework. EPA will review the LSS-OU7 in light of LDW data and decisions and new scientific information or methodologies at a future time.

Given that the RI/FS for the LDW site is still underway, and future cleanup criteria and decisions have not been determined for the LDW site, EPA intends to conduct the above-referenced review after the completion of the ROD for the LDW site.

Table 7-9. LSS-OU7, ARAR Analysis Summary[a]

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Surface Waters/Water Quality Standards;	Federal – Water Quality Standards (33 USC 1251; 40 CFR 131);	Relevant and Appropriate	Federal criteria for the protection of marine aquatic life are relevant and appropriate for discharges to surface water during sediment remediation.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Surface Waters/ Washington Water Pollution Control Act (WPCA); Washington State Water Quality Standards for Surface Water	State – WPCA – Water Pollution Control (RCW 90.48); WPCA Water Quality Standards for Surface Waters (WAC 173-201A)	Applicable	Narrative and quantitative limitations for surface water protection are provided in these regulations. Criteria are established for each water classification, including fecal coliform, total dissolved gas, total dissolved oxygen, temperature, pH, and turbidity. During sediment remediation, discharges to marine surface waters will comply with these requirements.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Sediment/Washington State Sediment Management Standards	State – Sediment Management Standards (RCW 43.21C, 70.105D, 90.48, 90.52, 90.54, 90.70; WAC 173-204)	Applicable	Numerical and narrative criteria for chemicals and biological effects are specified for sediment and are applicable to Harbor Island shipyard sediments.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Surface Waters/National Pollutant Discharge Elimination System (NPDES); Washington State Discharge Permit Program	Federal – NPDES (40 CFR 122, 125); State – NPDES (WAC 173-216, -220)	Applicable	Direct discharges to surface water conducted as part of the remedial actions. Conditions to authorizing direct discharges to surface water are specified under 40 CFR 122. Criteria and standards for discharges are specified in 40 CFR 125. The State of Washington has been authorized by the EPA to implement the NPDES permit program.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Surface Waters/Hydraulics Code Rules for Dredging	State – Hydraulics Code Rules on Dredging (WAC 220-110, -130, 320)	Applicable	Permits must be obtained from the Department of Fish and wildlife for any project that may interfere with the natural flow of surface water. On-site actions must achieve substantive permit requirements.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.

Table 7-9. LSS-OU7, ARAR Analysis Summary[a] (continued)

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Dredged sediment/Solid Waste Disposal Act; Washington State Minimum Functional Standards for Solid Waste Handling	Federal – Solid Waste Disposal (42 USC 3251; 40 CFR 257, 258); State – Solid Waste Handling (WAC 173-304)	Applicable	Wastes generated by the remedial action include dredged sediment and sandblast grit, which is separated from dredge sediment. Separated sandblast grit may be suitable for recycling as feedstock for cement production.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Dredged sediment/Washington State Dangerous Waste Regulations	State – Dangerous Waste Regulations (WAC 173-303)	Applicable	Shipyard wastes must be treated, stored, and disposed in accordance with the sections of these regulations. Section 173-303-070 describes the procedures for testing shipyard wastes to determine if it's a dangerous waste.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Dredged sediment/Clean Water Act (CWA) Dredge and Fill Requirements	Federal – Dredge and Fill Requirements under Sections 401 and 404 of CWA (33 USC 1251; 40 CFR 230, 231; 33 CFR 320-330)	Applicable	These specify requirements for the discharge of dredged or fill material to waters of the U.S.; including wetlands. Dredge and fill activities that will occur during remediation of the OU are specifically regulated by requirements outlined in Section 404. These regulations also provide guidelines for the specification of disposal sites, and define permit requirements for dredge and fill operations that would apply to the remedial action.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Shoreline/Seattle Shoreline Mater Plan; State Shoreline Management Act	Local – Seattle Shoreline Master Plan; State – Shoreline Management (RCW 90.58)	Applicable	Filling, dredging, and other remedial activities conducted within 200 feet of the shoreline will comply with the promulgated substantive requirements of this plan, which was developed pursuant to the State Shoreline Management Act.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Dredged Sediment/Rivers and Harbors Appropriations Act	Federal – Rivers and Harbors Appropriations Act (33 USC 403, 33 USC 322)	Applicable	Section 10 of this statute requires a permit from the U.S. Army of Engineers for construction of marinas, piers, and outfall pipes, and for dredging and filling below the mean high-water line in navigable waters of the United States. Dredging and filling that occur within the Harbor Island Site as part of the selected remedy must meet the substantive requirements of the permit.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.

Table 7-9. LSS-OU7, ARAR Analysis Summary[a] (continued)

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Wetlands/Executive Order 11990, Protection of Wetlands	Federal – Protection of Wetlands (40 CFR 6 Appendix A)	Applicable	Open waters and estuarine intertidal emergent and unconsolidated shore are located in and near the site. Remedial activities must be performed so as to minimize the destruction, loss or degradation of wetlands. Migration would be performed to ensure that no let loss of wetlands occurred.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Surface Water/Endangered Species Act of 1973	Federal – Endangered Species Act (16 USC 1531; 50 CFR 200, 402)	Applicable	Surface water is used as a salmonid migratory route. Remedial actions must be performed so as to conserve endangered or threatened species, including consultation with the Department of Interior.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Surface water/U.S. Fish and Wildlife Coordination Act	Federal – U.S. Fish and Wildlife Coordination (16 USC 661)	Applicable	The site surface water is used as a salmonid migratory route and includes potential use by bald eagles. This act prohibits water pollution with any substances deleterious to fish, plant life, or bird life and requires consultation with the U.S. Fish and Wildlife Service and appropriate state agencies.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Dredged Sediments/Dredge Disposal Analysis;	Local – Puget Sound Dredge Disposal Analysis (Local guidance)	TBC	Includes requirements and guidelines for evaluating dredged material, disposal site management, disposal site monitoring, and data management	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Dredged Sediments/Water Quality Management Plan; Standards for Confined Disposal of Contaminated Sediments	Water quality management plan (unknown authority); State – Standards for Confined Disposal of Contaminated Sediments (State guidance)	TBC	This sets water quality objectives relating to confined disposal of contaminated sediments.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.

Table 7-9. LSS-OU7, ARAR Analysis Summary[a] (continued)

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Surface water/Storm water Management Program	Federal – Water Programs (40 CFR 122 -124); State – Water Pollution Control (RCW 90.48)	TBC	This describes storm water management objectives that may apply to storm drains at Todd Shipyard.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Wetlands/EPA Wetland Action Plan	Federal – CWA Section 404	TBC	The National Wetland Policy who's primary goal is "no net loss" of wetlands.	No active sediment remediation is occurring. A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.
Sediments/Puget Sound Estuary Program Protocols	Local – Puget Sound Partnership	TBC	Provides sample collection, laboratory analysis, and QA/QC procedures for sampling and analyzing sediment samples.	A monitoring program is in place to provide visual inspections, hydrographic and topographic surveys, monitor sediment quality, and the quality of groundwater entering the West Waterway.

[a] No ARARs have been identified associated with the groundwater quality component of the monitoring program.

7.5 WEST WATERWAY SEDIMENTS OPERABLE UNIT 08

Because no remedial action was selected for the WW-OU8, Questions A, B, and C are not answered.

7.5.1 Technical Assessment Summary

The No Action ROD for the WW-OU8 (September 11, 2003) presented the basis for the determination that no CERCLA action was necessary at this OU to protect human health or the environment. Site conditions allow for unlimited use and unrestricted exposure. The no action ROD did not include any requirements for institutional controls and did not require long-term monitoring. Since EPA made the decision for No Action, the statutory requirements of CERCLA Section 121 for remedial actions are not applicable and no statutory or policy five-year reviews are required to be undertaken.

The Region will, however, conduct a discretionary review consistent with the following language reproduced herein from the No Action ROD for the WW-OU8:

"For the West Waterway OU, EPA has determined that no action is necessary to protect public health or welfare or the environment. No CERCLA action is necessary because environmental investigations and site-specific risk assessments found that chemical concentrations in marine sediments within the operable unit do not pose unacceptable risks to human health and the environment. A five-year review for the Harbor Island site will be performed for all OUs. As part of the five-year review process, EPA may authorize monitoring of the OU to verify that the sediment continues to pose no unacceptable risks to human health and the environment."

"As part of the five-year review process, EPA may require and/or conduct monitoring at the site to verify that sediment continues to pose no unacceptable risks to human health and the environment."

"In addition, for the following reasons, EPA expressly determines that the No Action decision in the ROD with respect to PCBs will be revisited if information gathered from dioxin-like PCB congener analyses undertaken for the Lower Duwamish Waterway Superfund site indicate that similar analyses are warranted for the West Waterway OU to ensure protectiveness of human health and the environment. This determination is based on the following circumstances, and is in addition to EPA's normal capacity to re-open site decisions whenever new information suggests EPA should do so to ensure adequate protection of human health and the environment:

- *The West Waterway OU is contiguous with and down river from the Lower Duwamish Waterway (LDW) site.*
- *EPA believes that sources of PCBs found in West Waterway OU may include the LDW site.*
- *All West Waterway OU PCB data utilized for this decision have been evaluated by the total PCB or Aroclor method.*
- *In the future, environmental samples from the LDW site will be analyzed for dioxin-like PCB congeners, as set forth in the December 20, 2000, LDW RI/FS AOC and attached SOW.*

EPA commits to review West Waterway OU in light of LDW data and decisions and new scientific information or methodologies at a future time."

Given that the RI/FS for the LDW site is still underway, and future cleanup criteria and decisions have not been determined for the LDW site, EPA intends to conduct the above-referenced review after the completion of the ROD for the LDW site. EPA acknowledges that the LDW RI Baseline Human Health Risk Assessment (November 12, 2007; Table B.5-64) indicates that the estimated excess cancer risk for the seafood consumption scenarios (Adult Tribal, Reasonable Maximum Exposure) is similar for PCB TEQs/Congeners (1x10-3) and total PCBs (2x10-3). Since there are no PCB congener data for the OU, and the LDW analysis indicates that the lack of these PCB congener data do not appear to result in any significant underestimation of risk, the review for the OU will likely focus on total PCBs.

In summary, EPA will review WW-OU8 in light of LDW data and decisions (which incorporates application of the EPA [2007] Tribal Framework), and new scientific information or methodologies after completion of the ROD for the LDW site.

7.6 TODD SHIPYARDS SEDIMENTS OPERABLE UNIT (TSS-OU9)

7.6.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. Results from the baseline and two annual monitoring events indicate that the remedy is functioning as intended by the decision documents for both the dredged and capped areas. The baseline monitoring event, which was completed immediately after the completion of remedial action, indicates that the remedy is functioning as expected and is effective. The chemical data collected from the dredged locations indicate that cleanup numbers were met. Annual monitoring of the capped areas are intact and do not appear to be subject to erosion. Evidence of fines and shell debris has settled on the surface of the caps indicating that erosion has not taken place. Samples of the sediments on top of the cap have been collected, but the results will not be available until September 2010.

The OMMP has “early warning” monitoring requirements and standards that serve as an indicator that remedial problems may occur in the future. There have been no exceedances of these standards.

Refer to the subsection Data Review (Section 6.7.2) for monitoring requirements, data collection, analysis, and summary of results.

Institutional Controls were not specified in the original ROD for the TSS-OU9 but need to be added to ensure long term functioning and protectiveness of the remedy. An IC study should be completed and ICs need to be implemented, maintained, and run with the land for the capped areas of sediment under the remaining piers,

The objectives for sediment ICs should be to:

- Protect the integrity of the cap(s) from disturbance by dredging, anchoring, and/or pier removal so as to keep buried contamination isolated and to prevent release or migration of contamination;
- Inform future property owners and lessees of the residual contamination under the cap and the corresponding O&M requirements; and
- Require prior notification and EPA approval in event more piers are to be removed or replaced.

7.6.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?

Yes. The remedial action required for the TSS-OU9 was based on the presence of unacceptable risks to benthic organisms. Cleanup numbers for the protection of benthic organisms were derived from Ecology regulations for sediment cleanups. The exposure assumptions and toxicity data have not changed, and the cleanup levels required by Ecology remain the same. The ROD and the subsequent ESDs did not specify/identify RAOs. However, in reading the decision documents, it is clear that the remedial action was meant to accomplish the following:

- Reduce concentrations of hazardous substances in sediments to levels that will have no adverse effect on marine organisms.
- To the extent practicable, the marine habitat must be restored to its most productive condition.

The human health risks, assessed based on exposure scenarios including EPA default Tribal consumption of seafood and direct contact with, and accidental ingestion of, sediments by fishers, were based on data from the West Waterway that also includes the LSS-OU7 and TSS-OU9. Risk numbers were below the level of concern that would require further investigation to determine whether remedial action for protection of human health should be taken.

Since the Shipyard Sediment OU ROD and the two ESDs for the TSS-OU9 were completed, new information has become available on Tribal seafood consumption rates and exposure durations for Tribal populations in Puget Sound and the Strait of Georgia. This new information has been considered for the LSS-OU7, as detailed below.

Note that a summary of the evaluation of each ARAR for TSS-OU9 is presented in Table 7-10.

Human Health: Changes in Assessing Risk to Tribes from Seafood Consumption

In August 2007, EPA Region 10 issued a "Framework for Selecting and Using Tribal Fish and Shellfish Consumption Rates for Risk-Based Decision Making at CERCLA and RCRA Cleanup Sites in Puget Sound and the Strait of Georgia" (EPA 2007; hereinafter referred to as the Framework). The Framework was designed to assist EPA Region 10 with managing hazardous waste cleanup sites with Tribal seafood consumption exposures and concerns.

The primary focus of the Framework is on the performance of risk assessments and their input into risk-based cleanup decisions. The Framework also addresses how five-year reviews will consider and incorporate tenets of the Framework. In part, the Framework concluded:

> Based on EPA's knowledge of sediment cleanup sites in Puget Sound, the Framework may have limited application for those CERCLA and RCRA sites where the remedy has already been selected…As part of the five-year review process, Tribes can provide new information to be considered or request that the lead federal agency evaluate particular aspects of a remedy relative to Tribal interests…Such requests would be evaluated on a site-specific basis consistent with EPA's five-year review guidance...In determining whether a recalculation of site risks or any other detailed analysis is needed as part of the five-year review, EPA would review the basis of the selection of the remedial action and cleanup levels and other relevant information to determine whether further analysis of such updated information is appropriate, and focus our analysis on matters that would help assess the protectiveness of the selected remedy.

Table 7-10. TSS-OU9, ARAR Analysis Summary

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Surface Waters/Water Quality Standards;	Federal – Water Quality Standards (33 USC 1251; 40 CFR 131);	Relevant and Appropriate	Federal criteria for the protection of marine aquatic life are relevant and appropriate for discharges to surface water during sediment remediation.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Surface Waters/ Washington Water Pollution Control Act (WPCA); Washington State Water Quality Standards for Surface Water	State – WPCA – Water Pollution Control (RCW 90.48); WPCA Water Quality Standards for Surface Waters (WAC 173-201A)	Applicable	Narrative and quantitative limitations for surface water protection are provided in these regulations. Criteria are established for each water classification, including fecal coliform, total dissolved gas, total dissolved oxygen, temperature, pH, and turbidity. During sediment remediation, discharges to marine surface waters will comply with these requirements.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Sediment/Washington State Sediment Management Standards	State – Sediment Management Standards (RCW 43.21C, 70.105D, 90.48, 90.52, 90.54, 90.70; WAC 173-204)	Applicable	Numerical and narrative criteria for chemicals and biological effects are specified for sediment and are applicable to Harbor Island shipyard sediments.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Surface Waters/National Pollutant Discharge Elimination System (NPDES); Washington State Discharge Permit Program	Federal – NPDES (40 CFR 122, 125); State – NPDES (WAC 173-216, -220)	Applicable	Direct discharges to surface water conducted as part of the remedial actions. Conditions to authorizing direct discharges to surface water are specified under 40 CFR 122. Criteria and standards for discharges are specified in 40 CFR 125. The State of Washington has been authorized by the EPA to implement the NPDES permit program.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Surface Waters/Hydraulics Code Rules for Dredging	State – Hydraulics Code Rules on Dredging (WAC 220-110, -130, 320)	Applicable	Permits must be obtained from the Department of Fish and wildlife for any project that may interfere with the natural flow of surface water. On-site actions must achieve substantive permit requirements.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Dredged sediment/Solid Waste Disposal Act; Washington State Minimum Functional Standards for Solid Waste Handling	Federal – Solid Waste Disposal (42 USC 3251; 40 CFR 257, 258); State – Solid Waste Handling (WAC 173-304)	Applicable	Wastes generated by the remedial action include dredged sediment and sandblast grit, which is separated from dredge sediment. Separated sandblast grit may be suitable for recycling as feedstock for cement production.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Dredged sediment/Washington State Dangerous Waste Regulations	State – Dangerous Waste Regulations (WAC 173-303)	Applicable	Shipyard wastes must be treated, stored, and disposed in accordance with the sections of these regulations. Section 173-303-070 describes the procedures for testing shipyard wastes to determine if it's a dangerous waste	

Table 7-10. TSS-OU9, ARAR Analysis Summary (continued)

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Dredged sediment/Clean Water Act (CWA) Dredge and Fill Requirements	Federal – Dredge and Fill Requirements under Sections 401 and 404 of CWA (33 USC 1251; 40 CFR 230, 231; 33 CFR 320-330)	Applicable	These specify requirements for the discharge of dredged or fill material to waters of the U.S.; including wetlands. Dredge and fill activities that will occur during remediation of the OU are specifically regulated by requirements outlined in Section 404. These regulations also provide guidelines for the specification of disposal sites, and define permit requirements for dredge and fill operations that would apply to the remedial action.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Shoreline/Seattle Shoreline Mater Plan; State Shoreline Management Act	Local – Seattle Shoreline Master Plan; State – Shoreline Management (RCW 90.58)	Applicable	Filling, dredging, and other remedial activities conducted within 200 feet of the shoreline will comply with the promulgated substantive requirements of this plan, which was developed pursuant to the State Shoreline Management Act.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Dredged Sediment/Rivers and Harbors Appropriations Act	Federal – Rivers and Harbors Appropriations Act (33 USC 403, 33 USC 322)	Relevant and Appropriate	Section 10 of this statute requires a permit from the U.S. Army of Engineers for construction of marinas, piers, and outfall pipes, and for dredging and filling below the mean high-water line in navigable waters of the United States. Dredging and filling that occur within the Harbor Island Site as part of the selected remedy must meet the substantive requirements of the permit.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Wetlands/Executive Order 11990, Protection of Wetlands	Federal – Protection of Wetlands (40 CFR 6 Appendix A)	Applicable	Open waters and estuarine intertidal emergent and unconsolidated shore are located in and near the site. Remedial activities must be performed so as to minimize the destruction, loss or degradation of wetlands. Migration would be performed to ensure that no let loss of wetlands occurred.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Surface Water/Endangered Species Act of 1973	Federal – Endangered Species Act (16 USC 1531; 50 CFR 200, 402)	Applicable	Surface water is used as a salmonid migratory route. Remedial actions must be performed so as to conserve endangered or threatened species, including consultation with the Department of Interior.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Surface water/U.S. Fish and Wildlife Coordination Act	Federal – U.S. Fish and Wildlife Coordination (16 USC 661)	Applicable	The site surface water is used as a salmonid migratory route and includes potential use by bald eagles. This act prohibits water pollution with any substances deleterious to fish, plant life, or bird life and requires consultation with the U.S. Fish and Wildlife Service and appropriate state agencies.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.

Table 7-10. TSS-OU9, ARAR Analysis Summary (continued)

Medium/Authority	ARAR	Status	Standard Applied in ROD	Current Use
Dredged Sediments/Dredge Disposal Analysis;	Local – Puget Sound Dredge Disposal Analysis (Local guidance)	TBC	Includes requirements and guidelines for evaluating dredged material, disposal site management, disposal site monitoring, and data management	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Dredged Sediments/Water Quality Management Plan; Standards for Confined Disposal of Contaminated Sediments	Water quality management plan (unknown authority); State – Standards for Confined Disposal of Contaminated Sediments (State guidance)	TBC	This sets water quality objectives relating to confined disposal of contaminated sediments.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Surface water/Storm water Management Program	Federal – Water Programs (40 CFR 122–124); State – Water Pollution Control (RCW 90.48)	TBC	This describes storm water management objectives that may apply to storm drains at Todd Shipyard.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Wetlands/EPA Wetland Action Plan	Federal – CWA Section 404	TBC	The National Wetland Policy who's primary goal is "no net loss" of wetlands.	No active sediment remediation is occurring. Only visual monitoring of the cap and the previous dredged channel is occurring.
Sediments/Puget Sound Estuary Program Protocols	Local – Puget Sound Partnership	TBC	Provides sample collection, laboratory analysis, and QA/QC procedures for sampling and analyzing sediment samples.	Current monitoring requires only visual monitoring.

The human health risk assumptions made in the ROD for the Shipyard Sediments Operable Unit and applicable to the TSS-OU9 were based on a tribal consumption scenario determined prior to EPA Region 10's development of the Framework. The Framework provides more location-specific consumption survey data for tribal consumption of seafood. The tribal consumption rates used for the risk assessment applicable to the TSS-OU9 represented national consumption rates, which are lower than the rates determined by the consumption survey data. Therefore, the risk to Tribal consumers of seafood may be greater than the risk levels presented in the RODs for the West Waterway and the Shipyard Sediment OUs, and EPA cannot assume that the previous seafood consumption exposure scenarios in the human health risk assessment are still valid. The Framework also emphasizes consultation with affected Tribes, whose fish consumption patterns can differ markedly. Formal consultation occurred with affected Tribes on November 16, 2009. At that meeting, representatives of the Muckleshoot Indian Tribe and Suquamish Tribe expressed that the Tribal Framework be brought into the Agency's decision regarding protectiveness. Tribal exposures will be considered again in subsequent statutory reviews or if new information that affects tribal consumption becomes available (for example, see Section 7.5.1 of the OU).

At the TSS-OU9, contaminated sediments were either dredged to native clean sediments or capped. Both remedial actions prevent exposure to fish and shellfish either by removing the contaminated sediments or capping contaminated sediments remaining in place and absent recontamination should be fully protective over its lateral extent. Based on post-cleanup sediment sampling of the cap and dredged area, all COCs, except mercury and PCBs, were undetected. Sediment concentrations of mercury and PCBs were below the SQS. Therefore, although consumption rates may have increased, the remedy has been successfully implemented, and seafood is not exposed to in-place capped sediment contamination.

7.6.3 Question C: Has other information come to light that could call into question the protectiveness of the remedy?

No, other than the new information regarding the Tribal Framework described in Section 7.6.2.

7.6.4 Technical Assessment Summary

The vast majority of the TSS-OU9 was dredged to clean, native sediments. Analytical data from numerous grab samples taken after the remedy was put in place indicated that surface sediment levels were below the cleanup numbers. The only capped areas are under remaining piers. Annual diver inspections have indicated that the caps remain intact and have not eroded. Sediment sampling was performed in May 2010. Analytical results will be reviewed by EPA when they are received and analyzed in the fall of 2010. Refer to the Data Review (Section 6.7.2), for details regarding monitoring requirements, data collection, analysis, and summary of results. Institutional Controls were not specified in the original ROD for the LSS-OU7, but need to be added to ensure long term functioning and protectiveness of the remedy.

7.7 EAST WATERWAY SEDIMENTS OPERABLE UNIT 10

This section does not apply to the East Waterway since no remedial action was completed.

8. ISSUES (TABLE OF ISSUES BY OPERABLE UNIT)

8.1 SOIL AND GROUNDWATER OPERABLE UNIT 01

Table 8-1 below lists the issues for the S&G-OU1.

Table 8-1. Issues for S&G-OU1

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. Cap inspection and maintenance reporting is inconsistent and PRPs have not been identified for all capped areas of the site.	N	Y
2. Appropriate Restrictive covenants are not in place for all required properties.	N	Y
3. Hot Spot containing heavy petroleum exists on eastern portion of Todd property.	N	Y
4. Cyanide is detected sporadically across the site. Currently analyzing for total and available cyanide, both of which have reporting limits above the cleanup goal for cyanide.	N	Y
5. Groundwater flow in the vicinity of HI-17 has not been confirmed.	N	Y
6. Long-term groundwater monitoring network may require modification.	N	Y
7. Five-Year Review sampling event identified several constituents that should be included in the groundwater monitoring analyte list.	N	Y
8. A potential relationship between constituent concentrations and tidal cycle may exist.	N	Y
9. ROD groundwater cleanup levels may not be protective of marine sediments.	N	Y
10. Groundwater monitoring and groundwater flow analysis is not coordinated with other HI-upland OUs.	N	Y

8.2 TANK FARMS OPERABLE UNIT 02

Table 8-2 below lists the issues for the TF-OU2.

Table 8-2. Issues for TF-OU2

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. It is uncertain if hydraulic capture at BP Plant 1 remedial system is maintained.	Y	Y
2. Elevated contaminant levels remain near the Shell and KM facilities and it is uncertain if contamination is migrating outside the TF-OU2 boundary.	N	Y
3. The source of elevated contaminant levels at the northern boundary of the Shell Main Terminal is uncertain.	N	Y

8.3 LOCKHEED UPLAND OPERABLE UNIT 03

Table 8-3 below lists the issues for the LU-OU3.

Table 8-3. Issues for LU-OU3

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. The cap frequently has ponded water, plant growth, and asphalt cracks.	N	Y
2. Appropriate restrictive covenants are not in place for all required properties.	N	Y
3. Groundwater monitoring program needs modification.	N	Y
4. Five-Year Review sampling event identified several constituents that may need to be included in the groundwater monitoring analyte list.	N	Y
5. PCE detected above cleanup goals near the waterway.	N	Y
6. ROD groundwater cleanup levels may not be protective of marine sediments.	N	Y

8.4 LOCKHEED SHIPYARD SEDIMENT OPERABLE UNIT 07

As reported in Sections 4.4.1 and 4.4.2, EPA has determined that the remedy is functioning as intended, capped contaminants are being contained, and the surface of the cap is not being re-contaminated by capped contaminants. The remedy is described in Section 4.4.2 and is summarized as follows:

- Contaminated sediments were either dredged to native material; or
- Capped with clean material.

Issues are shown below in Table 8-4.

Table 8-4. Issues for LSS-OU7

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. Institutional Controls Study needs to be completed and ICs need to be implemented.	N	Y
2. ICs necessary for protectiveness of the remedy are not included in a decision document.	N	Y
3. Shoreline wells need evaluation for appropriate screen intervals.	N	Y
4. Long Term Sediment Monitoring Data requires further evaluation.	N	Y

8.5 WEST WATERWAY SEDIMENTS OPERABLE UNIT 08

There are no issues for the WW-OU8. The No Action ROD for the WW-OU8 (September 11, 2003) presented the basis for the determination that no CERCLA action was necessary at this OU to protect human health or the environment. Site conditions allow for unlimited use and unrestricted exposure.

8.6 TODD SHIPYARDS SEDIMENT OPERABLE UNIT 09

As reported in Sections 4.6.1 and 4.6.2, EPA has determined that the remedy is functioning as intended and that capped contaminants are being contained. The remedy is described in Section 4.6.2 and is summarized as follows:

- Contaminated sediments were either dredged to native material; or
- Capped with clean material.

Issues are shown below in Table 8-5. In addition and as noted in Section 7, EPA will review sediment data from the TSS-OU9 for Tribal consumption of seafood in light of LDW data and decisions.

Table 8-5. Issues for TSS-OU9

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. Institutional Controls Study needs to be completed and ICs need to be implemented.	N	Y
2. ICs necessary for protectiveness of the remedy are not included in a decision document.	N	Y
3. Long Term Monitoring data needs further evaluation	N	Y

8.7 EAST WATERWAY SEDIMENTS OPERABLE UNIT 10

This section does not apply to the EW-OU10 since no remedial action was completed.

9. RECOMMENDATIONS AND FOLLOW-UP ACTIONS (TABLE OF RECOMMENDATIONS BY OPERABLE UNIT)

9.1 SOIL AND GROUNDWATER OPERABLE UNIT 01

Table 9-1 below lists recommendations for the S&G-OU1.

Table 9-1. S&G-OU1, Recommendations and Follow-Up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1. Cap inspection and maintenance reporting is inconsistent and PRPs have not been identified for all capped areas of the site.	1. Submit reports for all cap areas on a consistent basis.	Steering Committee	EPA	9/28/2010	N	Y
2. Appropriate Restrictive covenants are not in place for all required properties.	2. Record restrictive covenants on required properties and negotiate UECA covenants.	Steering Committee	EPA	9/28/2011	N	Y
3. Hot Spot containing heavy petroleum exists on eastern portion of Todd property.	3. Investigate the Hot Spot and evaluate remedial alternatives.	Todd Shipyard	EPA	9/28/2011	N	Y
4. Cyanide is detected sporadically across the site. Currently analyzing for total and available cyanide, both of which have reporting limits above the cleanup goal for cyanide.	4. Determine the appropriate analytic method and reporting limits for cyanide to determine if waterway is being impacted.	EPA	EPA	9/28/2011	N	Y
5. Groundwater flow in the vicinity of HI-17 has not been confirmed.	5. Assess the groundwater flow near HI-17, which may include a tidal study.	Steering Committee	EPA	9/28/2012	N	Y
6. Long-term groundwater monitoring network may require modification.	6. Modify the long-term groundwater monitoring network.	Steering Committee	EPA	12/31/2011	N	Y
7. Five-Year Review sampling event identified several constituents that should be included in the groundwater monitoring analyte list.	7. Include analyses for PCE at HI-7, bis(2-ethylhexyl)phthalate at HI-5.	Steering Committee	EPA	12/31/2011	N	Y
8. A potential relationship between constituent concentrations and tidal cycle may exist.	8. Consider the tidal cycle in future sampling events.	Steering Committee	EPA	12/31/2011	N	Y
9. ROD groundwater cleanup levels may not be protective of marine sediments.	9. Verify that ROD groundwater cleanup levels are protective of marine sediments.	EPA	EPA	9/28/2015	N	Y
10. Groundwater monitoring and groundwater flow analysis is not coordinated with other HI-upland OUs.	10. Work with all upland responsible parties to coordinate groundwater monitoring programs between all upland OUs.	PRPs	EPA	9/28/2015	N	Y

9.2 TANK FARMS OPERABLE UNIT 02

Table 9-2 below lists recommendations for the TF-OU2.

Table 9-2. TF-OU2, Recommendations and Follow-Up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1. It is uncertain if hydraulic capture at BP Plant 1 remedial system is maintained.	1. Evaluate hydraulic containment and perform investigations or modify the remediation system as necessary.	Tank Farm Facilities/PLPs	Ecology	9/28/2015	Y	Y
2. Elevated contaminant levels remain near the Shell and KM facilities and it is uncertain if contamination is migrating outside the TF-OU2 boundary.	2. Evaluate the extent and potential migration pathway outside of the TF-OU2 boundary.	Tank Farm Facilities/PLPs	Ecology	9/28/2015	N	Y
3. The source of elevated contaminant levels at the northern boundary of the Shell Main Terminal is uncertain.	3. Evaluate the extent and nature of the remaining contamination.	Tank Farm Facilities/PLPs	Ecology	9/28/2015	N	Y

9.3 LOCKHEED UPLAND OPERABLE UNIT 03

Table 9-3 below lists recommendations for the LU-OU3.

Table 9-3. LU-OU3, Recommendations and Follow-Up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1. The cap frequently has ponded water, plant growth, and asphalt cracks.	1. Permanently repair cap problems and construct stormwater controls consistent with plans for POS redevelopment.	POS	EPA	9/28/2011	N	Y
2. Appropriate restrictive covenants are not in place for all required properties.	2. Negotiate UECA covenants.	Lockheed	EPA	9/28/2011	N	Y
3. Groundwater monitoring program needs modification.	3. Assess groundwater flow direction, tidal influence, and appropriate screen intervals and modify groundwater monitoring network as necessary.	Lockheed	EPA	9/28/2011	N	Y
4. Five-Year Review sampling event identified several constituents that may need to be included in the groundwater monitoring analyte list.	4. Include analyses for PCE and bis(2-ethylhexl)phthalate.	Lockheed	EPA	9/28/2011	N	Y
5. PCE detected above cleanup goals near the waterway.	5. Assess groundwater flow and potential for PCE to impact the waterway.	EPA	EPA	9/28/2015	N	Y
6. ROD groundwater cleanup levels may not be protective of marine sediments.	6. Verify that ROD groundwater cleanup levels are protective of marine sediments.	EPA	EPA	9/28/2015	N	Y

9.4 LOCKHEED SHIPYARD SEDIMENT OPERABLE UNIT 07

Recommendations and follow-up actions are shown in Table 9-4 below. As noted in Section 7, EPA will review sediment data from the LSS-OU7 for Tribal consumption of seafood in light of LDW data and decisions.

Table 9-4. LSS-OU7, Recommendations and Follow-Up Actions

Issue	Recommended/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1. Institutional Controls Study needs to be completed and ICs need to be implemented.	1. Conduct IC Study to evaluate the need for ICs. Implement ICs.	PRP	EPA	October 2011	N	Y
2. ICs necessary for protectiveness of the remedy are not included in a decision document.	2. Include ICs in a decision document.	EPA	EPA	October 2012	N	Y
3. Shoreline wells need evaluation for appropriate screen intervals.	3. Conduct a geoprobe well screen assessment for the shoreline wells.	PRP	EPA	October 2011	N	Y
4. Long Term Sediment Monitoring Data requires further evaluation.	4. EPA intends to evaluate the sediment data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.4.2).	EPA	EPA	September 2015	N	Y

9.5 WEST WATERWAY SEDIMENTS OPERABLE UNIT 08

There are no recommendations or follow-up actions for the WW-OU8. The No Action ROD for the WW-OU8 (September 11, 2003) presented the basis for the determination that no CERCLA action was necessary at this OU to protect human health or the environment. Site conditions allow for unlimited use and unrestricted exposure.

9.6 TODD SHIPYARDS SEDIMENT OPERABLE UNIT 09

Table 9-5 provides recommendations and follow-up actions. As noted in Section 7, EPA commits to review sediment data in the TSS-OU9 for Tribal consumption of seafood in light of LDW data and decisions.

Table 9-5. TSS-OU9, Recommendations and Follow-Up Actions

Issue	Recommended/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1. Institutional Controls Study needs to be completed and ICs need to be implemented.	1. Conduct IC Study to evaluate the need for and implement ICs.	PRP	EPA	October 2011	N	Y
2. ICs necessary for protectiveness of the remedy are not included in a decision document.	2. Include ICs in a decision document.	EPA	EPA	October 2012	N	Y
3. Long Term Monitoring data needs further evaluation	3. EPA intends to evaluate the sediment data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.6.2).	EPA	EPA	September 2015	N	Y

9.7 EAST WATERWAY SEDIMENTS OPERABLE UNIT 10

This section does not apply to the EW-OU10 since no remedial action was completed.

10. PROTECTIVENESS STATEMENT(S)

10.1 SOIL AND GROUNDWATER OPERABLE UNIT 01

The remedy at the S&G-OU1 is protective of human health and the environment in the short term because a cap is in place to prevent exposure to contaminated soil and limit leaching of soil contaminants. However, in order for the remedy to be protective in the long-term, appropriate restrictive covenants must be recorded, cap inspections and maintenance must be completed annually, LNAPL removal must be continued at Todd Shipyard, and the groundwater monitoring program must be modified and coordinated with groundwater monitoring programs for the other upland OUs.

10.2 TANK FARMS OPERABLE UNIT 02

A protectiveness determination for the TF-OU2 is currently deferred until the following actions have been completed:

- Complete an evaluation of hydraulic containment near the shoreline at the BP Plant 1 remediation system to determine if contamination is reaching the West Waterway. Modify the system as necessary.
- Evaluate the nature and extent of contamination near the Shell and KM facilities to determine if it is migrating outside the TF-OU2 boundary. Remediate as necessary.
- Evaluate the nature and extent of contamination at the northern boundary of the Shell Main Terminal. Remediate as necessary.

It is expected that these actions will be completed prior to the next Five-Year Review.

10.3 LOCKHEED UPLAND OPERABLE UNIT 03

The remedy at the LU-OU3 is protective of human health and the environment in the short-term because a cap is in place to prevent exposure to contaminated soil and limit leaching of soil contaminants. However, in order for the remedy to be protective in the long-term permanent cap repairs must be completed, appropriate restrictive covenants must be recorded, the potential for PCE to impact the waterway must be evaluated, and the long-term monitoring program must be modified.

10.4 LOCKHEED SHIPYARD SEDIMENTS OPERABLE UNIT 07

For the LSS-OU7, all remedial actions have been completed, and the remedy is currently protective of human health and the environment. However, in order for the remedy to remain protective in the long-term, institutional controls for the sediment cap must be implemented to ensure long-term protectiveness of the remedy. After completion of the ROD for the adjacent LDW Superfund site, and evaluation of long-term monitoring results for this remedy, EPA intends to evaluate this PCB and/or mercury data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.4.2).

10.5 WEST WATERWAY SEDIMENTS OPERABLE UNIT 08

The No Action ROD for the WW-OU8 (September 11, 2003) presented the basis for the determination that no CERCLA action was necessary at this OU to protect human health or the environment and that site conditions allow for unlimited use and unrestricted exposure. The No Action ROD did not include any requirements for institutional controls and did not require long-term monitoring of sediments in the WW-OU8. Since EPA made the decision for No Action, the statutory requirements of CERCLA Section 121 for remedial actions are not applicable and no statutory or policy five-year reviews are required to be undertaken.

10.6 TODD SHIPYARDS SEDIMENTS OPERABLE UNIT 09

For the TSS-OU9, all remedial actions have been completed, the remedy is currently protective of human health and the environment. However, in order for the remedy to remain protective in the long-term, institutional controls for the sediment cap must be implemented to ensure long-term protectiveness of the remedy. Also, after completion of the ROD for the adjacent LDW Superfund site, if monitoring data from this OU shows the presence of PCBs and/or mercury, EPA intends to evaluate the sediment data in light of the results of the LDW risk assessment and the cleanup levels and decisions in the LDW ROD, and in consideration of the consumption rates that have been identified in EPA's 2007 Tribal Framework for assessing risk to Tribes from seafood consumption (see Section 7.6.2).

10.7 EAST WATERWAY SEDIMENTS OPERABLE UNIT 10

Since no remedial action has occurred in the EW-OU10, a protective determination cannot be made during this five-year review.

11. NEXT REVIEW

The next five-year review for the Harbor Island Superfund site is required by September 2015, five years from the date of this review.

REFERENCES

AECOM. 2009a. Revision 3 conductivity profile assessment memorandum. May 12, 2009.

AECOM. 2009b. Port of Seattle T-18 – 2008 cap inspection memorandum. November 6, 2009.

AECOM. 2009c. Harbor Island soil and groundwater operable unit – 2008–2009 groundwater monitoring report. November 30, 2009.

AECOM, 2010. March 2010 Groundwater Monitoring Report. May 2, 2010.

Delta Environmental Consultants, Inc. 2006a. Quarterly groundwater monitoring report, fourth quarter 2005. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. March 2006.

Delta Environmental Consultants, Inc., 2006b. Quarterly groundwater monitoring report, first quarter 2006. Kinder Morgan Liquid Terminals, LLC. Harbor Island Terminal. May 2006.

Delta Environmental Consultants, Inc. 2006c. C Yard groundwater confirmation plan and proposed site-wide groundwater compliance monitoring plan. Kinder Morgan Harbor Island Terminal, Seattle, WA. August 2, 2006.

Delta Environmental Consultants, Inc. 2006d. Annual groundwater monitoring report, second quarter 2006. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. September 2006.

Delta Environmental Consultants, Inc. 2006e. Quarterly groundwater monitoring report, third quarter 2006. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. November 2006.

Delta Environmental Consultants, Inc. 2007a. Construction documentation report bio-sparge barrier. Kinder Morgan Liquid Terminals, LLC Harbor Island Terminal. January 2007.

Delta Environmental Consultants, Inc. 2007b. Quarterly groundwater monitoring report, fourth quarter 2006, Kinder Morgan liquid Terminals LLC, Harbor Island Terminal. February 2007.

Delta Environmental Consultants, Inc. 2007c. Quarterly groundwater monitoring and bio-sparge system operation and monitoring report, first quarter 2007. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. May 2007.

Delta Environmental Consultants, Inc. 2007d. Site-wide groundwater compliance monitoring plan, proposed reduced monitoring. Kinder Morgan Harbor Island Terminal. June 21, 2007.

Delta Environmental Consultants, Inc. 2007e. Annual groundwater monitoring and bio-sparge system operation and monitoring report, second quarter 2007. Kinder Morgan Liquid Terminals, LLC, Harbor island Terminal. September 2007.

Delta Environmental Consultants, Inc. 2007f. Quarterly groundwater monitoring and bio-sparge system operation and monitoring report, third quarter 2007. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. November 2007.

Delta Environmental Consultants, Inc. 2008a. Quarterly groundwater monitoring and bio-sparge system operation and monitoring report, fourth quarter 2007. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. January 2008.

Delta Environmental Consultants, Inc. 2008b. Quarterly groundwater monitoring and bio-sparge system operation and monitoring report, first quarter 2008. Kinder Morgan Liquid Terminals, LLC, Harbor island Terminal. May 2008.

Delta Environmental Consultants, Inc. 2008c. A Yard soil confirmation sampling workplan. Kinder Morgan Harbor Island Terminal. November 19, 2008.

Delta Environmental Consultants, Inc. 2008d. Quarterly groundwater monitoring and bio-sparge system operation and monitoring report, third quarter 2008. Kinder Morgan Liquid Terminals, LLC, Harbor island Terminal. December 2008.

Delta Environmental Consultants, Inc. 2009a. Quarterly groundwater monitoring and bio-sparge system operation and monitoring report, fourth quarter 2008. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. January 2009.

Delta Environmental Consultants, Inc. 2009b. Quarterly groundwater monitoring and bio-sparge system operation and monitoring report, first quarter 2009. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. April 2009.

Delta Environmental Consultants, Inc. 2009c. C Yard groundwater confirmation and B Yard well installation workplan. Kinder Morgan Harbor Island Terminal. July 31, 2009.

Delta Environmental Consultants, Inc. 2009d. Second quarter 2008 and 5-year review report compliance groundwater monitoring and bio-sparge system operation. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. August 2009.

Delta Environmental Consultants, Inc. 2009e. Annual groundwater monitoring and bio-sparge system operation and monitoring report, second quarter 2009. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. August 2009.

Delta Environmental Consultants, Inc. 2009f. C Yard groundwater confirmation and B Yard well installation workplan addendum. Kinder Morgan Harbor Island Terminal. September 23, 2009.

Delta Environmental Consultants, Inc. 2009g. A Yard hot spot evaluation and completion of cleanup action. Kinder Morgan Harbor Island Terminal. October 21, 2009.

Delta Environmental Consultants, Inc. 2009h. C Yard confirmation groundwater monitoring and completion of cleanup action. Kinder Morgan Harbor Island Terminal. December 11, 2009.

Delta Environmental Consultants, Inc. 2009i. Quarterly groundwater monitoring and bio-sparge system operation and monitoring report, third quarter 2009. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. December 2009.

Delta Environmental Consultants, Inc. 2010a. Quarterly groundwater monitoring and bio-sparge system operation and monitoring report, fourth quarter 2009. Kinder Morgan Liquid Terminals, LLC, Harbor Island Terminal. January 2010.

Delta Environmental Consultants, Inc. 2010b. KMLT, Shell, and BP cooperative gauging Harbor Island tank farms operable unit, Seattle, Washington. January 27, 2010.

Delta Environmental Consultants, Inc. 2010c. Sulfate application pilot test workplan. Kinder Morgan Harbor Island Terminal. February 10, 2010.

Ecology (Washington State Department of Ecology). 1999. Equilon Consent Decree. 99-2-07176-0 SEA.

Ecology. 2000. ARCO Consent Decree. 00-2-05714-8 SEA.

Ecology. 2000. GATX Consent Decree. 00-2-07760-2 SEA.

ENSR Corporation, 2008a. 2007 Terminal 18 cap inspection report. April 2008.

ENSR Corporation, 2008b. Groundwater monitoring plan – revision 2, Harbor Island soil and groundwater operable unit, Seattle, Washington. July 2008.

ENSR Corporation, 2008c. Groundwater monitoring plan – Revision 3, Harbor Island soil and groundwater operable unit, Seattle, Washington. December 2008.

ENSR Corporation, 2008d. Harbor Island soil and groundwater operable unit – 2007–2008 groundwater monitoring report. November 25, 2008.

Floyd | Snider, 2005. Design report addendum, design set 1A, LNAPL remediation system Todd Shipyard, soil and groundwater operable unit. March 1, 2005.

EPA (Environmental Protection Agency). 2007. Framework for selecting and using tribal fish and shellfish consumption rates for risk-based decision making at CERCLA and RCRA cleanup sites in Puget Sound and the Strait of Georgia. August 2007.

EPA (Environmental Protection Agency). 2010. Letter to Mr. Bill Bath, Lockheed Martin Corporation. Subject: Response to EPA request for information, studies, and institutional control documentation for the Third Harbor Island Superfund 5-Year Review. February 12, 2010.

Floyd | Snider, 2008. Letter report to Ravi Sanga, EPA. 2008 geoprobe investigation results report. December 3, 2008.

Floyd | Snider, 2009a. Draft design report addendum, system modification work plan, design set 1A, LNAPL remediation system, Todd Pacific Shipyards, soil and groundwater operable unit. May 5, 2009.

Floyd | Snider, 2009b. Design report addendum, system modification work plan, design set 1A, LNAPL remediation system, Todd Pacific Shipyards, soil and groundwater operable unit. November 23, 2009.

Floyd | Snider, 2009c. Construction best management practices work plan, Port of Seattle, Terminal 10. May 6, 2010.

King County, 2006-2009. Annual report of inspections and summary of activities relating to the remedial action cap for King County/Fisher Mills property on Harbor Island.

Landau Associates, Inc. 1998. Draft final (95 percent) design, Harbor Island soil and groundwater operable unit design set 1A, LNAPL remediation, Todd Pacific Shipyards Corporation. October 28, 1998.

Lockheed Martin Corporation, 2008a. Letter to Ravi Sanga, EPA. Response to EPA review comments, yard 1 uplands semiannual groundwater monitoring report, Harbor Island, Seattle Washington. February 28, 2008.

Lockheed Martin Corporation, 2008b. Groundwater monitoring analytical program reduction evaluation, yard 1 Lockheed Shipyard sediment operable unit, shoreline monitoring program, Harbor Island, Seattle, Washington. September 11, 2008.

Lovely. 2006. Harbor Island soil and groundwater operable unit, groundwater monitoring plan implementation, installation of monitoring wells. April 27, 2006.

RETEC (The RETEC Group, Inc.). 1998. Design set 1B capping remedial action implementation report, Harbor Island superfund site soil and groundwater operable unit. September 15, 1998.

RETEC. 2004. Groundwater monitoring plan – revision 1, Harbor Island soil and groundwater operable unit, Seattle, Washington. January 30, 2004.

RETEC. 2005. Memorandum to Neil Thompson, EPA, re: proposed compliance monitoring well screen locations. July 22, 2005.

RETEC. 2006a. Proposed technical changes to Shell Harbor Island compliance monitoring plan. February 1, 2006.

RETEC. 2006b. Design set No. 2 capping implementation report, Terminal 18 expansion – Harbor Island Superfund Site, Seattle, Washington. February 14, 2006.

RETEC. 2006c. 2005–2006 groundwater monitoring report, Harbor Island superfund site – soil and groundwater operable unit, Seattle, Washington. September 25, 2006.

RETEC. 2007. Annual compliance monitoring report – 2005–2006. Shell Seattle Distribution Terminal, Seattle, WA. March 16, 2007.

Shell Oil Products U.S. 2006a. Progress report Shell Oil Products U.S., Seattle Terminal. November 1, 2005 through January 31, 2006. March 10, 2006.

Shell Oil Products U.S. 2006b. Progress report Shell Oil Products U.S., Seattle Terminal. February 1, 2006 through April 30, 2006. May 10, 2006.

Shell Oil Products U.S. 2006c. Progress report Shell Oil Products U.S., Seattle Terminal. May 1, 2006 through July 31, 2006. August 11, 2006.

TechSolv Consulting Group, Inc. 2006a. 2005 annual site report, BP West Coast Products Terminal, Harbor Island. May 2006.

TechSolv Consulting Group, Inc. 2006b. Atlantic Richfield Company Harbor Island Terminal, Seattle, WA, second quarter 2006 site progress report/first quarter 2006 groundwater performance monitoring report. July 18, 2006.

TechSolv Consulting Group, Inc. 2006c. Atlantic Richfield Company Harbor Island Terminal, Seattle, WA, third quarter 2006 site progress report/second quarter 2006 groundwater performance monitoring report. October 2006.

TechSolv Consulting Group, Inc. 2007a. Atlantic Richfield Company Harbor Island Terminal, Seattle, WA, fourth quarter 2006 site progress report/third quarter 2006 groundwater performance monitoring report. January 2007.

TechSolv Consulting Group, Inc. 2007b. 2006 annual site report, BP West Coast Products Terminal, Harbor Island. April 2007.

TechSolv Consulting Group, Inc. 2007c. Second quarter 2007 progress report/first quarter 2007 groundwater performance monitoring report, BP West Coast Products Terminal, Harbor Island. June 2007.

TechSolv Consulting Group, Inc. 2007d. Third quarter 2007 progress report/second quarter 2007 groundwater performance monitoring report, BP West Coast Products Terminal, Harbor Island. October 2007.

TechSolv Consulting Group, Inc. 2007e. Pilot testing workplan southern boundary SVE system, BP Terminal 21T, Harbor Island. November 2007.

TechSolv Consulting Group, Inc. 2008a. Second quarter 2008 progress report/first quarter 2008 groundwater performance monitoring report, BP West Coast Products Terminal, Harbor Island. June 2008.

TechSolv Consulting Group, Inc. 2008b. 2007 annual site report and five-year review, BP West Coast Products Terminal, Harbor Island. July 2008.

TechSolv Consulting Group, Inc. 2008c. Third quarter 2008 progress report/second quarter 2008 groundwater performance monitoring report, BP West Coast Products Terminal, Harbor Island. October 2008.

TechSolv Consulting Group, Inc. 2009a. Fourth quarter 2008 progress report/third quarter 2008 groundwater performance monitoring report, BP West Coast Products Terminal, Harbor Island. January 2009.

TechSolv Consulting Group, Inc., 2009b. Annual site report, BP West Coast Products Terminal, Harbor Island. April 2009.

TechSolv Consulting Group, Inc. 2009c. Second quarter 2009 progress report/first quarter 2009 groundwater performance monitoring report, BP West Coast Products Terminal, Harbor Island. July 2009.

TechSolv Consulting Group, Inc., Third quarter 2009d progress report/second quarter 2009 groundwater performance monitoring report, BP West Coast Products Terminal, Harbor Island. October 2009.

TechSolv Consulting Group, Inc. 2010a Fourth quarter 2009 progress report/third quarter 2009 groundwater performance monitoring report, BP West Coast Products Terminal, Harbor Island. January 2010.

Tetra Tech, Inc., 2005. Final Lockheed Yard 1, uplands cap inspection – October 2005, Harbor Island, Seattle, Washington. November 14, 2005.

Tetra Tech, Inc., 2006. Cap inspection report, Lockheed Shipyard No. 1 Uplands, Harbor Island, Seattle, Washington. Prepared for Lockheed Martin. September 29, 2006.

Tetra Tech, Inc., 2007. Proposal for consolidation of long-term groundwater monitoring programs, Seattle Yard 1 property, (Uplands OU and Lockheed Shipyard Sediment OU), Harbor Island, Seattle, Washington. January 2007.

Tetra Tech, Inc., 2008a. 2008 annual cap inspection report, Lockheed Shipyard No. 1 Uplands, Harbor Island, Seattle, Washington. Prepared for Lockheed Martin. September 2008.

Tetra Tech, Inc., 2008b. Shoreline groundwater monitoring report, April 2008 (Round 6) monitoring event. Seattle Yard 1 property (Uplands OU and Lockheed Shipyard sediment OU), Harbor Island, Seattle, Washington. January 2008.

Tetra Tech, Inc. 2009a. October 2008 Semi-annual groundwater monitoring report Lockheed Shipyard No. 1 – Uplands, Harbor Island, Seattle, Washington. January 2009.

Tetra Tech, Inc. 2009b. Shoreline groundwater monitoring report, October 2008 (Round 7) monitoring event. Seattle yard 1 property (Uplands OU and Lockheed Shipyard Sediment OU), Harbor Island, Seattle, Washington. January 2009.

Tetra Tech, Inc. 2009c. Shoreline groundwater monitoring report, April 2009 (Round 8) monitoring event. Seattle yard 1 property (Uplands OU and Lockheed Shipyard Sediment OU), Harbor Island, Seattle, Washington. June 2009.

Tetra Tech, Inc. 2010. Shoreline groundwater monitoring report, March 2010 (Round 10) Monitoring Event. Seattle Yard 1 property (Lockheed Shipyard Sediment OU, groundwater monitoring program) Harbor Island, Seattle, Washington. May 2010.

URS Corporation. 2006. Progress report Shell Oil Products U.S., Seattle Terminal. August 1, 2006 through October 31, 2006. November 15, 2006.

URS Corporation. 2007a. Progress report Shell Oil Products U.S., Seattle Terminal. November 1, 2006 through January 31, 2006. February 14, 2007.

URS Corporation. 2007b. Progress report Shell Oil Products U.S., Seattle Terminal. February 1, 2007 through April 30, 2007. May 15, 2007.

URS Corporation. 2007c. Work plan limited soil investigation tank 80000, Shell Harbor Island Terminal. July 11, 2007.

URS Corporation. 2007d. Work plan tank 280 groundwater investigation Shell Oil Seattle Terminal. August 8, 2007.

URS Corporation. 2007e. Progress report Shell Oil Products U.S., Seattle Terminal. May 1, 2007 through July 31, 2007. August 15, 2007.

URS Corporation. 2007f. Proposed technical changes to Shell Harbor Island compliance monitoring plan. September 14, 2007.

URS Corporation. 2007g. Work plan soil and groundwater investigation SH-04 area, Shell Harbor Island Terminal, Seattle, WA. October 23, 2007.

URS Corporation. 2007h. Annual compliance monitoring report – 2006–2007, Shell Seattle Distribution Terminal, Seattle, WA. November 7, 2007.

URS Corporation. 2007i. Progress report Shell Oil Products U.S., Seattle Terminal. August 1, 2007 through October 10, 2007. November 7, 2007.

URS Corporation. 2007j. Tank 280 groundwater investigation, Shell Oil Seattle Terminal, 2555 13th Avenue SW, Seattle, WA. November 7, 2007.

URS Corporation. 2008a. Tank 80000 limited soil investigation and excavation. Shell Oil Seattle Terminal. 2555 13th Avenue SW, Seattle, WA. January 24, 2008.

URS Corporation. 2008b. Progress report Shell Oil Products U.S., Seattle Terminal. November 1, 2007 through January 31, 2008. February 14, 2008.

URS Corporation. 2008c. Shoreline manifold completion of cleanup, Shell Seattle Terminal, Seattle, WA. March 27, 2008.

URS Corporation. 2008d. Progress report Shell Oil Products U.S., Seattle Terminal. February 1, 2008 through April 30, 2008. May 14, 2008.

URS Corporation. 2008e. Progress report Shell Oil Products U.S., Seattle Terminal. May 1, 2008 through July 31, 2008. August 15, 2008.

URS Corporation. 2008f. Progress report Shell Oil Products U.S., Seattle Terminal. August 1, 2008 through October 31, 2008. November 14, 2008.

URS Corporation. 2008g. Work plan soil investigation for shoreline manifold area, Shell Harbor Island Terminal, Seattle, WA. November 5, 2008.

URS Corporation. 2009a. Site investigation report, Shell Harbor Island Terminal Well SH-04 Area, 2555 13th Avenue SW, Seattle, WA. February 10, 2009.

URS Corporation. 2009b. Progress report Shell Oil Products U.S., Seattle Terminal. November 1, 2008 through January 31, 2009. February 13, 2009.

URS Corporation. 2009c. Draft five-year review report (2004–2008) Shell Seattle Distribution Terminal, Seattle, WA. March 2009.

URS Corporation. 2009d. Progress report Shell Oil Products U.S., Seattle Terminal. February 1, 2008 through April 30, 2009. May 14, 2009.

URS Corporation. 2009e. Shoreline manifold soil assessment report, Shell Harbor Island Terminal, 1711 13th Avenue SW, Seattle, WA. June 1, 2009.

URS Corporation. 2009f. Limited subsurface investigation work plan TX-03A Area, Shell Harbor Island Terminal, Seattle, WA. August 10, 2009.

URS Corporation. 2009g. Progress report Shell Oil Products U.S., Seattle Terminal. May 1, 2009 through July 31, 2009. August 14, 2009.

URS Corporation. 2009h. Progress report Shell Oil Products U.S., Seattle Terminal. August 1, 2009 through October 31, 2009. November 11, 2009.

URS Corporation. 2010a. Progress report Shell Oil Products U.S., Seattle Terminal. October 1, 2009 through December 31, 2009. February 12, 2010.

Windward Environmental, LLC. 2008. Port of Seattle Terminal 10, Interim maintenance plan for superfund cap, Draft. Prepared for Port of Seattle. January 22, 2008.

FIGURES

415-2328-007/046C(FR01) 8/10 (B)

N

0 3,000

SCALE IN FEET

Figure 2-1
Harbor Island Vicinity Map

415-2328-007/046C(FR01) 8/10 (B)

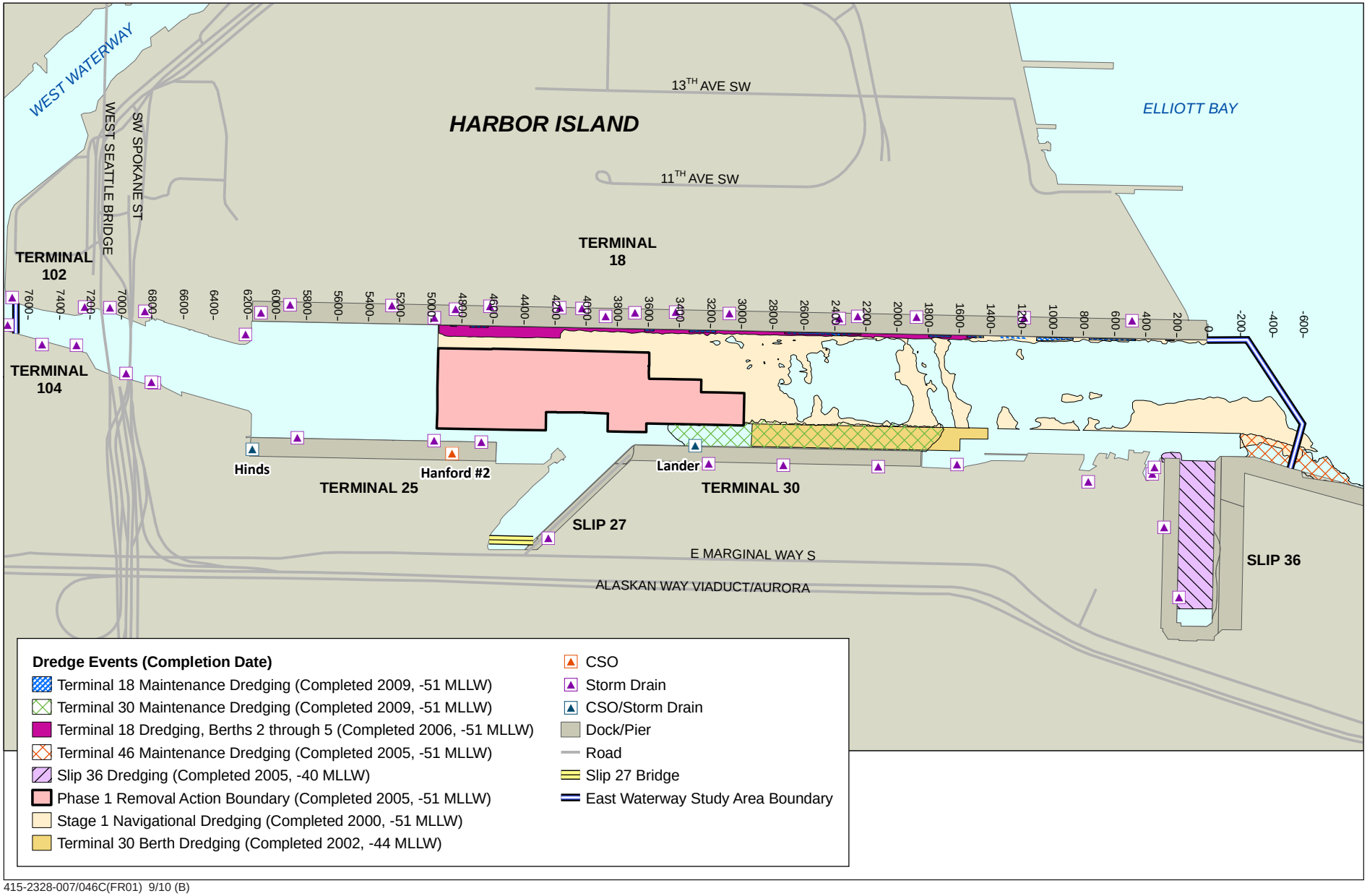
N

0 300

SCALE IN FEET

Operable Unit Boundary

Figure 2-2
Harbor Island Operable Units



415-2328-007/046C(FR01) 9/10 (B)

N

0 900

SCALE IN FEET

Figure 3-1
Summary of Dredging Activities

415-2328-007/046C(FR01) 9/10 (B)

Source: AECOM

N

0 850

SCALE IN FEET

Figure 4-1
S&G-OU1, Cap Areas

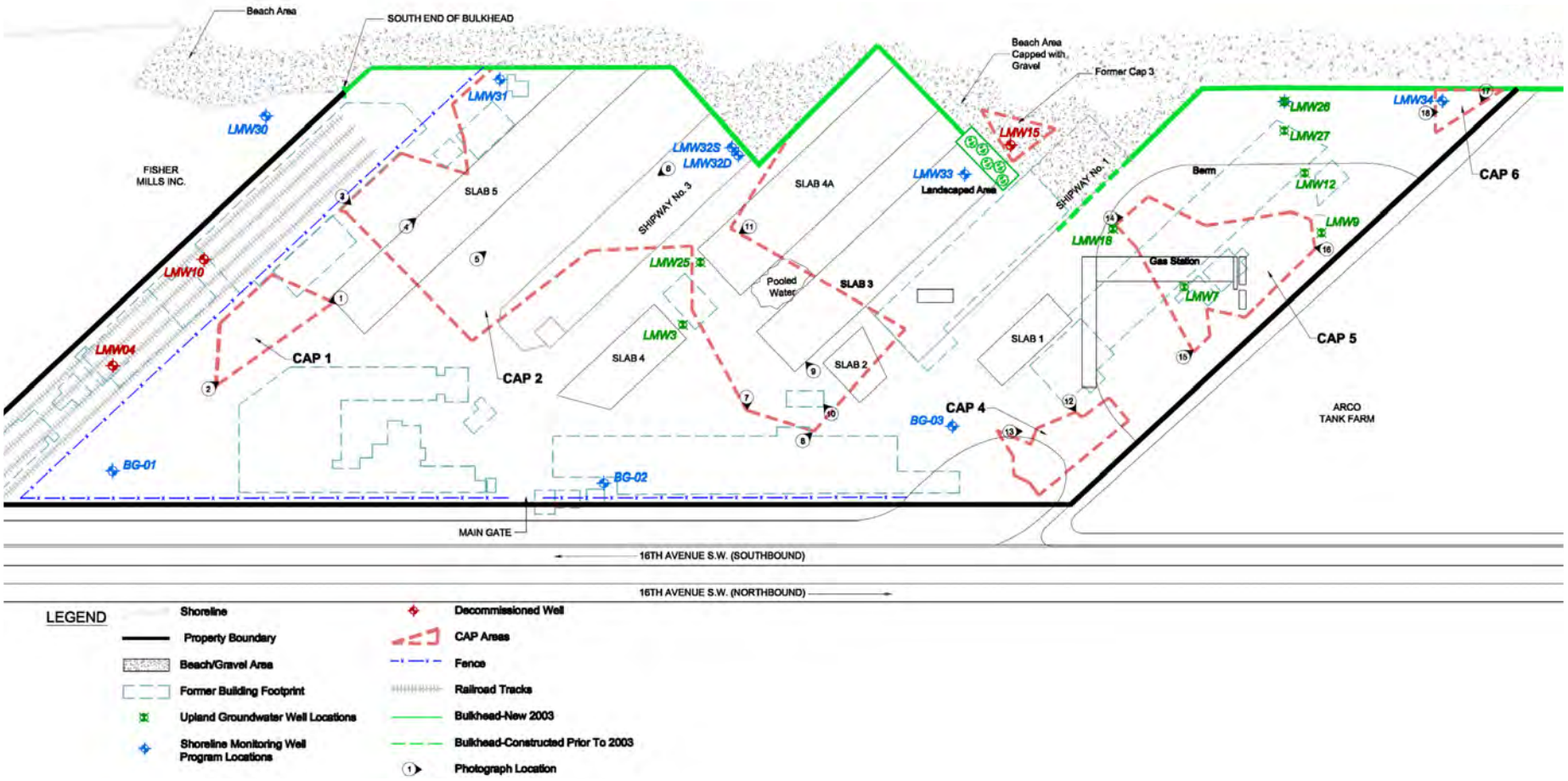
415-2328-007/046C(FR01) 9/10 (B)

N

0 175

SCALE IN FEET

Figure 4-2
Tank Farm Facility Boundaries



415-2328-007/046C(FR01) 9/10 (B)

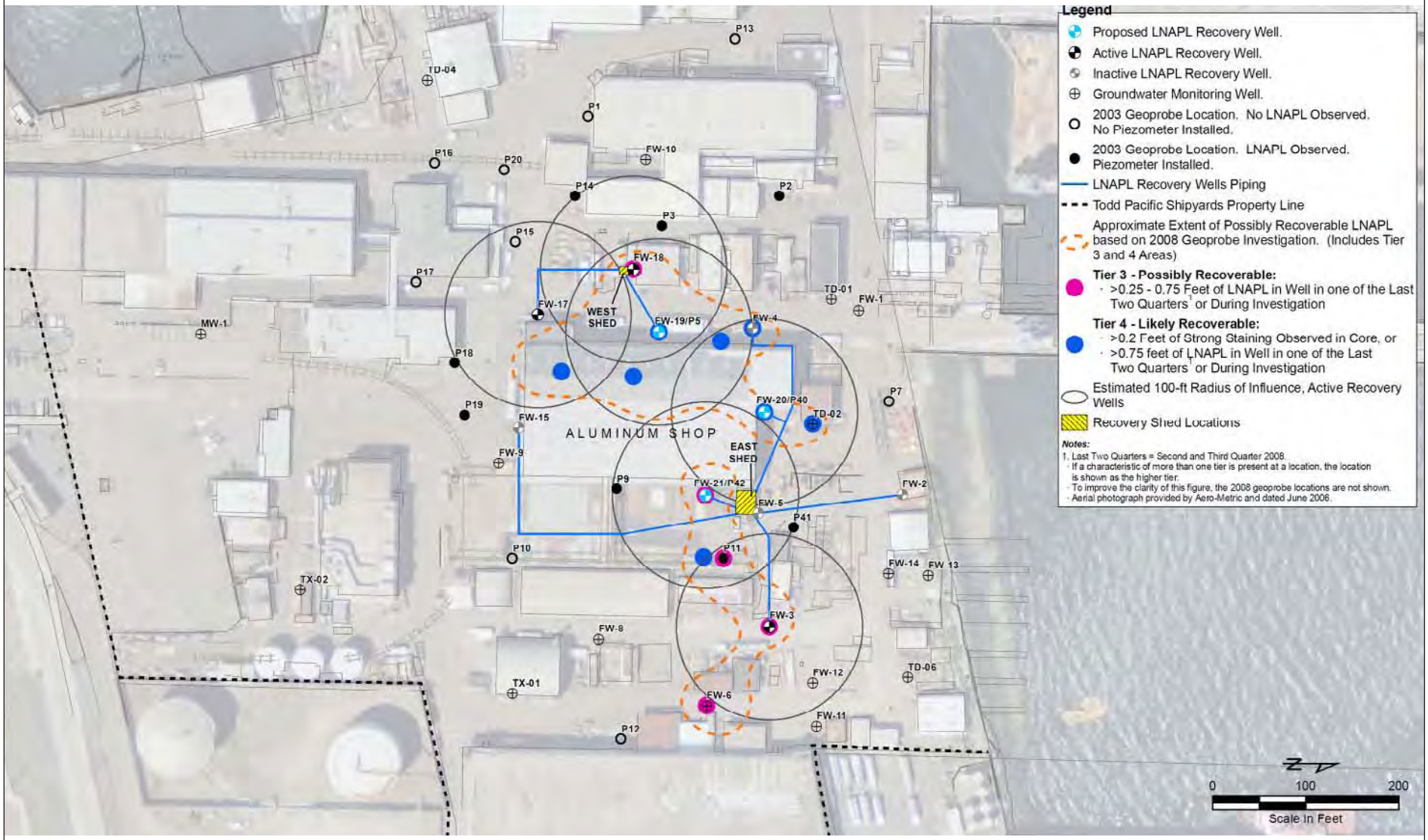
Source: Tetra Tech, Inc.

N

0 200

SCALE IN FEET

Figure 4-3
LU-OU3, Cap Areas and Groundwater Monitoring Network



415-2328-007/046C(FR01) 9/10 (B)

Source: Floyd Snider

N

0 150

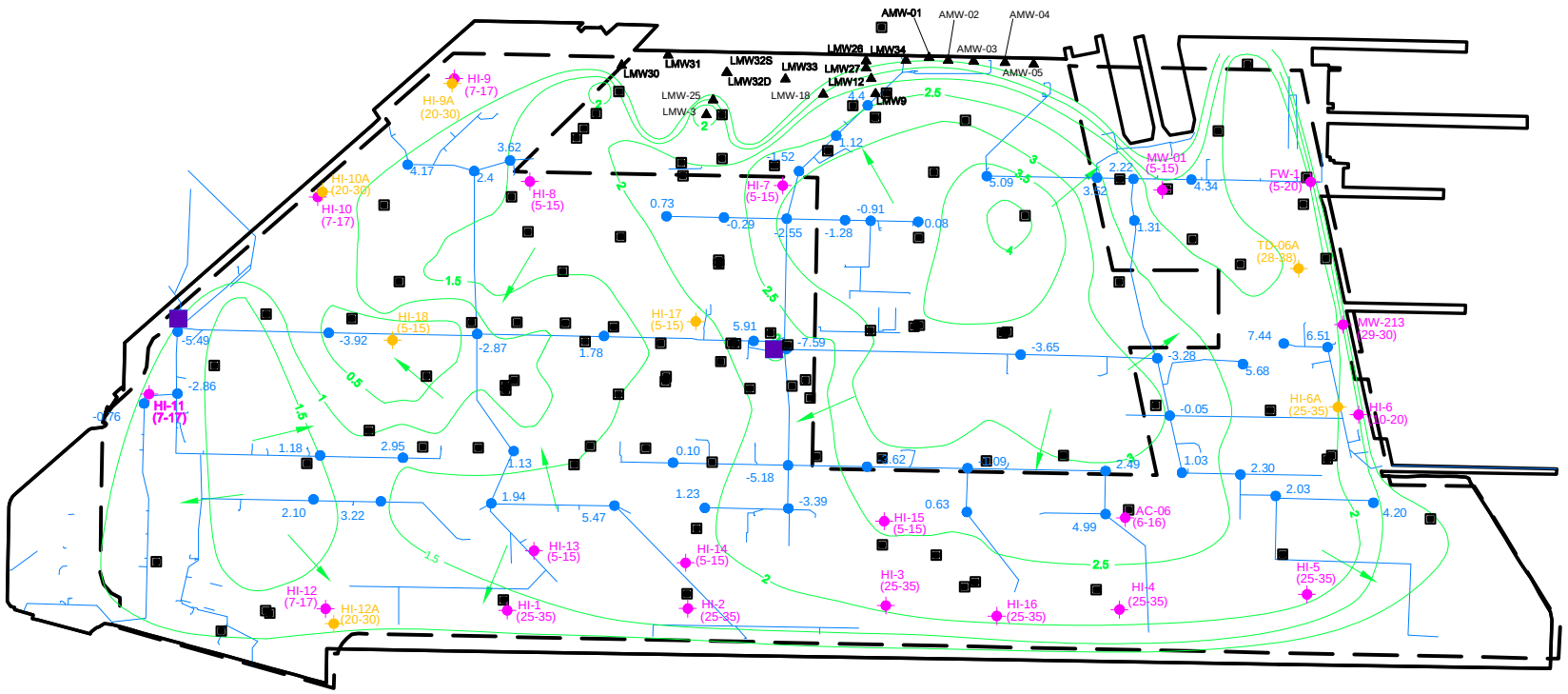
SCALE IN FEET

Figure 6-1
S&G-OU1, Todd Shipyards LNAPL Remediation System

415-2328-007/046C(FR01) 9/10 (B)

Source: Floyd Snider

Figure 6-2
S&G-OU1, Estimated Extent of LNAPL Based on Third Quarter 2009



NOTES:

1. GROUNDWATER CONTOURS ARE BASED ON DATA PRESENTED IN THE WESTON RI.
2. DEEP MONITORING WELLS AND SHALLOW MONITORING WELLS WITHOUT A SEPTEMBER 1992 WATER LEVEL MEASUREMENT ARE NOT SHOWN ON THIS MAP.
3. SANITARY SEWER LINES WERE TRACED FROM THE CITY OF SEATTLE'S SEWER & DRAINAGE INFRASTRUCTURE MAP SERIES (HTTP://MAPS.CI.SEATTLE.WA.US/). MAPS WERE CURRENT AS OF JANUARY 2005.
4. SANITARY SEWER LINE ELEVATIONS WERE OBTAINED FROM CITY OF SEATTLE SEWER CARDS. ELEVATIONS WERE CONVERTED FROM CITY OF SEATTLE LEGACY DATUM TO NGVD 29 TO COINCIDE WITH WESTON (1993) RI RESULTS.
5. TD-06A IS A REPLACEMENT FOR FW-1. THE SCREEN INTERVAL WAS DETERMINED DURING THE 2009 CONDUCTIVITY PROFILE ASSESSMENT.

LEGEND

- HI-1 (25-35) — GROUNDWATER MONITORING WELL (WELL SCREEN DEPTH INTERVAL IN FEET BELOW GROUND SURFACE)
- NEW/REPLACEMENT WELL
- EXISTING WELL
- HISTORIC WELL
- AMW-01 — SHORELINE WELL INCLUDED IN OTHER OU MONITORING PROGRAM
- 2.5 — GROUNDWATER ELEVATION CONTOUR SEPTEMBER 1992 (FEET NAVD29)
- GROUNDWATER FLOW DIRECTION
- SOIL AND GROUNDWATER OPERABLE UNIT BOUNDARY
- SANITARY SEWER LINE
- MAIN SANITARY SEWER LINE
- SANITARY PUMP STATION
- 3.22 — SANITARY SEWER LINE ELEVATION (FEET NGVD29)

415-2328-007/046C(FR01) 9/10 (B)

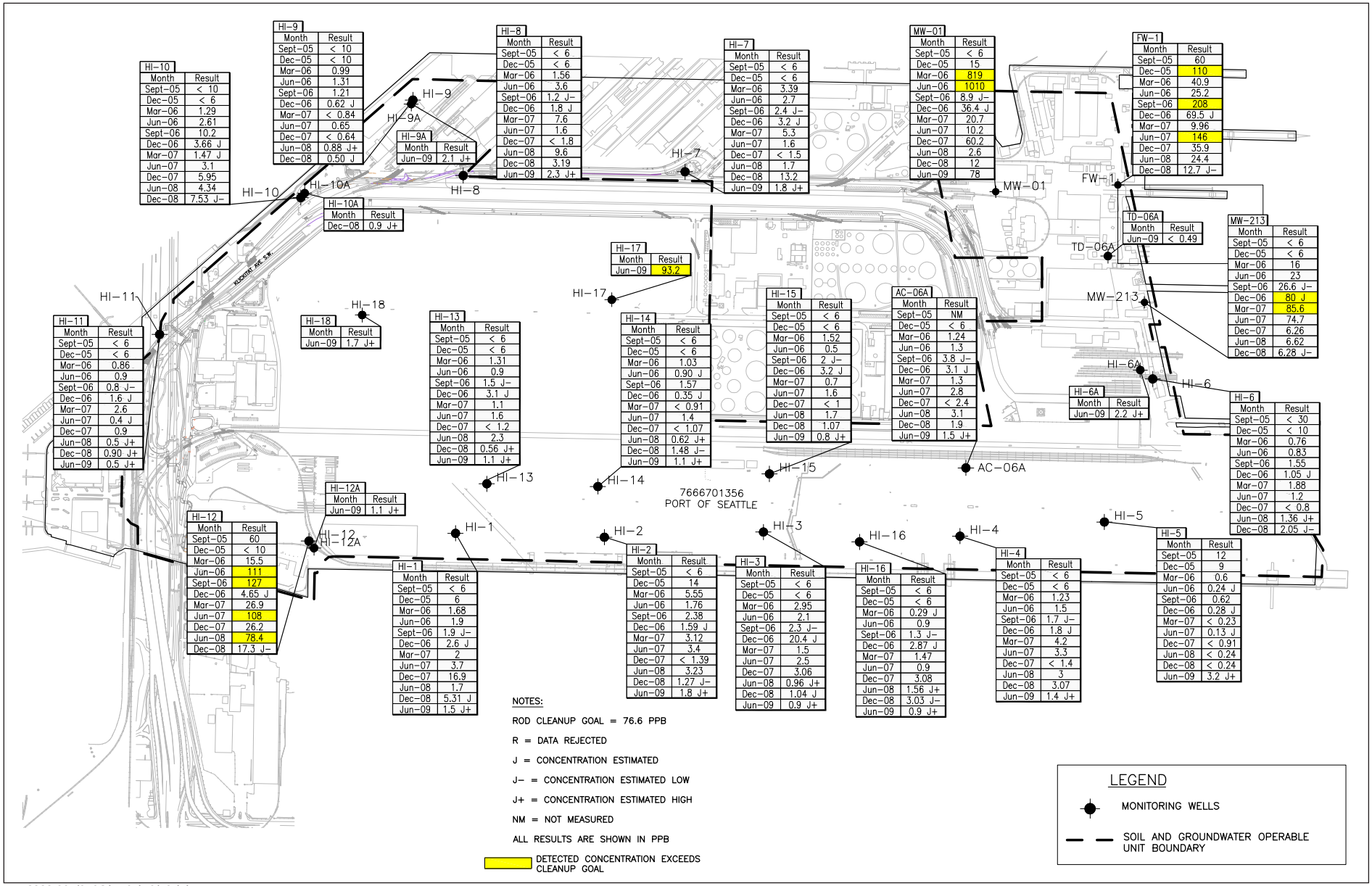
Source: AECOM

N

0 900

SCALE IN FEET

Figure 6-3
S&G-OU1, Long Term Monitoring Well Network



415-2328-007/046C(FR01) 9/10 (B)

Source: AECOM

N

0 600

SCALE IN FEET

Figure 6-4
S&G-OU1, Long Term Monitoring Network, Total Zinc Concentrations

415-2328-007/046C(FR01) 9/10 (B)

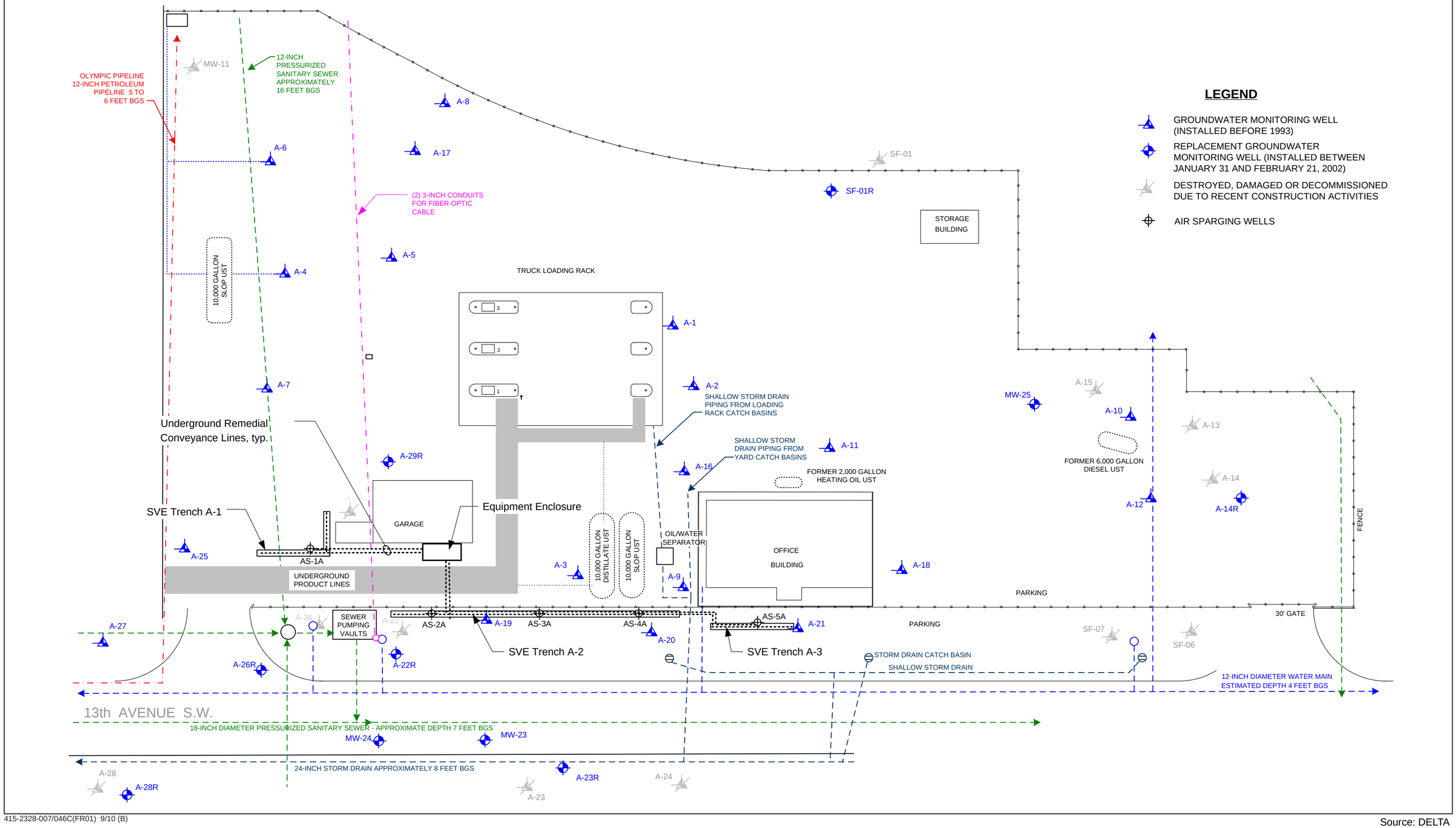
Source: AECOM

N

0 600

SCALE IN FEET

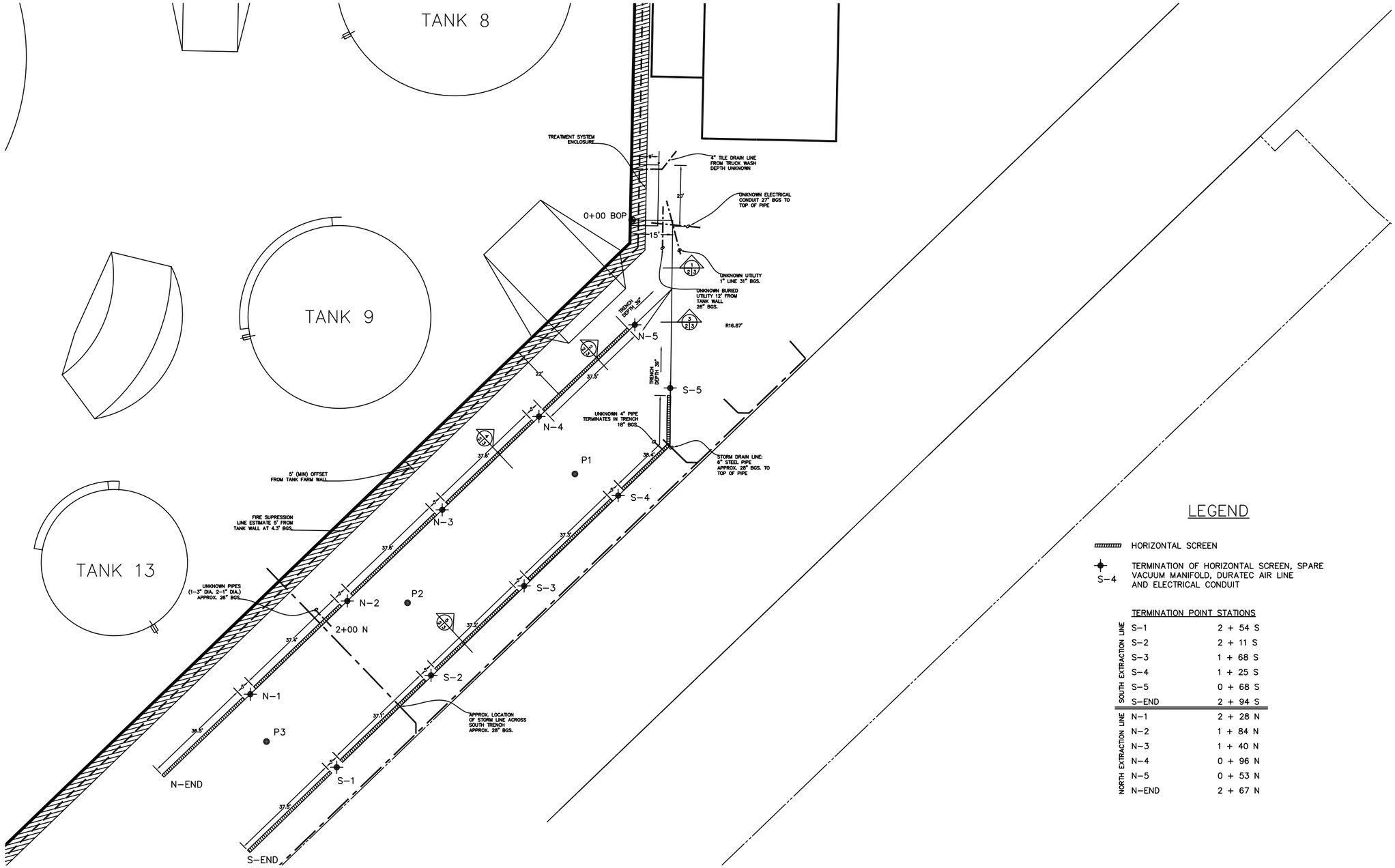
Figure 6-5
S&G-OU1, Long Term Monitoring Network, Cyanide Concentrations



415-2328-007/046C(FR01) 9/10 (B)

Source: DELTA

Figure 6-6
TF-OU2, Kinder Morgan Sparge SVE System



LEGEND

HORIZONTAL SCREEN

S-4 — TERMINATION OF HORIZONTAL SCREEN, SPARE VACUUM MANIFOLD, DURATEC AIR LINE AND ELECTRICAL CONDUIT

	TERMINATION POINT STATIONS	
SOUTH EXTRACTION LINE	S-1	2 + 54 S
	S-2	2 + 11 S
	S-3	1 + 68 S
	S-4	1 + 25 S
	S-5	0 + 68 S
	S-END	2 + 94 S
NORTH EXTRACTION LINE	N-1	2 + 28 N
	N-2	1 + 84 N
	N-3	1 + 40 N
	N-4	0 + 96 N
	N-5	0 + 53 N
	N-END	2 + 67 N

415-2328-007/046C(FR01) 9/10 (B)

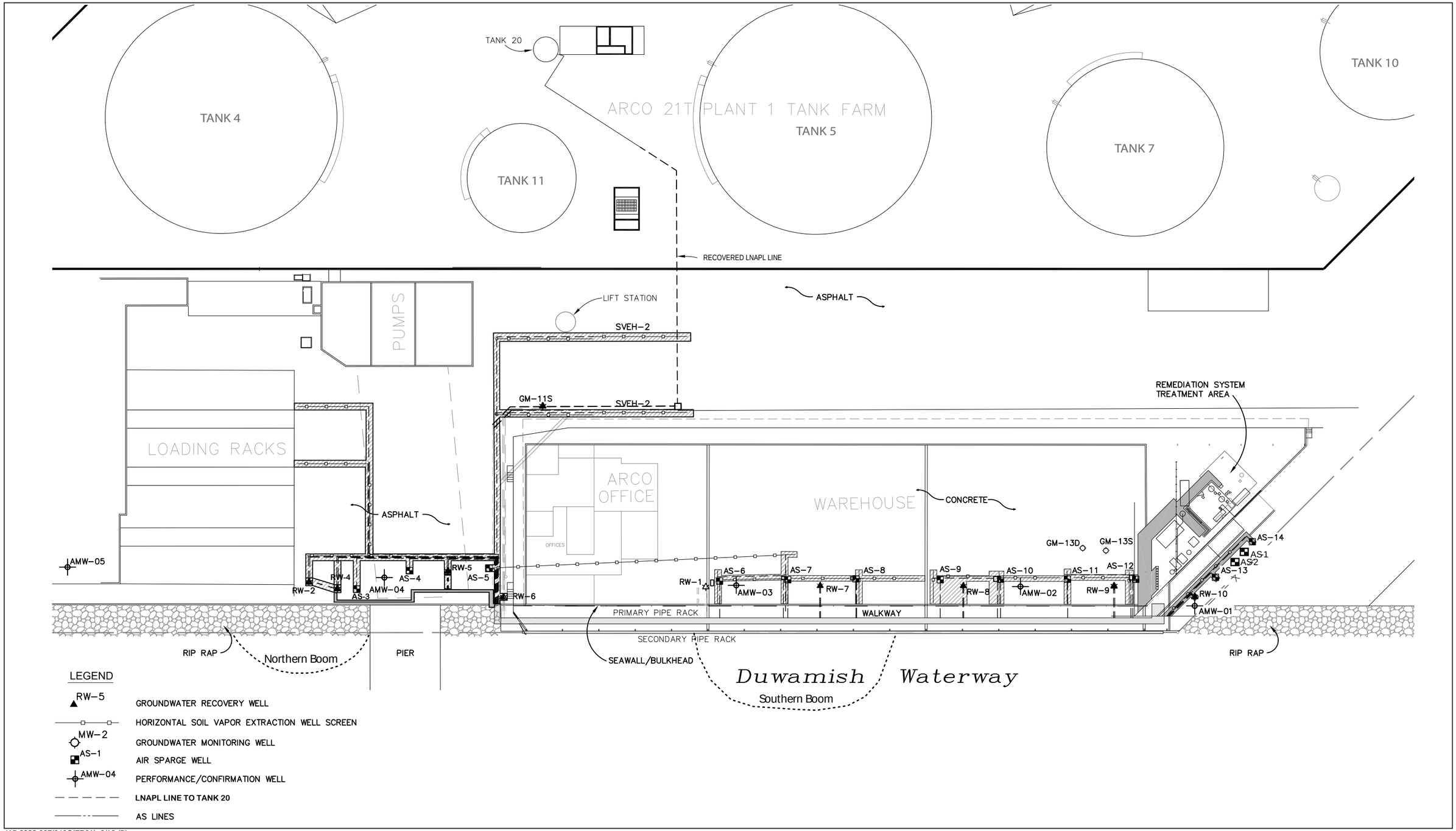
Source: TechSolv

N

0 35

SCALE IN FEET

Figure 6-7
TF-OU2, BP SVE System Plant 1 at Shoreline



415-2328-007/046C(FR01) 9/10 (B)

Source: TechSolv

N

0 40

SCALE IN FEET

Figure 6-8
BP SVE System Plant 1 at Shoreline

LEGEND

- MONITORING WELL (KINDER MORGAN) — KINDER MORGAN PROPERTY BOUNDARY
- MONITORING WELL (BP) — BP PROPERTY BOUNDARY
- MONITORING WELL (SHELL) — SHELL PROPERTY BOUNDARY

NOTE: MAP WAS DONE USING NAV 88 DATUM

415-2328-007/046C(FR01) 9/10 (B)

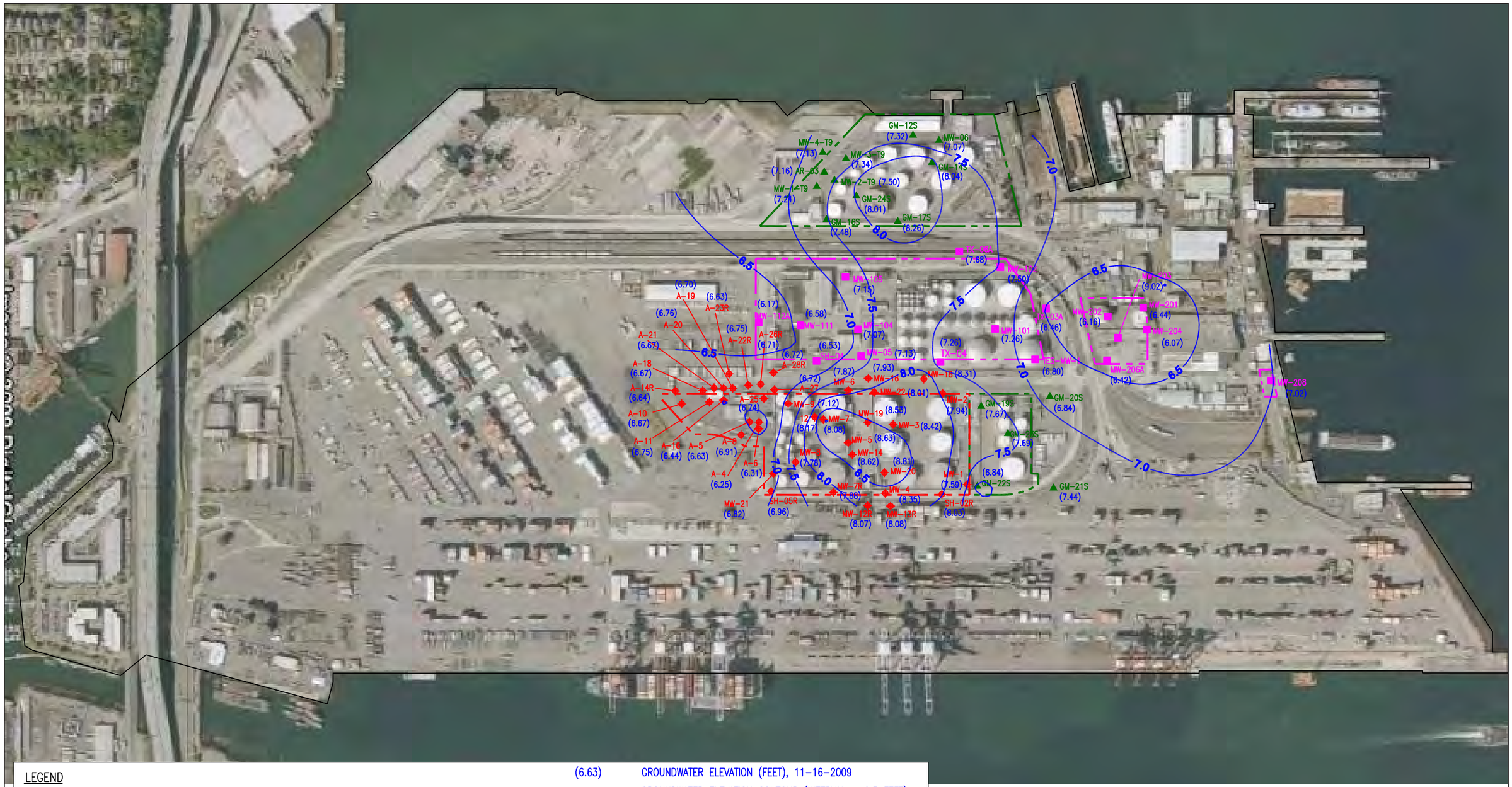
Source: DELTA

N

0 500

SCALE IN FEET

Figure 6-9
TF-OU2, Groundwater Monitoring Well Location Map



LEGEND

- MONITORING WELL (KINDER MORGAN)
- MONITORING WELL (BP)
- MONITORING WELL (SHELL)
- KINDER MORGAN PROPERTY BOUNDARY
- BP PROPERTY BOUNDARY
- SHELL PROPERTY BOUNDARY

(6.63) GROUNDWATER ELEVATION (FEET), 11-16-2009

7.0 GROUNDWATER ELEVATION CONTOUR (INTERVAL = 0.5 FEET)

* MW-203 DATA NOT USED IN CALCULATING CONTOURS

NOTE: GROUNDWATER ELEAVTIONS AND CONTOURS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988

415-2328-007/046C(FR01) 9/10 (B)

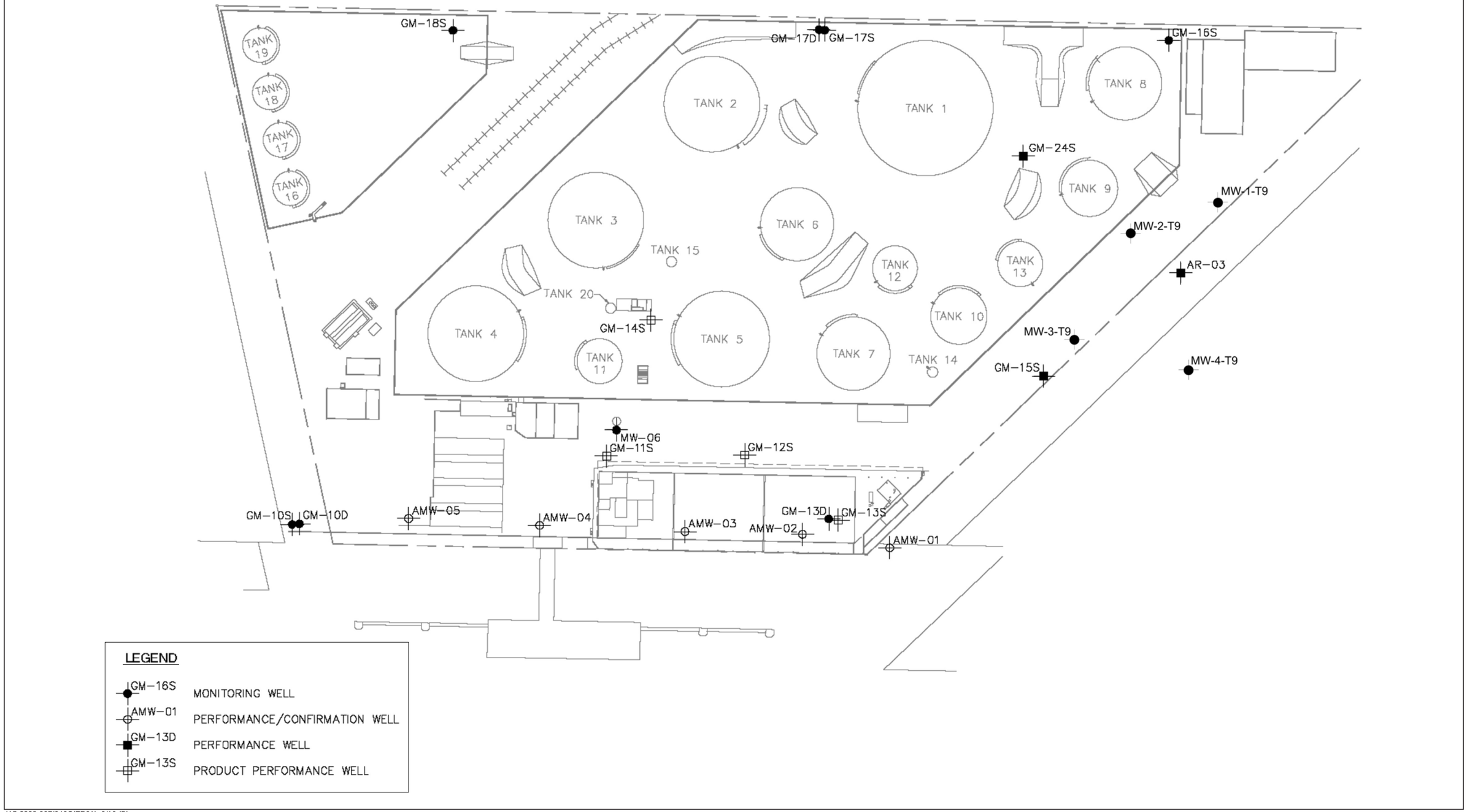
Source: DELTA

N

0 500

SCALE IN FEET

Figure 6-10
TF-OU2, Groundwater Contour Map



415-2328-007/046C(FR01) 9/10 (B)

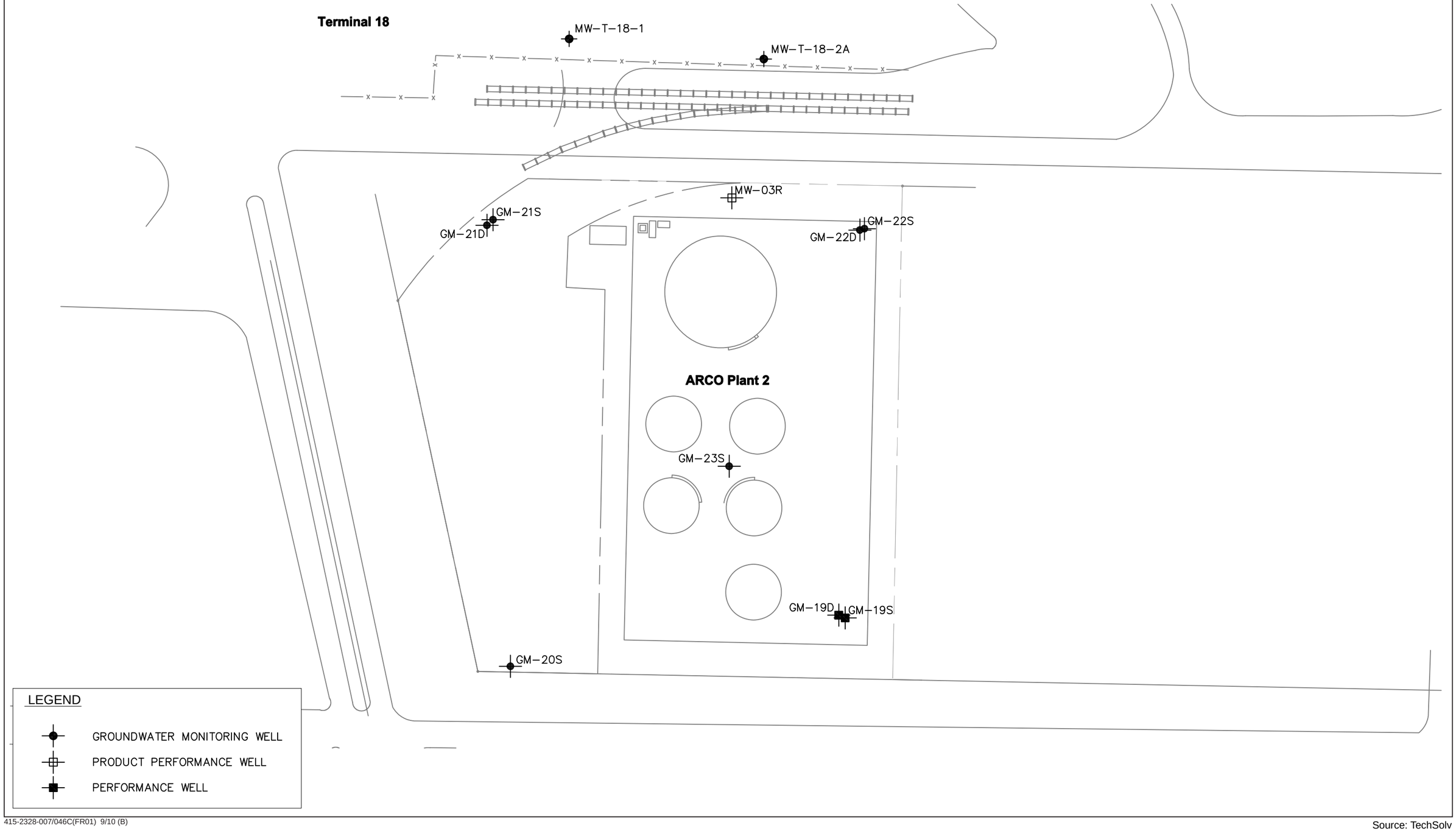
Source: TechSolv

N

0 100

SCALE IN FEET

Figure 6-11
TF-OU2, BP Plant 1 Monitoring Wells



415-2328-007/046C(FR01) 9/10 (B)

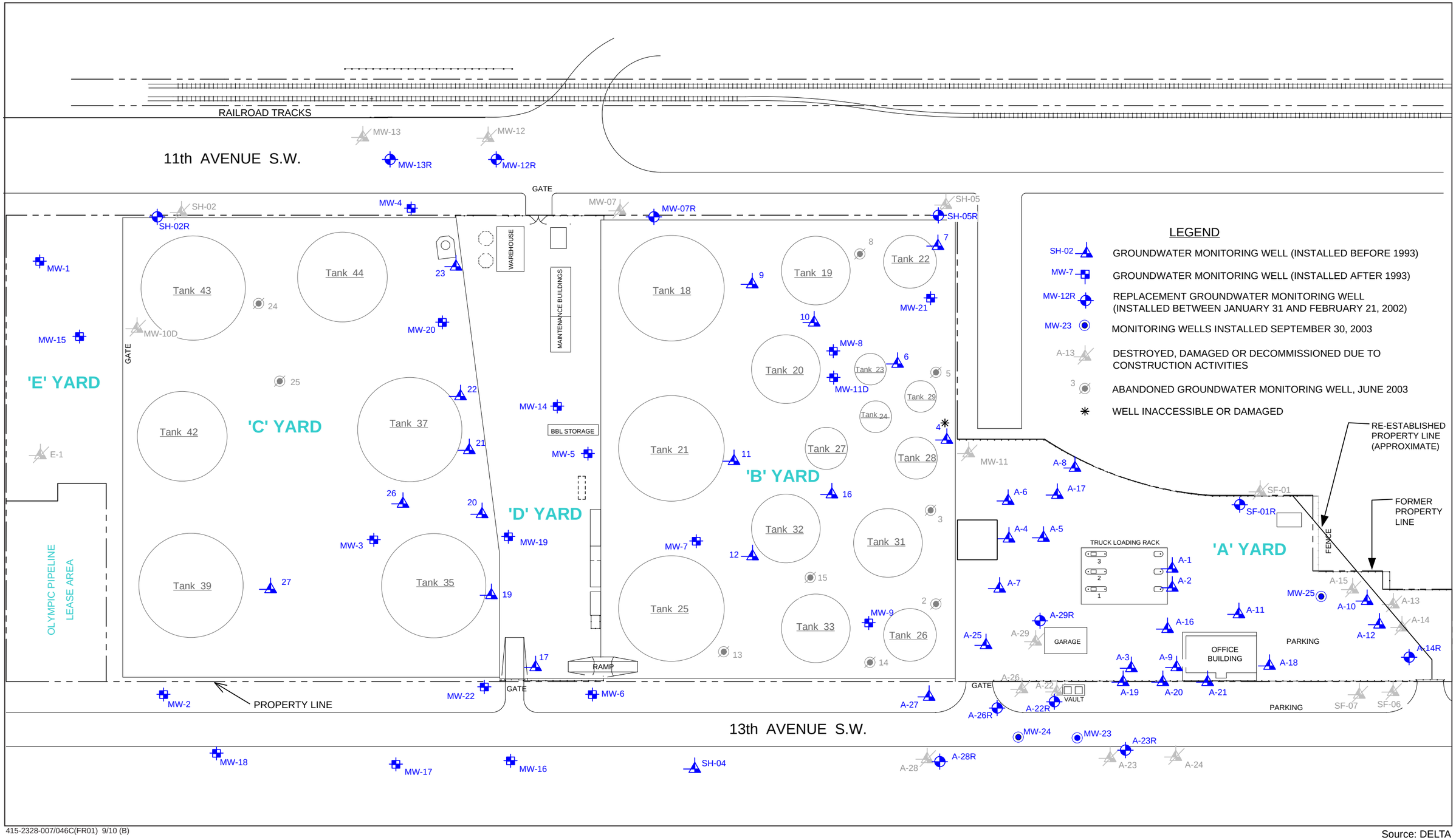
Source: TechSolv

N

0 100

SCALE IN FEET

Figure 6-12
TF-OU2, BP Plant 2 Monitoring Wells



415-2328-007/046C(FR01) 9/10 (B)

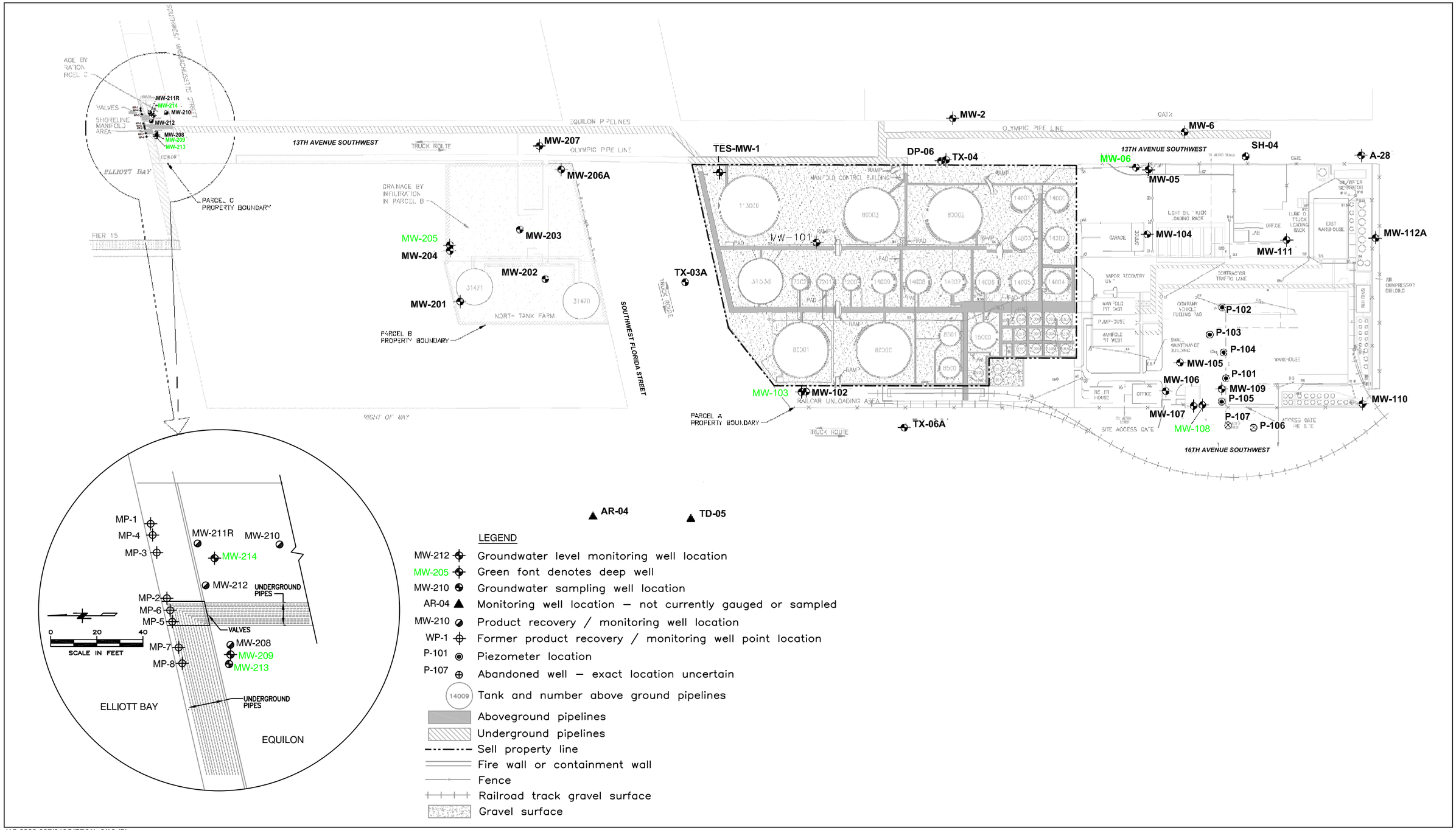
Source: DELTA

N

0 100

SCALE IN FEET

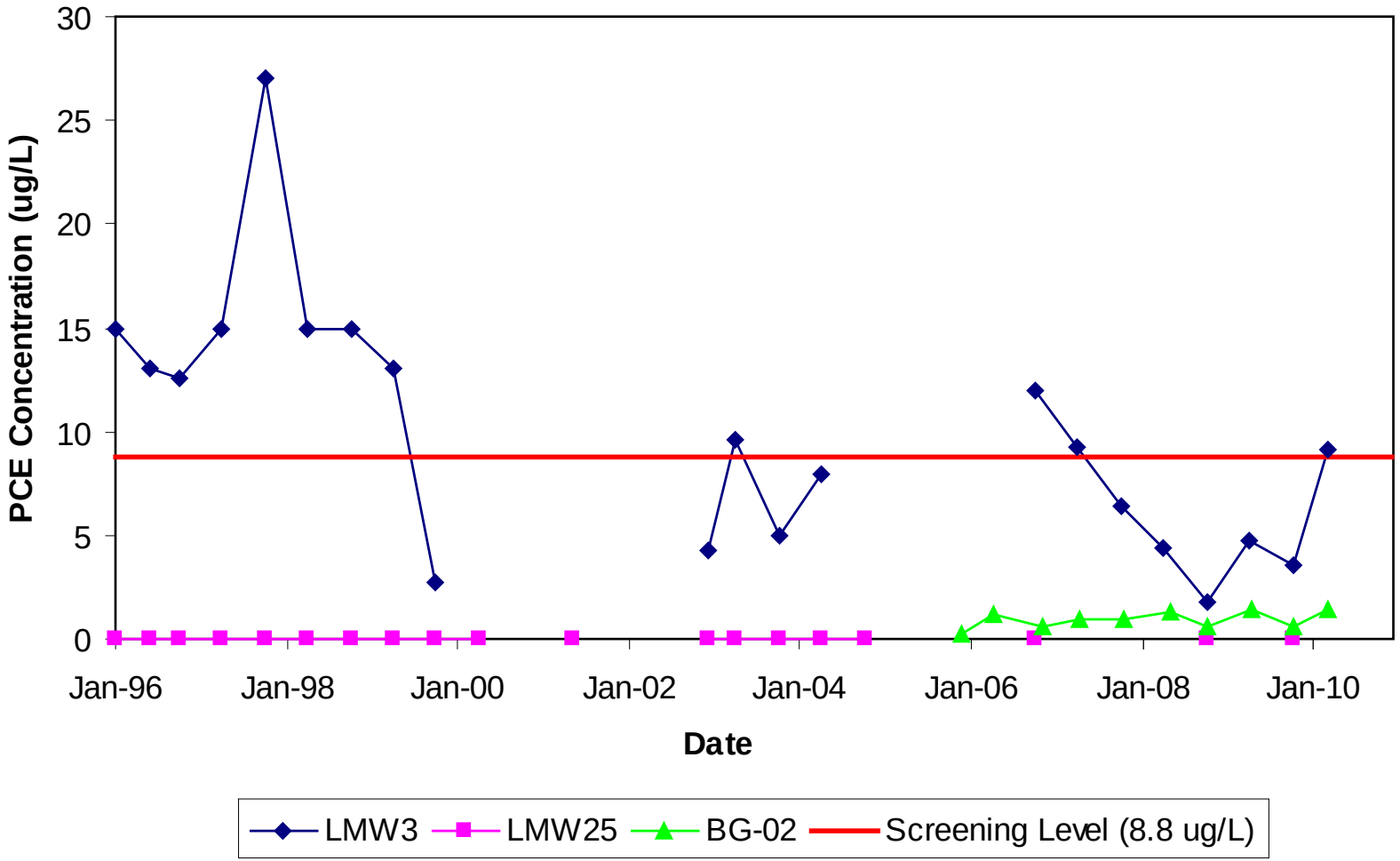
Figure 6-13
TF-OU2, Kinder Morgan Monitoring Wells



415-2328-007/046C(FR01) 9/10 (B)

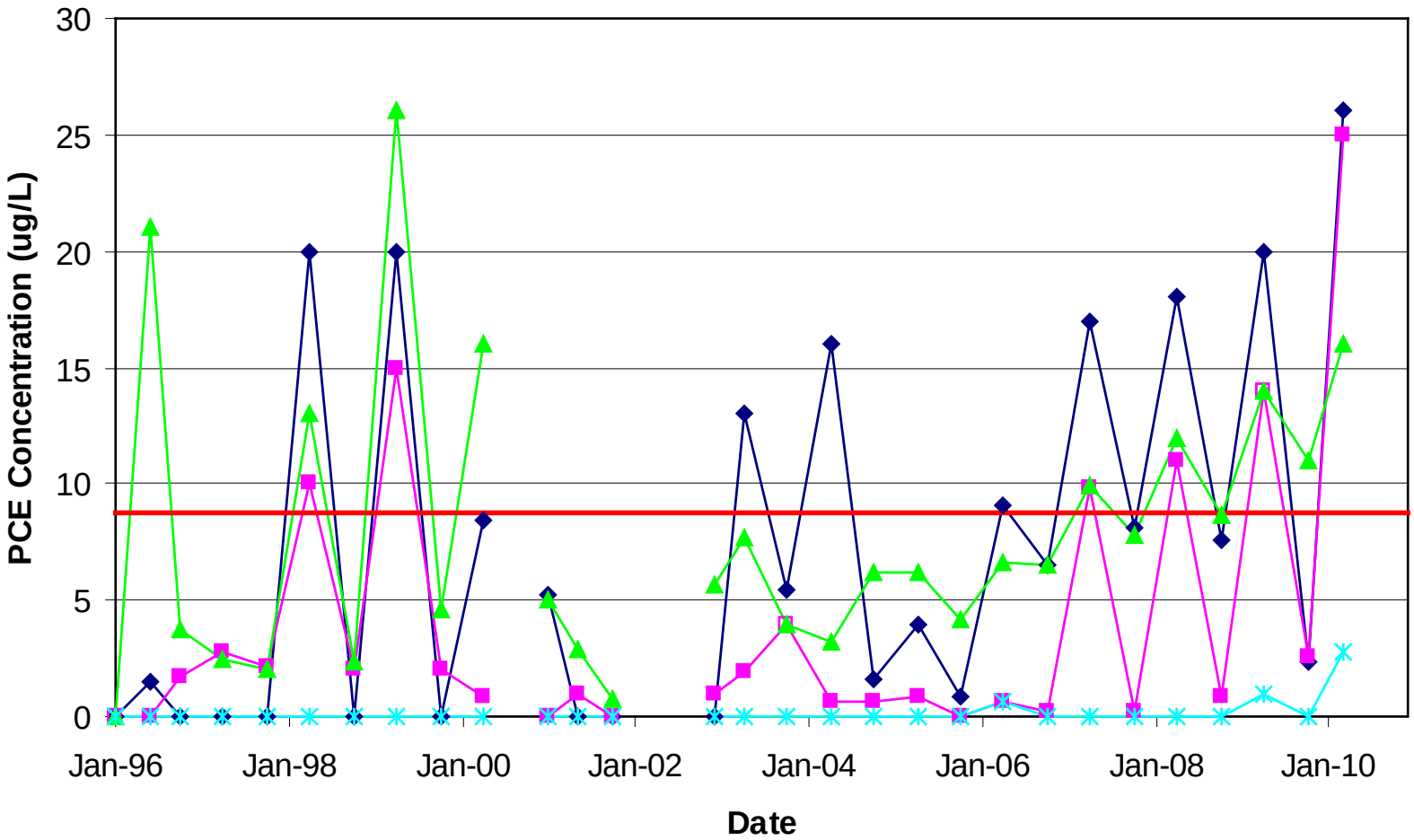
Source: URS

Figure 6-14
TF-OU2, Shell Monitoring Wells



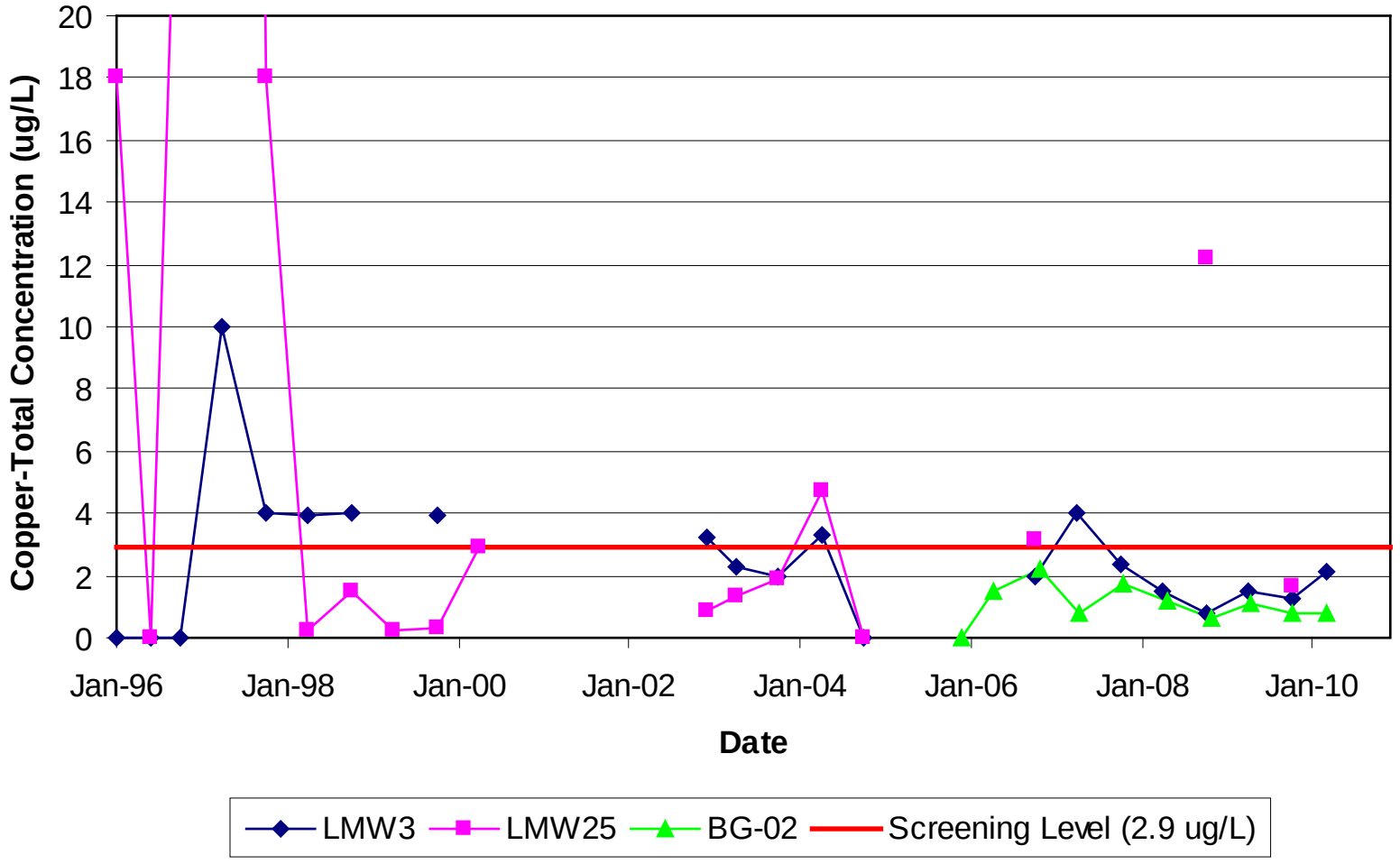
415-2328-007/046C(FR01) 9/10 (B)

Figure 6-15
LU-OU3, PCE Concentrations at LMW3, LMW25, and BG-02



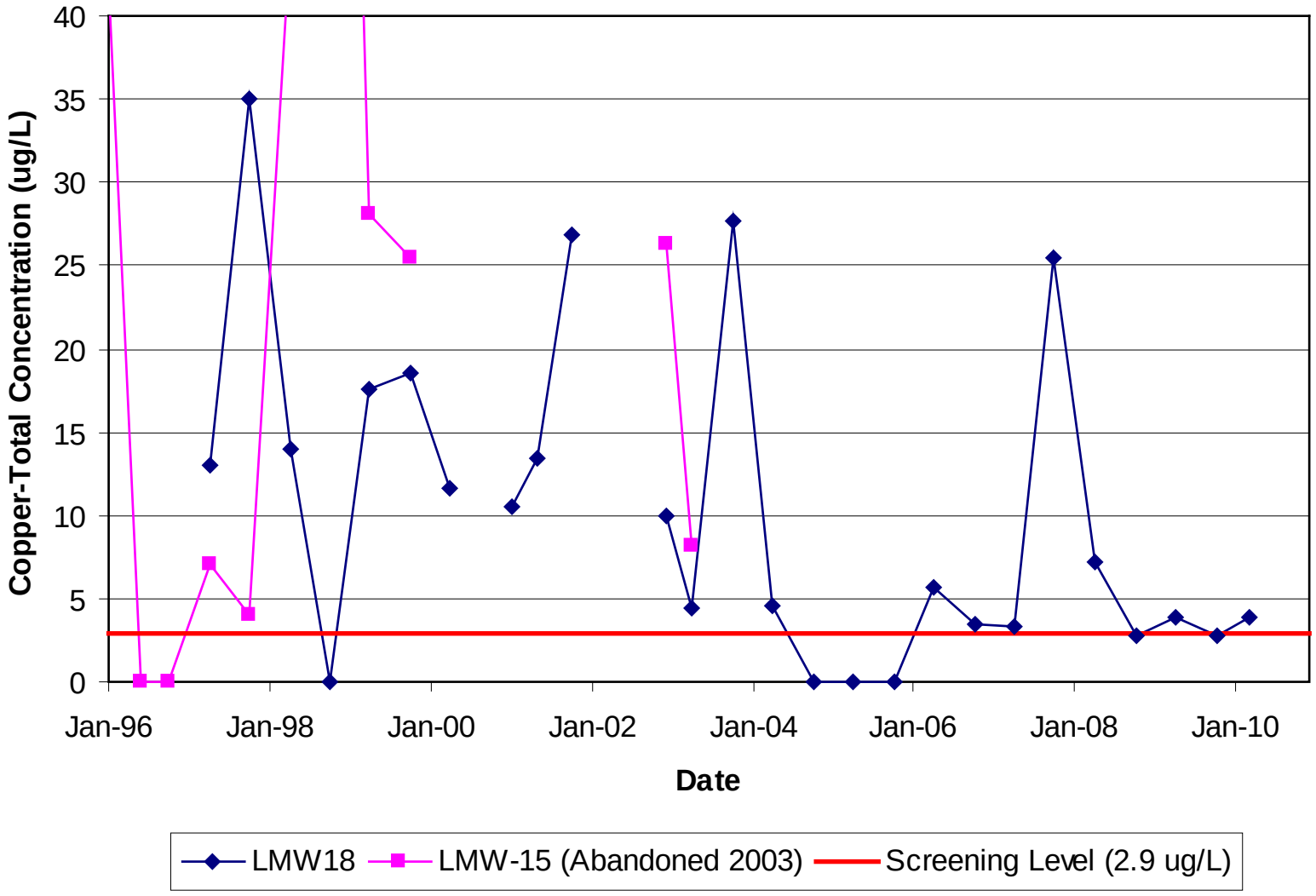
415-2328-007/046C(FR01) 9/10 (B)

Figure 6-16
LU-OU3, PCE Concentrations at LMW12, LMW27, and LMW9



415-2328-007/046C(FR01) 9/10 (B)

Figure 6-17
LU-OU3, LMW3, LMW25, and BG-02,
Total Copper Concentrations



415-2328-007/046C(FR01) 9/10 (B)

Figure 6-18
LU-OU3, LMW18 and LMW15,
Total Copper Concentrations

CHAPTER 6 TABLES

LIST OF CHAPTER 6 TABLES

Table 6-1. S&G-OU1, Long-Term Monitoring Well Network

Monitor Well	Well Construction	Location	Well Category	Well Screen Interval (ft bgs)	Sampling Schedule (as of 11/2009)
HI-1	2005	Terminal 18 – East Shoreline	Compliance	25-35	Semi-Annual
HI-2	2005	Terminal 18 – East Shoreline	Compliance	25-35	Semi-Annual
HI-3	2005	Terminal 18 – East Shoreline	Compliance	25-35	Semi-Annual
HI-4	2005	Terminal 18 – East Shoreline	Compliance	25-35	Semi-Annual
HI-5	2005	Terminal 18 – Northeast Shoreline	Compliance	25-35	Semi-Annual
HI-6	2005	S&G-OU1 North Shoreline	Compliance	10-20	None
HI-6R	2009	S&G-OU1 North Shoreline	Compliance-Replacement	25-35	Quarterly
MW-213	Pre-2005	S&G-OU1 North Shoreline	Compliance	29-39	Semi-Annual
TD-06	Pre-2005	Todd Shipyards – North Shoreline	Compliance	7-17	None
TD-06R	2009	Todd Shipyards – North Shoreline	Compliance-Replacement	28-38	Quarterly
MW-01	Pre-2005	Todd Shipyards – North Shoreline	Compliance	5-15	Semi-Annual
HI-7	2005	S&G Western Border	Boundary	5-15	Semi-Annual
HI-8	2005	S&G Western Border – Upgradient from HI-9/10	Boundary/Early Warning	5-15	Semi-Annual
HI-9	2005	Fisher Mills – Southwest Shoreline	Compliance	7-17	None
HI-9R	2009	Fisher Mills – Southwest Shoreline	Compliance-Replacement	20-30	Quarterly
HI-10	2005	S&G-OU1 Southwest Shoreline	Compliance	7-17	None
HI-10R	2009	S&G-OU1 Southwest Shoreline	Compliance-Replacement	20-30	Quarterly
HI-11	2005	S&G-OU1 Southwest Shoreline	Compliance	10-20	Semi-Annual
HI-12	2005	S&G-OU1 Southwest Shoreline	Compliance	1-17	None
HI-12R	2009	S&G-OU1 Southwest Shoreline	Compliance-Replacement	20-30	Quarterly
HI-13	2005	Terminal 18 – Upgradient from HI-1	Early Warning	5-15	Semi-Annual
HI-14	2005	Terminal 18 – Upgradient from HI-2	Early Warning	5-15	Semi-Annual
HI-15	2005	Terminal 18 – Upgradient from HI-3	Early Warning	5-15	Semi-Annual
HI-16	2005	Terminal 18 – Hot Spot Removal	Hot Spot Removal/ Compliance	25-35	Semi-Annual
AC-06A	2005	Terminal 18 – Upgradient from HI-4	Early Warning	6-16	Semi-Annual
HI-17	2009	Terminal 18 – Near the Sanitary Sewer Pump Station	Backfill Assessment	5-15	Quarterly
HI-18	2009	Terminal 18 – Near the Sanitary Sewer in the Groundwater Low	Backfill Assessment	5-15	Quarterly

Table 6-2. S&G-OU1, Profile Assessment Data

Depth (ft bgs)	HI-2		HI-5		HI-6		HI-9		HI-10		HI-11		HI-12		TD-06	
	Conductivity (S/m)	Salinity (ppt)	Conductivity (S/m)	Salinity (ppt)	Conductivity (S/m)	Salinity (ppt)	Conductivity (S/m)	Salinity (ppt)	Conductivity (S/m)	Salinity (ppt)	Conductivity (S/m)	Salinity (ppt)	Conductivity (S/m)	Salinity (ppt)	Conductivity (S/m)	Salinity (ppt)
5–6	na	na	na	na	1.3[a]	12.4	0.5	3.3	na	na	na	na	0.7	4	na	na
10–11	1.1	8.97	0.2	1	1.9	17.25	3.7	29.2	1.4	9.8	0	0.1	4	25	0.6[b]	5.04
15–16	1.8	14.74	0.3	1	2.7	24.45	2.3	17.1	2	14	0	0.1	4.1	26	1.1	9.31
20–21	2.4	20.15	0.3	1	1.6	14.28	0.3	2	0.7	4.3	0.8	5.6	1.1	6	1.6	13.6
25–26	0.7	5.19	0.3	1	0.4	3.01	0.1	6.1	0.3	2	0.3	1.7	1.1	6	1.1	8.53
30–31	0.8	6.27	0.3	1	0.4	3.01	1.2	8.3	0.3	1.6	0.2	0.8	1.1	6	0.5	3.81
35–36	0.9	6.93	0.3	1	0.3	2.2	1.6	12.1	1.4	9.8	0.7	4.6	1.4	8	0.5	3.6
40–41	1.1	8.65	0.4	1	0.4	2.8	2.2	16	3.9	29.1	1.3	9	1.9	11	0.3	2.6

[a] Sample collected at 7 feet

[b] Sample collected at 12 feet

Notes: Shading indicates selected well screen interval.

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010)

		Chemical Name:	Arsenic	Arsenic	Cadmium	Cadmium	Copper	Copper	Lead	Lead	Mercury	Mercury	Nickel	Nickel	Silver	Silver	Thallium	Thallium	Zinc	Zinc	Available Cyanide	Total Cyanide
		Total/Dissolved:	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	T	T
		Unit:	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/L	ug/L	ug/L	ug/l	ug/L	ug/l	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l
Sample ID		Sample Date	Sample Type																			
AC-06																						
	AC-06A-1205	12/7/2005	N	< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	< 0.00025	0.00022 J	0.8	0.6	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	< 1 R
	AC-06A-0306	3/29/2006	N	NA	1.2 J-	NA	0.052	NA	0.57	NA	< 0.026	NA	< 0.00026	NA	< 0.48	NA	< 0.02	NA	< 0.02	NA	1.24	NA	< 5
	AC-06A-0606	6/8/2006	N	NA	2.0 J-	NA	0.03	NA	0.57	NA	0.012 J	NA	< 0.00039	NA	4.56	NA	< 0.02	NA	< 0.02	NA	1.3	NA	< 5
	AC-16-0606	6/8/2006	FD	NA	2.1 J-	NA	0.03	NA	0.54	NA	< 0.02	NA	0.00027 J	NA	4.41	NA	< 0.02	NA	< 0.02	NA	0.9	NA	< 5
	AC-06A-0906	9/19/2006	N	NA	0.6	NA	0.05	NA	0.46	NA	0.134	NA	< 0.00137	NA	4.13	NA	< 0.02 R	NA	< 0.02	NA	3.8 J-	NA	< 5
	AC-06A-1206	12/20/2006	N	NA	0.38 J	NA	0.15	NA	0.29	NA	0.116	NA	< 0.00041	NA	0.9 J	NA	< 0.012	NA	0.009 J	NA	3.1 J	< 2	< 5
	AC06A-0307	3/7/2007	N	NA	0.42 J	NA	< 0.02	NA	0.39	NA	0.061	NA	< 0.00041	NA	2.32	NA	< 0.02	NA	< 0.02	NA	1.3	< 2 J	< 5
	AC-06A-0607	6/5/2007	N	NA	0.44 J	NA	0.177	NA	0.54	NA	0.18	NA	0.00119	NA	1.49	NA	< 0.020	NA	< 0.020	NA	2.8	< 2 R	< 5 J
	AC-06-1207	12/5/2007	N	NA	0.24 J	NA	0.006 J	NA	0.19	NA	0.344	NA	< 0.00015	NA	1.52	NA	< 0.01	NA	< 0.02	NA	< 2.4	2.8	< 5
	AC-06-0608	6/18/2008	N	NA	0.46 J	NA	0.015 J	NA	0.43	NA	0.779	NA	< 0.00015	NA	2.54	NA	0.083 J+	NA	0.005 J	NA	3.1	< 2	< 5
	AC-06-1208	12/11/2008	N	NA	0.3 J	NA	0.124	NA	0.36	NA	0.049	NA	0.00049 J	NA	1.38	NA	< 0.020	NA	< 0.020	NA	1.9	< 2	< 5
	AC-06A-0609	6/25/2009	N	NA	< 0.3	NA	0.025 J+	NA	0.23 J+	NA	0.071 J+	NA	0.00027 J	NA	0.76 J+	NA	< 0.02	NA	< 0.02	NA	1.5 J+	< 2	< 5
	AC-06A-0310	3/25/2010	N	NA	< 0.4	NA	0.011 J	NA	0.75 J+	NA	0.250 J	NA	0.00196 J+	NA	0.76	NA	< 0.020	NA	< 0.020	NA	4.28	< 2	< 5
FW-1																						
	FW-1-0905	9/20/2005	N	< 5	< 5	< 10	< 10	10	30	< 5	< 5	< J	0.0164 J	7	9	< 1	< 1	< 1	< 1	< 30	60	NA	1.15 J
	FW-1-1205	12/6/2005	N	< 1.1	< 5	< 0.04	< 4	< 0.2	13	0.1	< 5	0.00013 J	0.00271	0.6	10	< 0.04 J	< 1 J	< 0.04	< 1	< 1.1	110	NA	< 1 R
	FW-1-0306	3/29/2006	N	NA	0.52 J-	NA	0.099	NA	4.59	NA	1.03 J	NA	0.0239	NA	2.69 J	NA	0.003 J	NA	< 0.02	NA	40.9	NA	6
	FW-01-0606	6/8/2006	N	NA	0.43 J-	NA	0.059	NA	2.19	NA	0.616	NA	0.00595	NA	2.7	NA	< 0.02	NA	< 0.02	NA	25.2	NA	< 5
	FW-01-0906	9/20/2006	N	NA	1	NA	0.112	NA	19.5	NA	2.72	NA	0.0354	NA	3.54	NA	< 0.022	NA	0.0032 J	NA	208	NA	< 5 R
	FW-01-1206	12/20/2006	N	NA	< 0.26	NA	0.045	NA	2.88	NA	2.04	NA	0.0208	NA	1.06 J	NA	< 0.02	NA	< 0.0011	NA	69.5 J	1.7 J	19
	FW-1-0307	3/6/2007	N	NA	0.21 J	NA	< 0.02	NA	1.81	NA	0.57	NA	0.00731	NA	1.45 J	NA	< 0.02	NA	< 0.02	NA	9.96	3.8 J	< 5
	FW-01-0607	6/6/2007	N	NA	1.7	NA	0.217	NA	70	NA	7.67	NA	0.0903	NA	11.3	NA	< 0.020	NA	< 0.0200	NA	146	29 J-	< 5 J
	FW-1-1207	12/5/2007	N	NA	0.33 J	NA	0.051	NA	10.3	NA	1.16	NA	0.00558	NA	1.43	NA	< 0.02	NA	< 0.02	NA	35.9	3.2	< 5
	FW-01-0608	6/17/2008	N	NA	< 0.29	NA	0.022	NA	2.72	NA	0.558	NA	0.00427	NA	1.61	NA	< 0.02	NA	< 0.02	NA	24.4	170	< 5
	FW-01-1208	12/15/2008	N	NA	0.49 J-	NA	0.013 J	NA	2.2	NA	0.865	NA	0.0135	NA	0.98	NA	< 0.020	NA	< 0.020	NA	12.7 J-	< 2	< 5
	FW-01-0310	3/23/2010	N	NA	0.69 J+	NA	0.073	NA	15.4	NA	1.500 J+	NA	0.00615	NA	3.04	NA	< 0.020	NA	< 0.013	NA	73	< 2 J	< 5 J
HI-1																						
	HI-1-0905	9/19/2005	N	< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	0.00058 J	0.00063 J	0.8	0.8	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	44.3 J
	HI-1-1205	12/6/2005	N	< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	0.00024 J	< 0.00025	0.8	1	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	6	NA	34 J-
	HI-1-0306	3/28/2006	N	NA	3 J-	NA	0.01 J	NA	0.42	NA	< 0.034	NA	< 0.00025	NA	2.18 J	NA	< 0.02	NA	0.002 J	NA	1.68	NA	40
	HI-1-0606	6/7/2006	N	NA	2.4 J-	NA	0.03	NA	0.35	NA	0.036	NA	0.00042 J	NA	1.57	NA	< 0.026	NA	< 0.02	NA	1.9	NA	32
	HI-1-0906	9/19/2006	N	NA	2	NA	< 0.02	NA	0.3	NA	0.027 J+	NA	< 0.00021	NA	1.09	NA	< 0.004 R	NA	< 0.02	NA	1.9 J-	NA	37
	HI-1-1206	12/19/2006	N	NA	2.8	NA	0.04	NA	0.33	NA	1.14	NA	< 0.0004	NA	2.2 J	NA	< 0.024	NA	0.014 J	NA	2.6 J	< 2	40
	HI-1-0307	3/7/2007	N	NA	1.56	NA	< 0.02	NA	0.31	NA	0.246	NA	< 0.00019	NA	0.98	NA	< 0.02	NA	< 0.02	NA	2	< 2 J	39
	HI-01-0607	6/5/2007	N	NA	0.86	NA	0.014 J	NA	0.34 J-	NA	0.474	NA	0.00028	NA	0.77	NA	0.006 J	NA	0.005 J	NA	3.7	< 2 R	39 J
	HI-1-1207	12/4/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00025 J	NA	NA	NA	NA	NA	NA	NA	NA	< 2	21
	HI-1-1207RE	12/19/2007	N	NA	1.52	NA	1.29	NA	1.32	NA	1.63	NA	NA	NA	1.48	NA	< 0.019	NA	< 0.005	NA	16.9	NA	NA
	HI-1-0608	6/18/2008	N	NA	1.42	NA	0.056	NA	0.31	NA	0.129	NA	< 0.00015	NA	0.78	NA	< 0.026	NA	< 0.02	NA	1.7	< 2	18
	HI-1-1208	12/11/2008	N	NA	1.3	NA	0.046	NA	0.21	NA	0.086	NA	0.00057 J	NA	0.49	NA	< 0.020	NA	< 0.020	NA	5.31 J	< 2	7
	HI-100-1208	12/11/2008	FD	NA	1.4	NA	0.043	NA	0.25	NA	0.087	NA	0.00039 J	NA	0.5	NA	< 0.020	NA	< 0.020	NA	1.80 J	< 2	8
	HI-1-0609	6/24/2009	N	NA	0.6 J+	NA	< 0.012	NA	0.19 J+	NA	0.036 J+	NA	0.00153 J	NA	0.36 J+	NA	0.021 J+	NA	< 0.006	NA	1.5 J+	< 2	7
	HI-1-0310	3/24/2010	N	NA	1.08	NA	0.016 J	NA	0.30 J+	NA	0.045 J+	NA	< 0.00049	NA	0.36	NA	0.006 J	NA	< 0.007	NA	0.75 J+	< 2 J	5.4
HI-2																						
	HI-2-0905	9/19/2005	N	2 J+	3	< 2	< 2	2	3	< 2	< 2	0.00022 J	0.00022 J	3	3	< 0.5	< 0.5	< 0.5	< 0.5	< 6	< 6	NA	< 1 J
	HI-2-1205	12/6/2005	N	0.6	2	< 0.02	< 2	< 0.1	3	0.1	< 2	< 0.00025	< 0.00025	0.3	6	0.03 J-	< 0.5 J	< 0.02	< 0.5	1.4	14	NA	2 J-
	HI-2-0306	3/28/2006	N	NA	0.9 J-	NA	0.058	NA	0.172	NA	0.056 J	NA	< 0.00025	NA	0.47 J	NA	0.003 J	NA	< 0.02	NA	5.55	NA	< 5
	HI-2-0606	6/8/2006	N	NA	0.99 J-	NA	0.055	NA	0.098 J	NA	0.055	NA	< 0.0004	NA	0.4	NA	0.034	NA	< 0.02	NA	1.76	NA	< 5
	HI-2-0906	9/18/2006	N	NA	1.11	NA	0.059	NA	< 0.095	NA	0.037 J+	NA	< 0.00015	NA	< 0.17	NA	< 0.067	NA	0.001 J	NA	2.38	NA	< 5
	HI-2-1206	12/19/2006	N	NA	< 1.52	NA	0.038	NA	< 0.103	NA	0.386	NA	< 0.00041	NA	0.34 J	NA	0.011 J	NA	< 0.0016	NA	1.59 J	< 2	< 5
	HI-2-0307	3/7/2007	N	NA	1.88	NA	0.072	NA	0.26	NA	0.45	NA	< 0.00041	NA	< 0.26 R	NA	0.016 J	NA	< 0.0016	NA	3.12	< 2 J	< 5
	HI-02-0607	6/5/2007	N	NA	1.3	NA	0.165	NA	0.23	NA	1.32	NA	0.00011 J	NA	4.92	NA	0.002 J	NA	< 0.0200	NA	3.4	< 2 R	< 5 J
	HI-2-1207	12/5/2007	N	NA	1.21	NA	0.025	NA	0.079 J	NA	< 0.08	NA	< 0.00015	NA	0.09 J-	NA	< 0.02	NA	< 0.02	NA	< 1.39	< 2	< 5
	HI-2-0608	6/18/2008	N	NA	1.31 J+	NA	0.016 J	NA	0.114	NA	0.079 J+	NA	< 0.00015	NA	0.19 J-	NA	< 0.02	NA	< 0.02	NA	3.23	< 2 J	5
	HI-2-1208	12/11/2008	N	NA	1.5	NA	0.014 J	NA	0.08 J	NA	0.051	NA	0.00068 J	NA	< 0.60	NA	< 0.020	NA	< 0.020	NA	1.27 J-	< 2	< 5
	HI-2-0609	6/24/2009	N	NA	8.5	NA	0.02 J+	NA	0.58 J+	NA	0.081 J+	NA	0.00067 J	NA	1.48 J+	NA	< 0.015	NA	< 0.005	NA	1.8 J+	< 2	< 5
	HI-2-0310	3/24/2010	N	NA	1.43	NA	< 0.009	NA	< 0.048	NA	< 0.013	NA	< 0.00022	NA	0.17 J	NA	< 0.020	NA	< 0.030	NA	< 0.34	< 2 J	4.5 J

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

			Chemical Name:	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Benzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Carbon Tetrachloride	Tetrachloro-ethene
			Total/Dissolved:	T	T	T	T	T	T	T	T	T	T	T	T	T	T
			Unit:	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Sample ID		Sample Date	Sample Type														
AC-06																	
	AC-06A-1205	12/7/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	AC-06A-0306	3/29/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	AC-06A-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	AC-16-0606	6/8/2006	FD	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	AC-06A-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	AC-06A-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	AC06A-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	AC-06A-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	AC-06-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	AC-06-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	AC-06-1208	12/11/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	AC-06A-0609	6/25/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
	AC-06A-0310	3/25/2010	N	< 0.005 Y	< 0.032 Y	< 0.0078 Y	< 0.005 Y	< 0.005 Y	< 0.005 Y	< 0.005 Y	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
FW-1																	
	FW-1-0905	9/20/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	NA	NA	NA
	FW-1-1205	12/6/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	NA	NA	NA
	FW-1-0306	3/29/2006	N	< 0.01	< 0.01	< 0.02	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	NA	NA	NA	NA	NA
	FW-01-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.02	< 0.010	< 0.010	< 0.010	< 0.010	NA	NA	NA	NA	NA
	FW-01-0906	9/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	FW-01-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	FW-1-0307	3/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	FW-01-0607	6/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	FW-1-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	FW-01-0608	6/17/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	FW-01-1208	12/15/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	FW-01-0310	3/23/2010	N	< 0.005 Y	< 0.037 Y	< 0.0073 Y	< 0.0097 Y	< 0.0082 Y	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-1																	
	HI-1-0905	9/19/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-1-1205	12/6/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-1-0306	3/28/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-1-0606	6/7/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	HI-1-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-1-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-1-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-01-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-1-1207	12/4/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-1-1207RE	12/19/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	HI-1-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-1-1208	12/11/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-100-1208	12/11/2008	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-1-0609	6/24/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
	HI-1-0310	3/24/2010	N	< 0.005	< 0.0099	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-2																	
	HI-2-0905	9/19/2005	N	< 0.015	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-2-1205	12/6/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	< 1	< 1	< 1	< 1	< 1
	HI-2-0306	3/28/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-2-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	HI-2-0906	9/18/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-2-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-2-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-02-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-2-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-2-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-2-1208	12/11/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-2-0609	6/24/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
	HI-2-0310	3/24/2010	N	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

Sample ID		Sample Date	Sample Type	Chemical Name:	Arsenic	Cadmium	Cadmium	Copper	Copper	Lead	Lead	Mercury	Mercury	Nickel	Nickel	Silver	Silver	Thallium	Thallium	Zinc	Zinc	Available Cyanide	Total Cyanide
				Total/Dissolved:	D	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	T	T
				Unit:	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/L	ug/L	ug/L	ug/l	ug/L	ug/l	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l
HI-3																							
	HI-3-0905	9/19/2005	N		< 1	< 2	< 2	< 2	2	< 1	< 1	0.00027 J	0.0006 J	0.8	0.8	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	< 1 J
	HI-3-1205	12/7/2005	N		< 1	< 2	< 2	< 2	< 2	< 1	< 1	< 0.00025	0.00083	1	1.4	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	1 J-
	HI-3-0306	3/28/2006	N		NA	NA	0.067	NA	1.05	NA	0.26 J	NA	< 0.00262	NA	1.54 J	NA	< 0.02	NA	0.005 J	NA	2.95	NA	< 5
	HI-3-0606	6/8/2006	N		NA	NA	0.09	NA	0.35	NA	0.015 J	NA	< 0.00043	NA	2.26	NA	< 0.02	NA	< 0.02	NA	2.1	NA	< 5
	HI-3-0906	9/18/2006	N		NA	NA	< 0.02	NA	0.34	NA	0.062	NA	< 0.00015	NA	1.04	NA	< 0.004 R	NA	< 0.02	NA	2.3 J-	NA	< 5
	HI-3-1206	12/19/2006	N		NA	NA	0.04	NA	0.2	NA	1	NA	< 0.0004	NA	1.3 J	NA	< 0.02	NA	0.022	NA	20.4 J	< 2	< 5
	HI-3-0307	3/7/2007	N		NA	NA	< 0.02	NA	0.33	NA	2.52	NA	< 0.00041	NA	1.41	NA	< 0.046	NA	< 0.02	NA	1.5	< 2 J	< 5
	HI-03-0607	6/5/2007	N		NA	NA	0.03	NA	0.19 J-		0.919	NA	0.00016 J	NA	0.62	NA	< 0.020	NA	< 0.020	NA	2.5	< 2 R	< 5 J
	HI-3-1207	12/5/2007	N		NA	< 0.5	NA	0.199	NA	0.144	NA	0.175	NA	< 0.00015	NA	0.2 J-		< 0.02	NA	< 0.02	NA	3.06	1.5 J	< 5
	HI-3-0608	6/18/2008	N		NA	< 0.03	NA	0.03	NA	< 0.056	NA	1.3	NA	< 0.00015	NA	0.14 J-	NA	< 0.02	NA	< 0.02	NA	0.96 J+	< 2 J	< 5
	HI-3-1208	12/11/2008	N		NA	< 0.50	NA	0.166	NA	0.23	NA	0.135	NA	0.00058 J	NA	< 0.60	NA	< 0.020	NA	< 0.020	NA	1.04 J	< 2	< 5
	HI-3-0609	6/24/2009	N		NA	1.4 J+	NA	0.021 J+	NA	0.24 J+	NA	0.064 J+	NA	0.00095 J	NA	0.66 J+	NA	< 0.02	NA	< 0.02	NA	0.9 J+	< 2	< 5
	HI-3-0310	3/24/2010	N		NA	< 0.05	NA	0.178	NA	0.101 J+	NA	0.046 J+	NA	< 0.00035	NA	0.12 J	NA	< 0.020	NA	< 0.004	NA	0.81 J+	< 2 J	< 5
HI-4																							
	HI-4-0905	9/20/2005	N		< 1	< 2	< 2	< 2	< 2	< 1	< 1	0.00018 J	0.00033 J	0.6	0.7	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	< 1 J
	HI-4-1205	12/6/2005	N		< 1	< 2	< 2	< 2	< 2	< 1	< 1	< 0.00025	0.00053	0.9	1.2	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	1 J-
	HI-4-0306	3/28/2006	N		NA	0.6 J-	NA	0.008 J	NA	0.42	NA	< 0.02	NA	< 0.00025	NA	< 0.73	NA	< 0.02	NA	< 0.02	NA	1.23	NA	< 5
	HI-4-0606	6/7/2006	N		NA	0.5 J-	NA	0.14	NA	0.49	NA	0.031	NA	< 0.00042	NA	2.44	NA	< 0.02	NA	< 0.02	NA	1.5	NA	< 5
	HI-4-0906	9/20/2006	N		NA	0.4 J	NA	0.06	NA	0.47	NA	0.021 J+	NA	< 0.00015	NA	1.01	NA	< 0.02 R	NA	< 0.02	NA	1.7 J-	NA	< 5
	HI-4-1206	12/19/2006	N		NA	0.51	NA	0.05	NA	0.28	NA	0.185	NA	< 0.0004	NA	1.1 J	NA	< 0.02	NA	0.014 J	NA	1.8 J	0.96 J	< 5
	HI-4-0307	3/7/2007	N		NA	0.32 J	NA	0.09	NA	0.31	NA	3.11	NA	< 0.00041	NA	1.13	NA	< 0.02	NA	< 0.02	NA	4.2	< 2 J	< 5
	HI-04-0607	6/5/2007	N		NA	0.27 J	NA	0.106	NA	0.32 J-		1.06	NA	0.00025 J	NA	1	NA	< 0.020	NA	< 0.020	NA	3.3	< 2 R	< 5 J
	HI-4-1207	12/5/2007	N		NA	0.28 J	NA	0.018 J	NA	0.16	NA	0.071	NA	< 0.00015	NA	0.67	NA	< 0.02	NA	< 0.008	NA	< 1.4	< 2	< 5
	HI-4-0608	6/18/2008	N		NA	0.34 J	NA	0.007 J	NA	0.31	NA	0.978	NA	< 0.00015	NA	1.14	NA	0.033 J+	NA	< 0.02	NA	3	< 2	< 5
	HI-4-1208	12/11/2008	N		NA	0.3 J	NA	0.036	NA	0.47	NA	0.095	NA	0.00035 J	NA	0.65	NA	< 0.020	NA	< 0.020	NA	3.07	< 2	< 5
	HI-4-0609	6/24/2009	N		NA	< 0.1	NA	0.023 J+	NA	0.19 J+	NA	0.063 J+	NA	0.00028 J	NA	0.45 J+	NA	< 0.02	NA	< 0.02	NA	1.4 J+	< 2	< 5
	HI-4-0310	4/5/2010	N		NA	< 0.27	NA	0.023 J+	NA	0.39 J+	NA	0.032 J+	NA	< 0.00017	NA	0.61	NA	< 0.004	NA	< 0.040	NA	1.44 J+	< 2	< 10
HI-5																							
	HI-5-0905	9/20/2005	N		< 1	1	< 2	< 2	3	6	< 1	< 1	0.00199 J	0.00244 J	1	1.3	< 0.2	< 0.2	< 0.2	< 0.2	< 6	12	NA	< 1 J
	HI-5-1205	12/6/2005	N		< 0.6	< 1	< 0.02	< 2	< 0.1	3	< 0.02	< 1	0.0012	0.00201	1.1	1.2	< 0.02 J	< 0.2 J	< 0.02	< 0.2	< 0.6	9	NA	1 J-
	HI-5-0306	3/28/2006	N		NA	< 0.5	NA	0.009 J	NA	0.125	NA	0.021 J	NA	< 0.00026	NA	2.88 J	NA	< 0.02	NA	< 0.02	NA	0.6	NA	< 5
	HI-5-0606	6/8/2006	N		NA	0.03 J-	NA	< 0.02	NA	0.075 J	NA	0.008 J	NA	0.00025 J	NA	3.56	NA	< 0.02	NA	< 0.02	NA	0.24 J	NA	< 5
	HI-5-0906	9/18/2006	N		NA	< 0.5	NA	< 0.02	NA	< 0.208	NA	0.049 J+	NA	< 0.00148	NA	< 0.3	NA	< 0.02	NA	< 0.02	NA	0.62	NA	< 5
	HI-5-1206	12/19/2006	N		NA	< 0.5	NA	< 0.02	NA	0.181	NA	< 0.01	NA	0.00055 J	NA	< 0.8	NA	< 0.02	NA	< 0.02	NA	0.28 J	1.3 J	< 5
	HI-5-0307	3/7/2007	N		NA	< 0.5	NA	< 0.02	NA	< 0.08	NA	< 0.024	NA	0.00026 J	NA	< 0.02 R	NA	< 0.02	NA	< 0.02	NA	< 0.23	< 2 J	< 5
	HI-05-0607	6/5/2007	N		NA	< 0.50	NA	< 0.020	NA	0.03 J	NA	0.04	NA	0.00095	NA	< 0.20	NA	< 0.020	NA	< 0.0200	NA	0.13 J	< 2 R	< 5 J
	HI-5-1207	12/5/2007	N		NA	0.03 J-	NA	< 0.02	NA	0.504	NA	0.116	NA	0.00039 J	NA	0.76	NA	< 0.02	NA	< 0.02	NA	< 0.91	7.1	< 5
	HI-5-0608	6/18/2008	N		NA	< 0.5	NA	< 0.02	NA	< 0.083	NA	< 0.014	NA	0.00035 J	NA	< 0.2	NA	< 0.02	NA	< 0.02	NA	< 0.24	3.4 J-	< 5
	HI-5-1208	12/10/2008	N		NA	< 0.50	NA	< 0.020	NA	0.07 J	NA	0.012 J	NA	0.00046 J	NA	< 0.60	NA	< 0.020	NA	< 0.020	NA	< 0.24	< 2	< 5
	HI-5-0609	6/25/2009	N		NA	< 0.8	NA	0.044 J+	NA	1.46	NA	0.198 J+	NA	0.00051 J	NA	0.79 J+	NA	< 0.019	NA	< 0.04	NA	3.2 J+	1.7 J	< 5
	HI-5-0310	3/25/2010	N		NA	< 0.50	NA	< 0.020	NA	0.134 J+	NA	< 0.018	NA	0.00172	NA	< 0.6	NA	< 0.020	NA	< 0.030	NA	< 0.29	< 2 J	13.8
HI-6																							
	HI-6-0905	9/20/2005	N		< 5	< 5	< 10	< 10	20	20	< 5	< 5	0.00148 J	0.00255 J	14	13	< 1	< 1	< 1	< 1	< 30	< 30	NA	< 1 J
	HI-6-1205	12/7/2005	N		0.6	< 5	0.07	< 4	1.4	4	0.06	< 10	0.00226	0.00307	3.1	13	0.04 J-	< 2 J	< 0.02	< 2	0.6	< 10	NA	< 1 R
	HI-6-0306	3/29/2006	N		NA	0.48 J-		0.078	NA	0.796	NA	< 0.02	NA	< 0.00377	NA	2.45 J	NA	< 0.02	NA	< 0.02	NA	0.76	NA	< 5
	HI-6-0606	6/7/2006	N		NA	0.47 J-	NA	0.023	NA	0.961	NA	0.064	NA	0.00995	NA	0.81	NA	0.024	NA	< 0.02	NA	0.83	NA	< 5
	HI-6-0906	9/19/2006	N		NA	0.68	NA	0.079	NA	1.77	NA	0.135 J+	NA	0.032	NA	< 1.19	NA	0.157	NA	0.0035 J	NA	1.55	NA	< 5
	HI-6-1206	12/20/2006	N		NA	< 0.62	NA	0.069	NA	1.11	NA	1.67	NA	0.0128	NA	1.34 J	NA	0.014 J	NA	< 0.0024	NA	1.05 J	< 2	< 5
	HI-6-0307	3/7/2007	N		NA	0.4 J	NA	0.044	NA	1.1	NA	5.4	NA	0.01119	NA	0.88 J	NA	< 0.02	NA	< 0.0014	NA	1.88	< 2 J	< 5
	HI-06-0607	6/6/2007	N		NA	0.41 J	NA	0.054	NA	1.33	NA	0.681	NA	0.01062	NA	1.13	NA	< 0.020	NA	< 0.0200	NA	1.2	< 2 R	< 5 J
	HI-6-1207	12/5/2007	N		NA	0.2 J-	NA	0.044	NA	0.69	NA	< 0.033	NA	0.00789	NA	1.1	NA	< 0.02	NA	< 0.02	NA	< 0.8	< 2	< 5
	HI-6-0608	6/19/2008	N		NA	< 0.42	NA	0.044	NA	1.28	NA	0.158 J+	NA	0.00415	NA	0.83	NA	< 0.02	NA	< 0.002	NA	1.36 J+	< 2 J	< 5
	HI-6-1208	12/10/2008	N		NA	0.43 J	NA	0.067	NA	1.1	NA	0.054	NA	0.0103	NA	0.79	NA	< 0.020	NA	0.0023 J	NA	2.05 J-	< 2	< 5
	HI-6-0310	3/23/2010	N		NA	< 0.47	NA	< 0.012	NA	0.478 J+	NA	0.093 J+	NA	0.0265	NA	0.63	NA	< 0.020	NA	< 0.030	NA	0.67 J+	< 2 J	1.4 J

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

		Chemical Name:	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Benzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Carbon Tetrachloride	Tetrachloro-ethene
		Total/Dissolved:	T	T	T	T	T	T	T	T	T	T	T	T	T	T
		Unit:	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Sample ID		Sample Date	Sample Type													
HI-3																< 1
	HI-3-0905	9/19/2005	N	< 0.1	< 0.3	< 0.2	< 0.12	< 0.075	< 0.1	< 0.02	< 0.015	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-3-1205	12/7/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-3-0306	3/28/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-3-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	NA
	HI-3-0906	9/18/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-3-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-3-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-03-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-3-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-3-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-3-1208	12/11/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-3-0609	6/24/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	< 0.50
	HI-3-0310	3/24/2010	N	< 0.005 Y	< 0.0099 Y	< 0.014 Y	< 0.0061 Y	< 0.005 Y	< 0.005 Y	< 0.005 Y	< 0.005 Y	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	
HI-4																	< 1
	HI-4-0905	9/20/2005	N	< 0.02	< 0.2	< 0.1	< 0.075	< 0.075	< 0.05	< 0.015	< 0.015	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-4-1205	12/6/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-4-0306	3/28/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-4-0606	6/7/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	NA
	HI-4-0906	9/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-4-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-4-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-04-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-4-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-4-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-4-1208	12/11/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-4-0609	6/24/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	< 0.50
	HI-4-0310	4/5/2010	N	< 0.0049	< 0.023 Y	< 0.0049 Y	< 0.0049	< 0.0049 Y	< 0.0049	< 0.0049 Y	< 0.0049	< 0.0049	< 0.50	< 0.50	< 0.50	< 0.50	
HI-5																	< 1
	HI-5-0905	9/20/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-5-1205	12/6/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-5-0306	3/28/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-5-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	NA
	HI-5-0906	9/18/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-5-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-5-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-05-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-5-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-5-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-5-1208	12/10/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-5-0609	6/25/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	< 0.50
	HI-5-0310	3/25/2010	N	< 0.005 J	< 0.01 J	< 0.005 J	< 0.005 J	< 0.005 J	< 0.005 J	< 0.005 J	< 0.005 J	< 0.005 J	< 0.50	< 0.50	< 0.50	< 0.50	
HI-6																	< 1
	HI-6-0905	9/20/2005	N	< 0.01	< 0.025	< 0.01	< 0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-6-1205	12/7/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-6-0306	3/29/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-6-0606	6/7/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	NA
	HI-6-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-6-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-6-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-06-0607	6/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-6-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-6-0608	6/19/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-6-1208	12/10/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	< 0.50
	HI-6-0310	3/23/2010	N	< 0.005	< 0.0099	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 1

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

Sample ID		Sample Date	Sample Type	Chemical Name:	Arsenic	Arsenic	Cadmium	Cadmium	Copper	Copper	Lead	Lead	Mercury	Mercury	Nickel	Nickel	Silver	Silver	Thallium	Thallium	Zinc	Zinc	Available Cyanide	Total Cyanide
				Total/Dissolved:	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	T	T
				Unit:	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/L	ug/L	ug/L	ug/l	ug/L	ug/l	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l
HI-6A																								
	HI-6A-0609	6/24/2009	N		NA	7.7	NA	0.024 J+	NA	0.73 J+	NA	0.185 J+	NA	0.00027 J	NA	4.27	NA	< 0.01	NA	< 0.005	NA	2.2 J+	< 2	< 5
	HI-6A-0909	9/28/2009	N		NA	0.28 J-	NA	0.042 J+	NA	0.408	NA	0.084 J+	NA	0.00084 J	NA	0.38	NA	< 0.005	NA	< 0.020	NA	0.68 J+	< 2	< 5
	HI-6A-1209	12/15/2009	N		NA	0.18 J	NA	< 0.007	NA	0.289	NA	0.045	NA	0.00023 J	NA	0.23	NA	< 0.02	NA	< 0.02	NA	0.2 J	< 2	< 5 J
	HI-6A-0310	3/23/2010	N		NA	< 0.48	NA	< 0.021	NA	1.47	NA	0.270 J+	NA	0.0029	NA	0.81	NA	< 0.050	NA	< 0.075	NA	2.31 J+	< 2 J	< 5 J
HI-7																								
	HI-7-0905	9/21/2005	N		2 J+	2	< 2	< 2	< 2	< 2	< 1	< 1	0.00041 J	0.00063 J	1.2	1.4	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	94.6 J
	HI-17A-0905	9/21/2005	FD		2	2	< 2	< 2	< 2	< 2	< 1	< 1	0.00054 J	0.00076 J	2.3	2.3	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	< 1 J
	HI-7-1205	12/5/2005	N		1	1	< 2	< 2	< 2	< 2	< 1	< 1	0.00011 J	0.00014 J	1.9	2.5	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	32 J-
	HI-7-0306	3/29/2006	N		NA	0.6 J-	NA	0.101	NA	1.77	NA	< 0.02	NA	< 0.00025	NA	2.18 J	NA	< 0.02	NA	0.003 J	NA	3.39	NA	20
	HI-7-0606	6/8/2006	N		NA	0.6 J-	NA	0.37	NA	1.64	NA	0.016 J	NA	0.00067	NA	8.83	NA	< 0.02	NA	< 0.02	NA	2.7	NA	51
	HI-7-0906	9/19/2006	N		NA	0.8	NA	0.03	NA	0.59	NA	0.009 J+	NA	< 0.00037	NA	4.12	NA	< 0.02 R	NA	< 0.02	NA	2.4 J-	NA	25
	HI-7-1206	12/20/2006	N		NA	0.63	NA	0.33	NA	2.43	NA	1.26	NA	0.00085	NA	2.7 J	NA	< 0.02	NA	0.016 J	NA	3.2 J	< 2	12
	HI-7-0307	3/6/2007	N		NA	0.67	NA	0.19	NA	1.64	NA	0.039	NA	0.00081	NA	5.54	NA	< 0.02	NA	0.007 J	NA	5.3	< 2 J	27
	HI-07-0607	6/6/2007	N		NA	0.40 J	NA	0.155	NA	0.88	NA	0.201	NA	0.00048	NA	2.51	NA	< 0.020	NA	0.010 J	NA	1.6	< 2 R	11 J
	HI-7-1207	12/7/2007	N		NA	0.6	NA	0.035	NA	1.98	NA	0.82	NA	0.00202	NA	4.08	NA	< 0.02	NA	< 0.028	NA	< 1.5	< 2	12
	HI-7-0608	6/18/2008	N		NA	0.93	NA	0.032	NA	1.89	NA	0.104	NA	0.00088	NA	5.52	NA	< 0.014	NA	0.01 J	NA	1.7	< 2 J	11
	HI-7-1208	12/10/2008	N		NA	0.7	NA	0.523	NA	2.13	NA	0.022	NA	0.002	NA	3.24	NA	< 0.020	NA	< 0.008	NA	13.2	< 2	7
	HI-7-0609	6/23/2009	N		NA	1.2 J+	NA	0.128	NA	1.43	NA	0.139 J+	NA	0.00143 J	NA	1.95	NA	< 0.02	NA	< 0.015	NA	1.8 J+	< 2	7
	HI-7-0310	3/25/2010	N		NA	0.87	NA	0.023	NA	1.01 J+	NA	0.033 J+	NA	< 0.00093	NA	2.01	NA	< 0.020	NA	< 0.012	NA	0.93 J+	< 2	< 5
HI-8																								
	HI-8-0905	9/21/2005	N		< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	0.00024 J	0.00021 J	1.2	1.2	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	4.19 J
	HI-8-1205	12/5/2005	N		< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	< 0.00025	0.00011 J	1.5	1.4	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	9 J-
	HI-8-0306	3/29/2006	N		NA	0.3 J-	NA	0.261	NA	0.92	NA	< 0.02	NA	< 0.00025	NA	1.14 J	NA	< 0.02	NA	0.004 J	NA	1.56	NA	5
	HI-8-0606	6/8/2006	N		NA	0.4 J-	NA	0.03	NA	0.81	NA	0.039	NA	< 0.00041	NA	5.23	NA	< 0.02	NA	< 0.02	NA	3.6	NA	9
	HI-8-0906	9/19/2006	N		NA	0.4 J	NA	0.05	NA	0.53	NA	< 0.02	NA	< 0.00015	NA	2.19	NA	< 0.02 R	NA	< 0.02	NA	1.2 J-	NA	7
	HI-8-1206	12/20/2006	N		NA	1.25	NA	1.01	NA	0.73	NA	0.584	NA	0.00032 J	NA	1.4 J	NA	< 0.02	NA	0.028	NA	1.8 J	< 2	< 5
	HI-8-0307	3/6/2007	N		NA	0.42 J	NA	0.2	NA	1.41	NA	2.53	NA	< 0.00011	NA	2.08	NA	< 0.02	NA	0.006 J	NA	7.6	< 2 J	< 5
	HI-8-0207-B	3/12/2007	N		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 2	NA
	HI-08-0607	6/6/2007	N		NA	0.31 J	NA	0.124	NA	0.5	NA	0.551	NA	< 0.00025	NA	1.2	NA	< 0.020	NA	0.010 J	NA	1.6	< 2 R	< 5 J
	HI-8-1207	12/6/2007	N		NA	0.35 J	NA	0.088	NA	0.77	NA	0.741	NA	0.00044	NA	1.39	NA	< 0.02	NA	< 0.009	NA	< 1.8	< 2	< 5
	HI-8-0608	6/19/2008	N		NA	0.29 J	NA	0.105	NA	0.81	NA	0.072	NA	0.00018 J	NA	2.5	NA	< 0.03	NA	< 0.01	NA	9.6	< 2	5
	HI-8-1208	12/10/2008	N		NA	0.5	NA	0.097	NA	0.56	NA	0.018 J	NA	0.00029	NA	2.33	NA	< 0.020	NA	< 0.020	NA	3.19	< 2	< 5
	HI-8-0609	6/23/2009	N		NA	< 0.4	NA	0.025 J+	NA	0.56 J+	NA	< 0.012	NA	0.0003 J	NA	1.05 J+	NA	< 0.01	NA	< 0.015	NA	2.3 J+	< 2	< 5
	HI-80-0609	6/23/2009	FD		NA	< 0.3	NA	0.033 J+	NA	0.58 J+	NA	< 0.016	NA	0.00097 J	NA	2.27 J	NA	< 0.006	NA	< 0.009	NA	1.8 J+	< 2	< 5
	HI-8-0310	3/25/2010	N		NA	0.61 J+	NA	0.04	NA	0.47 J+	NA	< 0.011	NA	< 0.0005	NA	0.96	NA	< 0.020	NA	< 0.012	NA	2.54 J+	< 2	12.6
HI-9																								
	HI-9-0905	9/21/2005	N		< 5	< 5	< 4	< 4	5	5	< 5	< 5	0.00048 J	0.00042 J	5	6	< 1	< 1	< 1	< 1	< 10	< 10	NA	2.03 J
	HI-9-1205	12/5/2005	N		< 0.6	< 5	0.04	< 4	0.6	< 4	0.03	< 5	0.00031	0.00034	0.8	7	< 0.02 J	< 1 J	< 0.02	< 1	0.7	< 10	NA	3 J-
		3/29/2006	N		NA	0.38 J-		0.162	NA	0.665	NA	< 0.02	NA	< 0.00051	NA	1.95 J	NA	0.009 J	NA	< 0.02	NA	0.99	NA	< 5
	HI-9-0606	6/8/2006	N		NA	0.42 J-	NA	0.098	NA	0.955	NA	0.042	NA	0.00047	NA	1.8	NA	0.046	NA	< 0.02	NA	1.31	NA	< 5
	HI-9-0906	9/19/2006	N		NA	0.54	NA	0.065	NA	1.43	NA	0.023 J+	NA	< 0.0008	NA	< 1.16	NA	< 0.1	NA	0.0194 J	NA	1.21	NA	< 5
	HI-9-1206	12/20/2006	N		NA	< 0.66	NA	0.036	NA	1.57	NA	< 0.051	NA	0.0006	NA	1.09 J	NA	0.033	NA	< 0.0123	NA	0.62 J	< 2	< 5
HI-9-0306	HI-9-0307	3/7/2007	N		NA	0.71	NA	0.014 J	NA	1.71	NA	0.75	NA	0.00074	NA	0.87 J	NA	< 0.02	NA	< 0.0071	NA	< 0.84	< 2 J	< 5
	HI-09-0607	6/6/2007	N		NA	0.42 J	NA	0.039	NA	1.31	NA	0.115	NA	0.00047	NA	1.47	NA	< 0.020	NA	< 0.0200	NA	0.65	< 2 R	< 5 J
		12/5/2007	N		NA	0.75	NA	0.026	NA	1.41	NA	0.387 J	NA	0.00105	NA	1.13	NA	< 0.02	NA	0.009 J	NA	< 0.64	< 2	< 5
	DUP01-120507	12/5/2007	FD		NA	1.21	NA	0.03	NA	1.53	NA	1.74 J	NA	0.00094	NA	0.95	NA	< 0.02	NA	0.008 J	NA	< 0.55	< 2	< 5
	HI-9-0608	6/19/2008	N		NA	0.98 J+	NA	0.059	NA	1.54	NA	0.067 J+	NA	0.00074	NA	1.27	NA	< 0.006	NA	< 0.008	NA	0.88 J+	< 2	< 5
	HI-9-1208	12/10/2008	N		NA	1.4	NA	0.022	NA	1.3	NA	< 0.020	NA	0.00079	NA	0.85	NA	0.003 J	NA	0.0100 J	NA	0.50 J	< 2	< 5
HI-9-1207	HI-9-0310	3/22/2010	N		NA	0.75	NA	0.087	NA	1.39	NA	0.051 J+	NA	0.00149	NA	2.49	NA	0.009 J	NA	< 0.022	NA	1.07 J+	< 2 J	< 5
HI-9A																								
	HI-9A-0609	**6/23/2009**	**N**		**NA**	**1.8 J+**	**NA**	**< 0.019**	**NA**	**0.38 J+**	**NA**	**0.866 J+**	**NA**	**0.00067 J**	**NA**	**0.66 J+**	**NA**	**< 0.012**	**NA**	**< 0.02**	**NA**	**2.1 J+**	**< 2**	**< 5**
	HI-9A-0909	9/29/2009	N		NA	0.37 J-	NA	< 0.020	NA	0.321	NA	0.089 J+	NA	0.00138	NA	< 0.40	NA	< 0.020	NA	< 0.020	NA	0.59 J+	< 2	< 5
		12/15/2009	N		NA	0.31 J	NA	< 0.02	NA	0.104	NA	0.086	NA	0.00073 J	NA	0.42	NA	< 0.02	NA	< 0.02	NA	1.2	< 2	< 5 J
		3/22/2010	N		NA	< 0.15	NA	< 0.006	NA	0.147 J+	NA	0.163 J	NA	0.00087 J	NA	0.59	NA	0.010 J	NA	< 0.033	NA	0.60 J+	< 2 J	< 5
	HI-90A-0310	3/22/2010	FD		NA	< 0.17	NA	< 0.013	NA	< 0.247	NA	< 0.034	NA	0.00045 J	NA	0.40 J	NA	0.021 J	NA	< 0.075	NA	< 0.46	< 2 J	< 5

HI-9A-1209
HI-9A-0310

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

			Chemical Name:	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Benzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Carbon Tetrachloride	Tetrachloro-ethene
			Total/Dissolved:	T	T	T	T	T	T	T	T	T	T	T	T	T	T
			Unit:	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Sample ID		**Sample Date**	**Sample Type**														
HI-6A																	
	HI-6A-0609	6/24/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	< 1 J	< 1 J	< 1 J	< 1 J
	HI-6A-0909	9/28/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.040 J	< 0.50	< 0.50	< 0.50	< 0.50
	HI-6A-1209	12/15/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	HI-6A-0310	3/23/2010	N	< 0.005	< 0.01 Y	< 0.019 Y	< 0.005 Y	< 0.005 Y	< 0.005 Y	< 0.005 Y	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-7																	
	HI-7-0905	9/21/2005	N	< 0.01	< 0.02	< 0.01	< 0.015	< 0.02	< 0.015	< 0.02	< 0.02	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-17A-0905	9/21/2005	FD	< 0.01	< 0.025	< 0.02	< 0.02	< 0.05	< 0.025	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-7-1205	12/5/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-7-0306	3/29/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-7-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	HI-7-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-7-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-7-0307	3/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-07-0607	6/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-7-1207	12/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-7-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-7-1208	12/10/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-7-0609	6/23/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
	HI-7-0310	3/25/2010	N	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	1.2
HI-8																	
	HI-8-0905	9/21/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.025	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-8-1205	12/5/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-8-0306	3/29/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-8-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	HI-8-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-8-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-8-0307	3/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-8-0207-B	3/12/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	HI-08-0607	6/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-8-1207	12/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-8-0608	6/19/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-8-1208	12/10/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-8-0609	6/23/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
	HI-80-0609	6/23/2009	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
	HI-8-0310	3/25/2010	N	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-9																	
	HI-9-0905	9/21/2005	N	< 0.02	< 0.015	< 0.025	< 0.015	< 0.025	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-9-1205	12/5/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-9-0306	3/29/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-9-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	HI-9-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-9-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-9-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-09-0607	6/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-9-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	DUP01-120507	12/5/2007	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-9-0608	6/19/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-9-1208	12/10/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-9-0310	3/22/2010	N	< 0.020 Y	< 0.040 Y	< 0.020	< 0.020	< 0.020 Y	< 0.020 Y	< 0.020	< 0.020	< 0.020	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-9A																	
	HI-9A-0609	6/23/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	< 1 J	< 1 J	< 1 J	< 1 J
	HI-9A-0909	9/29/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.040 J	< 0.50	< 0.50	< 0.50	< 0.50
	HI-9A-1209	12/15/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	HI-9A-0310	3/22/2010	N	< 0.020	< 0.071 Y	< 0.020 Y	< 0.020 Y	< 0.020	< 0.020 Y	< 0.020	< 0.020	< 0.020	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
	HI-90A-0310	3/22/2010	FD	< 0.020 Y	< 0.052 Y	< 0.020 Y	< 0.020 Y	< 0.020 Y	< 0.020	< 0.020	< 0.020	< 0.020	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

		Chemical Name:	Arsenic	Arsenic	Cadmium	Cadmium	Copper	Copper	Lead	Lead	Mercury	Mercury	Nickel	Nickel	Silver	Silver	Thallium	Thallium	Zinc	Zinc	Available Cyanide	Total Cyanide
		Total/Dissolved:	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	T	T
		Unit:	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/L	ug/L	ug/L	ug/l	ug/L	ug/l	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l
Sample ID	**Sample Date**	**Sample Type**																				
HI-10																						
HI-10-0905	9/21/2005	N	< 5	< 5	< 4	< 4	6	7	< 5	< 5	0.00082 J	0.00064 J	16	17	< 1	< 1	< 1	< 1	< 10	< 10	NA	23.6 J
HI-10-1205	12/5/2005	N	< 0.6	< 5	0.22	< 2	1.3	3	0.04	< 5	0.00037	0.00039	4.4	10	0.04 J-	< 1 J	0.03	< 1	4.2	< 6	NA	14 J-
HI-10-0306	3/29/2006	N	NA	0.53 J-		0.047	NA	2.8	NA	0.016 J	NA	< 0.00157	NA	1.68 J	NA	< 0.02	NA	< 0.02	NA	1.29	NA	345
HI-10-0606	6/8/2006	N	NA	0.50 J-	NA	0.089	NA	2.12	NA	0.017 J	NA	0.00062	NA	2.25	NA	0.014 J	NA	< 0.0252	NA	2.61	NA	276
HI-10-0906	9/19/2006	N	NA	0.4 J	NA	0.443	NA	2.09	NA	0.029 J+	NA	< 0.0011	NA	4.43	NA	0.146	NA	0.0864	NA	10.2	NA	63
HI-10-1206	12/20/2006	N	NA	< 0.5	NA	0.081	NA	2.54	NA	0.09 J	NA	0.00097	NA	2.33 J	NA	0.015 J	NA	< 0.0337	NA	3.66 J	< 2	138
HI-100-1206	12/20/2006	FD	NA	< 0.51 NA	NA	0.079	NA	2.54	NA	0.255 J	NA	0.00118	NA	2.34 J	NA	0.009 J	NA	< 0.0319	NA	3.22 J	< 2	141
HI-10-0307	3/7/2007	N	NA	0.6 J	NA	0.017 J	NA	4.72 J	NA	0.218 J	NA	0.00167 J	NA	1.08 J	NA	< 0.02	NA	< 0.0143	NA	1.47 J	< 2 J	280 J
HI-101-0307	3/7/2007	FD	NA	1.58 J	NA	0.02	NA	0.35 J	NA	0.428 J	NA	< 0.00025	NA	0.98	NA	< 0.02	NA	< 0.02	NA	2.7 J	< 2 J	37 J
HI-10-0607	6/6/2007	N	NA	0.30 J	NA	0.071	NA	1.55	NA	0.425	NA	0.00074	NA	1.86	NA	< 0.020	NA	< 0.0255	NA	3.1	< 2 R	17 J
HI-10-1207	12/5/2007	N	NA	0.3 J-	NA	0.205	NA	1.66	NA	0.731	NA	0.00078	NA	3.59	NA	0.028	NA	0.058	NA	5.95	< 2	24
HI-10-0608	6/17/2008	N	NA	< 0.33	NA	0.111	NA	1.66	NA	< 0.019	NA	0.00073	NA	1.55	NA	< 0.014	NA	0.03 J+	NA	4.34	< 2	11
HI-10-1208	12/10/2008	N	NA	0.24 J	NA	0.294	NA	1.3	NA	0.194 J	NA	0.00121	NA	2.7	NA	0.039	NA	0.0667	NA	7.53 J-	< 2	41
HI-10-0310	3/22/2010	N	NA	0.73	NA	0.022 J+	NA	3.61	NA	< 0.020	NA	0.0027	NA	0.94	NA	< 0.020	NA	< 0.012	NA	1.28 J+	< 2 J	104 J
HI-10A																						
HI-10A-0609	6/23/2009	N	NA	4.6	NA	< 0.016	NA	0.39 J+	NA	0.102 J+	NA	0.00042 J	NA	1.26 J+	NA	< 0.02	NA	< 0.02	NA	0.9 J+	< 2	18
HI-10A-0909	9/28/2009	N	NA	0.11 J-	NA	< 0.009	NA	< 0.036	NA	0.021 J+	NA	0.0002 J	NA	0.29	NA	< 0.008	NA	< 0.006	NA	< 0.31	< 2	24
HI-10A-1209	12/15/2009	N	NA	0.13 J	NA	< 0.002	NA	0.026 J	NA	< 0.02	NA	0.00037 J	NA	0.24	NA	< 0.02	NA	< 0.02	NA	0.2 J	< 2	29 J-
HI-10A-0310	3/22/2010	N	NA	< 0.1	NA	< 0.007	NA	< 0.069	NA	0.026 J+	NA	0.00028 J	NA	0.48	NA	< 0.020	NA	< 0.030	NA	2.03 J+	< 2 J	38 J
HI-11																						
HI-11-0905	9/21/2005	N	< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	0.00034 J	0.00017 J	1	1.2	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	2.75 J
HI-11-1205	12/5/2005	N	< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	< 0.00025	< 0.00025	1.1	0.6	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	2 J-
HI-11-0306	3/29/2006	N	NA	0.5 J-	NA	0.054	NA	0.62	NA	< 0.02	NA	< 0.00025	NA	< 0.46	NA	< 0.02	NA	0.004 J	NA	0.86	NA	< 5
HI-11-0606	6/8/2006	N	NA	0.3 J-	NA	< 0.02	NA	0.38	NA	0.017 J	NA	0.00025 J	NA	1.38	NA	< 0.02	NA	< 0.02	NA	0.9	NA	< 5
HI-11-0906	9/19/2006	N	NA	0.2 J	NA	< 0.02	NA	0.26	NA	< 0.02	NA	< 0.00026	NA	0.55	NA	< 0.02 R	NA	< 0.02	NA	0.8 J-	NA	< 5
HI-11-1206	12/20/2006	N	NA	0.34 J	NA	< 0.02	NA	0.61	NA	0.126	NA	< 0.0004	NA	0.3 J+	NA	< 0.02	NA	0.014 J	NA	1.6 J	< 2	< 5
HI-11-0307	3/7/2007	N	NA	0.21 J	NA	0.4	NA	0.46	NA	0.644	NA	< 0.00041	NA	0.85	NA	< 0.02	NA	< 0.02	NA	2.6	< 2 J	< 5
HI-11-0607	6/7/2007	N	NA	0.16 J	NA	0.014 J	NA	0.30 J-	NA	0.254	NA	0.00022 J	NA	0.43	NA	< 0.020	NA	0.004 J	NA	0.4 J	< 2 R	< 5 J
HI-11-1207	12/4/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00033 J	NA	NA	NA	NA	NA	NA	NA	NA	< 2	< 5
HI-12-1107	12/4/2007	N	NA	0.15 J	NA	0.01 J	NA	0.33	NA	0.02	NA	NA	NA	0.33	NA	< 0.02	NA	< 0.02	NA	< 0.9	NA	NA
HI-11-0608	6/19/2008	N	NA	0.23 J	NA	< 0.02	NA	0.26	NA	0.149	NA	0.00018 J	NA	0.4 J+	NA	< 0.03	NA	< 0.02	NA	0.5 J+	< 2	< 5
HI-11-1208	12/10/2008	N	NA	0.2 J	NA	0.037	NA	0.36	NA	0.025	NA	0.00027	NA	0.7	NA	0.009 J	NA	0.010 J	NA	0.90 J+	< 2	< 5
HI-11-0609	6/23/2009	N	NA	< 0.2	NA	< 0.02	NA	0.36 J+	NA	0.257 J+	NA	0.00016 J	NA	0.46 J+	NA	< 0.02	NA	< 0.02	NA	0.5 J+	< 2	< 5
HI-11-0310	3/25/2010	N	NA	< 0.22	NA	0.006 J	NA	0.20 J+	NA	0.059 J+	NA	< 0.0002	NA	0.4	NA	< 0.020	NA	< 0.007	NA	< 0.44	< 2 J	2.6 J
HI-12																						
HI-12-0905	9/19/2005	N	< 5	< 5	< 10	< 10	20	20	< 5	< 5	0.0015 J	0.00158 J	11	11	< 1	< 1	< 1	< 1	50	60	NA	< 1 J
HI-12-1205	12/6/2005	N	< 0.6	< 5	0.11	< 4	2	6	0.03	< 5	0.00074	0.00093	1.2	9	0.06 J-	< 1 J	< 0.02	< 1	12.1	< 10	NA	< 1 R
HI-12-0306	3/28/2006	N	NA	0.37 J-		0.206	NA	1.65	NA	0.018 J	NA	< 0.00078	NA	2.23 J	NA	0.048	NA	< 0.02	NA	15.5	NA	< 5
HI-12-0606	6/7/2006	N	NA	0.35 J-	NA	0.535	NA	3.42	NA	0.414	NA	0.00179	NA	3.68	NA	0.116	NA	< 0.0263	NA	111	NA	< 5
HI-12-0906	9/18/2006	N	NA	0.42 J	NA	0.335	NA	4.78	NA	0.341 J+	NA	< 0.00165	NA	4.53	NA	0.183	NA	0.0422	NA	127	NA	< 5
HI-12-1206	12/19/2006	N	NA	< 0.85	NA	0.071	NA	3.09	NA	0.219	NA	0.00541	NA	1.16 J	NA	0.01 J	NA	< 0.0077	NA	4.65 J	< 2	< 5
HI-12-0307	3/7/2007	N	NA	0.56 NA	NA	0.264	NA	2.04	NA	0.219	NA	0.00106	NA	2.38 J	NA	0.03	NA	< 0.0209	NA	26.9	< 2 J	< 5
HI-12-0607	6/5/2007	N	NA	0.29 J	NA	0.257	NA	2.98	NA	0.407	NA	0.00082	NA	3.46	NA	< 0.073	NA	< 0.0233	NA	108	< 2 R	< 5 J
HI-12-1207	12/4/2007	N	NA	0.51	NA	0.124	NA	1.63	NA	1.63	NA	0.00131	NA	1.64	NA	0.017 J	NA	0.014 J	NA	26.2	< 2	< 5
HI-12-0608	6/17/2008	N	NA	< 0.38	NA	0.159	NA	2.9	NA	0.266	NA	0.00085	NA	2.42	NA	0.035 J+	NA	0.021 J+	NA	78.4	2.4	< 5
HI-112-0608	6/17/2008	FD	NA	< 0.35	NA	0.166	NA	2.86	NA	0.228	NA	0.0007	NA	2.42	NA	0.035 J+	NA	0.022 J+	NA	77.6	3.2	< 5
HI-12-1208	12/10/2008	N	NA	0.43 J	NA	0.086	NA	1.9	NA	2.56	NA	0.00095	NA	1	NA	0.025	NA	0.0224	NA	17.3 J-	< 2	< 5
HI-12-0310	3/24/2010	N	NA	< 0.24	NA	0.409	NA	2.54	NA	0.284 J+	NA	< 0.00094	NA	3.12	NA	0.029	NA	< 0.025	NA	69	< 2 J	5.1
HI-12A																						
HI-12A-0609	6/24/2009	N	NA	6.9	NA	< 0.005	NA	0.63 J+	NA	0.042 J+	NA	0.00037 J	NA	1.31 J+	NA	< 0.006	NA	< 0.02	NA	1.1 J+	< 2	< 5
HI-12A-0909	9/29/2009	N	NA	0.49 J-	NA	0.009 J+	NA	0.172	NA	0.085 J+	NA	0.00034 J	NA	0.17 J	NA	< 0.020	NA	< 0.020	NA	< 0.38	< 2	4 J
HI-12A-1209	12/16/2009	N	NA	0.39 J	NA	< 0.002	NA	0.084 J	NA	0.056	NA	0.00283	NA	0.15 J	NA	< 0.02	NA	< 0.02	NA	0.4 J	1.6 J	< 5 J
HI-12A-0310	3/24/2010	N	NA	< 0.18	NA	< 0.004	NA	< 0.035	NA	0.032 J+	NA	< 0.00018	NA	0.08 J	NA	< 0.020	NA	< 0.030	NA	1.23 J+	< 2 J	4.1 J

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

			Chemical Name:	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Benzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Carbon Tetrachloride	Tetrachloro-ethene
			Total/Dissolved:	T	T	T	T	T	T	T	T	T	T	T	T	T	T
			Unit:	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Sample ID		**Sample Date**	**Sample Type**														
HI-10																	
	HI-10-0905	9/21/2005	N	< 0.015	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-10-1205	12/5/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-10-0306	3/29/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-10-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	HI-10-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-10-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-100-1206	12/20/2006	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-10-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-101-0307	3/7/2007	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-10-0607	6/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-10-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-10-0608	6/17/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-10-1208	12/10/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-10-0310	3/22/2010	N	< 0.020	< 0.039 Y	< 0.020	< 0.020 Y	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-10A																	
	HI-10A-0609	6/23/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	< 1 J	< 1 J	< 1 J	< 1 J
	HI-10A-0909	9/28/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
	HI-10A-1209	12/15/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	HI-10A-0310	3/22/2010	N	< 0.020 Y	< 0.11 Y	< 0.020 Y	< 0.020 Y	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-11																	
	HI-11-0905	9/21/2005	N	< 0.01	< 0.035	< 0.015	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-11-1205	12/5/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-11-0306	3/29/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-11-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	HI-11-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-11-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-11-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-11-0607	6/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-11-1207	12/4/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-12-1107	12/4/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	HI-11-0608	6/19/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-11-1208	12/10/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-11-0609	6/23/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
	HI-11-0310	3/25/2010	N	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-12																	
	HI-12-0905	9/19/2005	N	< 0.015	< 0.01	< 0.035	< 0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-12-1205	12/6/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	HI-12-0306	3/28/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	HI-12-0606	6/7/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	HI-12-0906	9/18/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-12-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-12-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-12-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-12-1207	12/4/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-12-0608	6/17/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-112-0608	6/17/2008	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	HI-12-1208	12/10/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	HI-12-0310	3/24/2010	N	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-12A																	
	HI-12A-0609	6/24/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	< 1 J	< 1 J	< 1 J	< 1 J
	HI-12A-0909	9/29/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.040 J	< 0.50	< 0.50	< 0.50	< 0.50
	HI-12A-1209	12/16/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	HI-12A-0310	3/24/2010	N	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

		Chemical Name:	Arsenic	Arsenic	Cadmium	Cadmium	Copper	Copper	Lead	Lead	Mercury	Mercury	Nickel	Nickel	Silver	Silver	Thallium	Thallium	Zinc	Zinc	Available Cyanide	Total Cyanide
		Total/Dissolved:	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	T	T
		Unit:	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/L	ug/L	ug/L	ug/l	ug/L	ug/l	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l
Sample ID	**Sample Date**	**Sample Type**																				
HI-13																						
HI-13-0905	9/20/2005	N	< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	0.00062 J	0.00155 J	0.8	0.8	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	2.59 J
HI-13-1205	12/7/2005	N	< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	< 0.00025	0.00039	0.8	0.8	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	5 J-
HI-13-0306	3/28/2006	N	NA	1.4 J-	NA	0.055	NA	0.66	NA	< 0.032	NA	< 0.00055	NA	< 0.49	NA	< 0.02	NA	< 0.02	NA	1.31	NA	< 5
HI-13-0606	6/8/2006	N	NA	1.0 J-	NA	< 0.02	NA	0.44	NA	0.034	NA	0.00078	NA	1.56	NA	< 0.02	NA	< 0.02	NA	0.9	NA	5
HI-13-0906	9/19/2006	N	NA	0.8	NA	0.12	NA	0.44	NA	0.062	NA	< 0.00114	NA	1.15	NA	< 0.011 R	NA	< 0.02	NA	1.5 J-	NA	< 5
HI-13-1206	12/19/2006	N	NA	1.54	NA	0.06	NA	0.31	NA	0.237	NA	< 0.00041	NA	0.7 J	NA	< 0.02	NA	0.019 J	NA	3.1 J	< 2	< 5
HI-13-0307	3/7/2007	N	NA	0.97	NA	< 0.02	NA	0.58	NA	0.872	NA	0.00113	NA	2.24	NA	< 0.02	NA	< 0.02	NA	1.1	< 2 J	< 5
HI-13-0607	6/5/2007	N	NA	0.55	NA	< 0.020	NA	0.23 J-	NA	0.894 J	NA	0.00036	NA	0.63	NA	< 0.020	NA	< 0.020	NA	1.6	< 2 R	< 5 J
HI-113-0607	6/5/2007	FD	NA	0.61	NA	< 0.020	NA	0.24 J-	NA	1.410 J	NA	0.00056	NA	0.71	NA	< 0.020	NA	< 0.020	NA	1.8	< 2 R	< 5 J
HI-13-1207	12/6/2007	N	NA	0.54	NA	0.015 J	NA	0.15	NA	0.161	NA	0.0002 J	NA	0.7	NA	< 0.02	NA	< 0.02	NA	< 1.2	< 2	6
HI-13-0608	6/18/2008	N	NA	0.68	NA	< 0.02	NA	0.39	NA	0.039 J+	NA	0.00062	NA	0.76	NA	0.032 J+	NA	< 0.02	NA	2.3	< 2 J	5
HI-13-1208	12/11/2008	N	NA	0.5	NA	0.008 J	NA	0.36	NA	0.043	NA	0.00121	NA	1.06	NA	< 0.017	NA	< 0.020	NA	0.56 J+	< 2	11
HI-113-1208	12/11/2008	FD	NA	0.6	NA	0.013 J	NA	0.33	NA	0.06	NA	0.00104	NA	1.22	NA	0.016 J	NA	< 0.020	NA	0.85 J+	< 2	7
HI-13-0609	6/24/2009	N	NA	< 0.4	NA	< 0.018	NA	0.4 J+	NA	0.498 J+	NA	0.00105 J	NA	0.6 J+	NA	< 0.008	NA	< 0.02	NA	1.1 J+	< 2	10
HI-13-0310	3/24/2010	N	NA	2.12	NA	< 0.020	NA	1.21	NA	0.104 J	NA	0.00308	NA	0.63	NA	0.006 J	NA	< 0.01	NA	< 0.4	< 2 J	22
HI-14																						
HI-14-0905	9/20/2005	N	< 1	1	< 2	< 2	2	3	< 1	< 1	0.00077 J	0.00098 J	3.6	3.5	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	10.3 J
HI-14-1205	12/6/2005	N	< 1.1	< 2	< 0.04	< 2	< 0.2	< 2	< 0.04	< 2	0.0002 J	0.00078	0.7	8	< 0.04 J	< 0.5 J	< 0.04	< 0.5	< 1.1	< 6	NA	10 J-
HI-14-0306	3/28/2006	N	NA	0.25 J-		0.05	NA	0.405	NA	0.351 J	NA	0.00838	NA	1.49 J	NA	0.008 J	NA	< 0.04	NA	1.03	NA	10
HI-14-0606	6/7/2006	N	NA	0.05 J-	NA	0.339	NA	0.812	NA	0.057 J	NA	0.0032	NA	4.81	NA	< 0.1	NA	< 0.1	NA	0.90 J	NA	16
HI-14-0906	9/20/2006	N	NA	0.33 J	NA	0.058	NA	0.606	NA	0.266 J+	NA	0.00222	NA	< 1.56	NA	< 0.016	NA	0.002 J	NA	1.57	NA	13
HI-14-1206	12/19/2006	N	NA	< 0.27	NA	0.011 J	NA	0.271	NA	< 0.017	NA	0.00021 J	NA	1.75 J	NA	< 0.02	NA	< 0.02	NA	0.35 J	< 2	13
HI-14-0307	3/7/2007	N	NA	< 2.5 NA	NA	0.034 J	NA	0.56	NA	1.01	NA	0.00036 J	NA	< 1.84 R	NA	< 0.1	NA	< 0.1	NA	< 0.91	< 2 J	16
HI-14-0607	6/5/2007	N	NA	0.24 J	NA	0.008 J	NA	0.43	NA	1.29	NA	0.00162	NA	1.43	NA	< 0.020	NA	< 0.020	NA	1.4	< 2 R	16 J
HI-14-1207	12/6/2007	N	NA	< 0.5	NA	0.014 J	NA	0.341	NA	1.16	NA	0.00086	NA	1.57	NA	< 0.02	NA	< 0.02	NA	< 1.07	< 2	18
HI-14-0608	6/18/2008	N	NA	< 0.03	NA	0.007 J	NA	0.458	NA	0.364	NA	0.00066	NA	3.38	NA	< 0.01	NA	< 0.02	NA	0.62 J+	< 2 J	18
HI-14-1208	12/11/2008	N	NA	0.15 J	NA	0.007 J	NA	0.05 J	NA	0.024	NA	0.00106 J	NA	< 0.60	NA	< 0.020	NA	< 0.020	NA	1.48 J-	< 2	14
HI-14-0609	6/25/2009	N	NA	5.3	NA	0.043 J+	NA	0.98	NA	0.085 J+	NA	0.00174 J	NA	2.82	NA	< 0.012	NA	< 0.02	NA	1.1 J+	< 2	21
HI-14-0310	3/24/2010	N	NA	< 0.31	NA	< 0.011	NA	0.101 J+	NA	< 0.017	NA	0.00205	NA	0.71	NA	< 0.020	NA	< 0.030	NA	< 0.44	< 2 J	27.5
HI-15																						
HI-15-0905	9/20/2005	N	4	5	< 2	< 2	< 2	< 2	2	< 1	0.00039 J	0.00056 J	1.6	1.1	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	87.3 J
HI-15-1205	12/6/2005	N	3	3	< 2	< 2	< 2	< 2	< 1	< 1	< 0.00025	< 0.00025	0.8	0.8	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	1 J-
HI-15-0306	3/29/2006	N	NA	2.3 J-	NA	0.027	NA	0.6	NA	< 0.02	NA	< 0.00026	NA	< 0.4	NA	< 0.02	NA	< 0.02	NA	1.52	NA	< 5
HI-15-0606	6/8/2006	N	NA	1.9 J-	NA	< 0.02	NA	0.45	NA	0.010 J	NA	< 0.00042	NA	3.87	NA	< 0.02	NA	< 0.02	NA	0.5	NA	< 5
HI-15-0906	9/19/2006	N	NA	2.8	NA	0.04	NA	0.44	NA	0.1	NA	< 0.00022	NA	2.52	NA	< 0.02 R	NA	< 0.02	NA	2 J-	NA	< 5
HI-15-1206	12/19/2006	N	NA	1.07	NA	< 0.02	NA	0.31	NA	0.052	NA	< 0.00041	NA	0.5 J	NA	< 0.011	NA	< 0.02	NA	3.2 J	< 2	< 5
HI-15-0307	3/7/2007	N	NA	1.55	NA	0.45	NA	0.28	NA	0.056	NA	0.00037 J	NA	1.66	NA	< 0.02	NA	< 0.02	NA	0.7	< 2 J	< 5
HI-15-0607	6/5/2007	N	NA	1.76	NA	0.608	NA	0.29 J-	NA	1.29	NA	0.00016 J	NA	0.81	NA	< 0.020	NA	< 0.020	NA	1.6	< 2 R	< 5 J
HI-15-1207	12/6/2007	N	NA	0.45 J	NA	0.021	NA	0.18	NA	0.144	NA	0.00018 J	NA	0.94	NA	< 0.02	NA	< 0.02	NA	< 1	< 2	< 5
HI-15-0608	6/18/2008	N	NA	1.62	NA	0.026	NA	0.3	NA	0.044 J+	NA	< 0.00016	NA	1.33	NA	0.038 J+	NA	< 0.02	NA	1.7	< 2 J	< 5
HI-15-1208	12/11/2008	N	NA	1.3	NA	0.101	NA	0.22	NA	0.084	NA	0.00042 J	NA	1.7	NA	< 0.020	NA	< 0.020	NA	1.07	< 2	< 5
HI-15-0609	6/25/2009	N	NA	1.2 J+	NA	0.05 J+	NA	0.23 J+	NA	0.133 J+	NA	0.00016 J	NA	0.71 J+	NA	0.021 J+	NA	< 0.008	NA	0.8 J+	< 2	< 5
HI-15-0310	3/24/2010	N	NA	0.98	NA	0.031	NA	< 0.07	NA	< 0.007	NA	< 0.00016	NA	0.43	NA	0.004 J	NA	< 0.003	NA	< 0.29	< 2	< 5
HI-16																						
HI-16-0905	9/19/2005	N	< 1	< 1	< 2	< 2	2	< 2	< 1	< 1	0.00018 J	0.00023 J	1.9	1.9	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	1.63 J
HI-16-1205	12/6/2005	N	< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	< 0.00025	< 0.00025	0.6	0.6	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	< 1 R
HI-16-0306	3/28/2006	N	NA	< 0.5	NA	< 0.02	NA	0.058 J	NA	< 0.02	NA	< 0.00025	NA	0.57 J	NA	0.003 J	NA	< 0.02	NA	0.29 J	NA	< 5
HI-16-0606	6/7/2006	N	NA	0.05 J-	NA	0.053	NA	0.098 J	NA	0.023	NA	< 0.0004	NA	0.6	NA	0.004 J	NA	< 0.02	NA	0.9	NA	< 5
HI-16-0906	9/20/2006	N	NA	1.1	NA	0.03	NA	0.7	NA	0.016 J+	NA	< 0.00015	NA	6.7	NA	< 0.003 R	NA	< 0.02	NA	1.3 J-	NA	< 5
HI-16-1206	12/19/2006	N	NA	< 0.11	NA	0.052	NA	< 0.104	NA	3.68	NA	< 0.00041	NA	0.26 J	NA	< 0.02	NA	< 0.02	NA	2.87 J	< 2	< 5
HI-16-0307	3/6/2007	N	NA	0.04 J	NA	0.017 J	NA	0.21	NA	0.105	NA	< 0.0004	NA	< 0.15 R	NA	< 0.02	NA	< 0.02	NA	1.47	1.2 J	< 5
HI-16-0607	6/6/2007	N	NA	0.08 J	NA	0.039	NA	0.18	NA	0.394	NA	< 0.00025	NA	0.2	NA	< 0.020	NA	< 0.020	NA	0.9	< 2 R	< 5 J
HI-16-1207	12/5/2007	N	NA	0.13 J-	NA	0.087	NA	0.504	NA	0.237	NA	0.00104	NA	0.47	NA	< 0.02	NA	< 0.02	NA	3.08	2.3	< 5
HI-16-0608	6/18/2008	N	NA	< 0.5	NA	0.093	NA	0.538	NA	0.333	NA	< 0.00016	NA	3.59	NA	< 0.007	NA	< 0.02	NA	1.56 J+	< 2 J	< 5
HI-16-1208	12/11/2008	N	NA	< 0.50	NA	0.198	NA	0.25	NA	0.239	NA	0.00049 J	NA	< 0.60	NA	< 0.020	NA	< 0.020	NA	3.03 J-	< 2	< 5
HI-16-0609	6/25/2009	N	NA	0.7 J+	NA	< 0.018	NA	0.45 J+	NA	0.214 J+	NA	0.00033 J	NA	1.42 J+	NA	0.022 J+	NA	< 0.02	NA	0.9 J+	< 2	< 5
HI-16-0310	3/25/2010	N	NA	< 0.06	NA	< 0.008	NA	< 0.018	NA	0.030 J+	NA	< 0.00023	NA	0.14 J	NA	< 0.020	NA	< 0.030	NA	< 0.1	< 2	< 5

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

Sample ID	Sample Date	Sample Type	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Benzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Carbon Tetrachloride	Tetrachloro-ethene
Chemical Name:			Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Benzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Carbon Tetrachloride	Tetrachloro-ethene
Total/Dissolved:			T	T	T	T	T	T	T	T	T	T	T	T	T	T
Unit:			ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
HI-13																
HI-13-0905	9/20/2005	N	< 0.05	< 0.01	< 0.12	< 0.1	< 0.1	< 0.05	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
HI-13-1205	12/7/2005	N	< 0.01	< 0.01	< 0.025	< 0.025	< 0.015	< 0.02	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
HI-13-0306	3/28/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
HI-13-0606	6/8/2006	N	< 0.015	< 0.1	< 0.05	< 0.025	< 0.025	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
HI-13-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-13-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-13-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-13-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-113-0607	6/5/2007	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-13-1207	12/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-13-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-13-1208	12/11/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-113-1208	12/11/2008	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-13-0609	6/24/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
HI-13-0310	3/24/2010	N	< 0.026 Y	< 0.15 Y	< 0.081 Y	< 0.03 Y	< 0.039 Y	< 0.017 Y	< 0.005	< 0.005 Y	< 0.005	0.13 J	< 1.3	< 1.3	< 1.3	< 1.3
HI-14																
HI-14-0905	9/20/2005	N	< 0.01	< 0.025	< 0.02	< 0.015	< 0.025	< 0.03	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
HI-14-1205	12/6/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
HI-14-0306	3/28/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
HI-14-0606	6/7/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
HI-14-0906	9/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-14-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-14-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-14-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-14-1207	12/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-14-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-14-1208	12/11/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-14-0609	6/25/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
HI-14-0310	3/24/2010	N	< 0.0049	< 0.0098	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-15																
HI-15-0905	9/20/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
HI-15-1205	12/6/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
HI-15-0306	3/29/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
HI-15-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
HI-15-0906	9/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-15-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-15-0307	3/7/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-15-0607	6/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-15-1207	12/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-15-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-15-1208	12/11/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-15-0609	6/25/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
HI-15-0310	3/24/2010	N	< 0.005 Y	< 0.041 Y	< 0.0058 Y	< 0.0054 Y	< 0.005 Y	< 0.005 Y	< 0.005 Y	< 0.005 Y	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
HI-16																
HI-16-0905	9/19/2005	N	< 0.1	< 0.075	< 0.2	< 0.12	< 0.1	< 0.2	< 0.03	< 0.02	< 0.01	1	< 1	< 1	< 1	< 1
HI-16-1205	12/6/2005	N	< 0.01	< 0.01	< 0.025	< 0.015	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	1.4	< 1	< 1	< 1	< 1
HI-16-0306	3/28/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	1.2	< 1	< 1	< 1	< 1
HI-16-0606	6/7/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
HI-16-0906	9/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.3	NA	NA	NA	NA
HI-16-1206	12/19/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-16-0307	3/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-16-0607	6/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-16-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-16-0608	6/18/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
HI-16-1208	12/11/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
HI-16-0609	6/25/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
HI-16-0310	3/25/2010	N	< 0.005 Y	< 0.015 Y	< 0.012 Y	< 0.0082 Y	< 0.0077 Y	< 0.005 Y	< 0.005 Y	< 0.005	< 0.005	0.070 J	< 0.50	< 0.50	< 0.50	< 0.50

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (September 2005–March 2010) (Continued)

Sample ID		Sample Date	Sample Type	Chemical Name: Arsenic	Arsenic	Cadmium	Cadmium	Copper	Copper	Lead	Lead	Mercury	Mercury	Nickel	Nickel	Silver	Silver	Thallium	Thallium	Zinc	Zinc	Available Cyanide	Total Cyanide
				Total/Dissolved: D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	T	T
				Unit: ug/L	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/L	ug/L	ug/L	ug/l	ug/L	ug/l	ug/L	ug/l	ug/l	ug/l	ug/l	ug/l
HI-17																							
	HI-17-0609	6/25/2009	N	NA	435	NA	19.9	NA	1.09	NA	54.5	NA	0.00139 J	NA	88.9	NA	< 0.006	NA	< 0.007	NA	93.2	< 2	< 5
	HI-170-0609	6/25/2009	FD	NA	434	NA	19.7	NA	1.12	NA	56.9	NA	0.00162 J	NA	89.6	NA	< 0.007	NA	< 0.007	NA	93.1	< 2	< 5
	HI-17-0909	9/29/2009	N	NA	349	NA	117	NA	4.01	NA	41.7	NA	0.00104	NA	198	NA	< 0.012	NA	0.067 J+	NA	449	< 2	< 5
	HI-170-0909	9/29/2009	FD	NA	380	NA	113	NA	4.09	NA	40.9	NA	0.0017	NA	196	NA	< 0.004	NA	0.046 J+	NA	433	< 2	< 5
	HI-17-1209	12/16/2009	N	NA	323	NA	44.2	NA	2.99	NA	13.5	NA	0.00125	NA	140	NA	0.012 J	NA	0.013 J	NA	164	0.8 J	< 5 J
	HI-170-1209	12/16/2009	FD	NA	338	NA	40.5	NA	2.59	NA	11.3	NA	0.00123	NA	129	NA	0.031 J	NA	0.014 J	NA	154	2	< 5 J
	HI-17-0310	3/26/2010	N	NA	139	NA	85.9	NA	2.56	NA	5.950 J	NA	0.00308 J	NA	138	NA	0.007 J	NA	0.021	NA	314	< 2	5.3
	HI-170-0310	3/26/2010	FD	NA	144	NA	85.5	NA	2.53	NA	5.9 J	NA	0.00584 J	NA	140	NA	0.004 J	NA	0.024	NA	316	< 2	< 5
HI-18																							
	HI-18-0609	6/25/2009	N	NA	6.3	NA	0.021 J+	NA	0.47 J+	NA	0.084 J+	NA	0.00212 J	NA	4.04	NA	< 0.02	NA	< 0.02	NA	1.7 J+	< 2	< 5
	HI-18-0909	9/28/2009	N	NA	4.6	NA	< 0.020	NA	0.44	NA	0.109 J+	NA	0.00009 J	NA	2.5	NA	< 0.020	NA	< 0.014	NA	1.0 J+	< 2	< 5
	HI-18-1209	12/16/2009	N	NA	5.07	NA	0.011 J	NA	0.94	NA	0.01 J	NA	0.00051 J	NA	9.39	NA	< 0.04	NA	< 0.02	NA	1.42	0.85 J	< 5 J
	HI-18-0310	3/26/2010	N	NA	3.59	NA	0.007 J	NA	0.40 J+	NA	< 0.01	NA	< 0.00068	NA	2	NA	< 0.020	NA	< 0.020	NA	1.03 J+	< 2	1.3 J
MW-01																							
	MW-01-0905	9/20/2005	N	3	3	< 2	< 2	< 2	4	< 1	< 1	0.0003 J	0.00097 J	0.8	0.9	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	< 1 J
	MW-01-1205	12/7/2005	N	2.6	4	< 0.02	< 2	< 0.1	< 2	0.03	< 1	< 0.00025	0.00031	0.6	0.9	< 0.02 J	< 0.2 J	< 0.02	< 0.2	5.4	15	NA	< 1 R
	MW-01-0306	3/29/2006	N	NA	4 J-	NA	0.456	NA	27.4	NA	1.55 J	NA	< 0.00138	NA	4.13 J	NA	< 0.02	NA	0.047	NA	819	NA	< 5
	MW-10-0306	3/29/2006	FD	NA	4.2 J-	NA	0.465	NA	25.6	NA	1.42 J	NA	< 0.0014	NA	4.11 J	NA	< 0.02	NA	0.047	NA	796	NA	< 5
	MW-01-0606	6/8/2006	N	NA	3.5 J-	NA	0.51	NA	5.13	NA	1.22	NA	0.00249	NA	8.66	NA	< 0.02	NA	0.02	NA	1010	NA	< 5
	MW-01-0906	9/20/2006	N	NA	7.1	NA	0.24	NA	1.26	NA	0.385	NA	< 0.00073	NA	2.59	NA	< 0.02 R	NA	< 0.02	NA	8.9 J-	NA	< 5
	MW-101-0906	9/20/2006	FD	NA	6.7	NA	0.25	NA	1.32	NA	0.372	NA	< 0.00067	NA	2.73	NA	< 0.02 R	NA	< 0.02	NA	10.1 J-	NA	< 5
	MW-01-1206	12/20/2006	N	NA	5.09	NA	0.04	NA	4.08	NA	1.2	NA	0.0008	NA	1.7 J	NA	< 0.02	NA	0.015 J	NA	36.4 J	< 2	< 5
	MW-01-0307	3/6/2007	N	NA	3.81	NA	0.14	NA	3.77	NA	1.26	NA	0.00039 J	NA	3.82	NA	< 0.004	NA	< 0.02	NA	20.7	< 2 J	< 5
	MW-01-0607	6/6/2007	N	NA	3.4	NA	0.008 J	NA	1.73	NA	0.99	NA	0.00112	NA	0.8	NA	< 0.020	NA	< 0.020	NA	10.2	< 2 R	< 5 J
	MW-1-1207	12/5/2007	N	NA	5.54	NA	0.076	NA	6.45	NA	0.247	NA	0.00069	NA	2.74	NA	< 0.01	NA	< 0.014	NA	60.2	< 2	< 5
	MW-01-0608	6/19/2008	N	NA	5.45	NA	0.005 J	NA	0.92	NA	0.207	NA	0.00022 J	NA	3.58	NA	0.046 J+	NA	< 0.02	NA	2.6	< 2 J	< 5
	MW-01-1208	12/10/2008	N	NA	4.2	NA	0.02	NA	2.1	NA	0.405	NA	0.0008	NA	1.92	NA	< 0.020	NA	< 0.020	NA	12	< 2	< 5
	MW-01-0609	6/23/2009	N	NA	5.6	NA	< 0.013	NA	2.29	NA	0.512 J+	NA	0.00084 J	NA	1.49 J+	NA	0.022 J+	NA	< 0.007	NA	78	< 2	< 5
	MW-01-0310	3/23/2010	N	NA	5.38	NA	0.009 J	NA	1.7	NA	0.272 J	NA	0.00227	NA	1.83	NA	< 0.020	NA	< 0.020	NA	42.6	< 2 J	69 J
MW-213																							
	MW-213-0905	9/20/2005	N	< 1	< 1	< 2	< 2	3	3	< 1	< 1	0.00025 J	0.00155 J	0.8	0.9	< 0.2	< 0.2	< 0.2	< 0.2	< 6	< 6	NA	< 1 J
	MW-213-1205	12/6/2005	N	< 0.6	< 1	< 0.02	< 2	< 0.1	< 2	< 0.02	< 1	< 0.00025	< 0.00025	1.2 J	2.8	< 0.02 J	< 0.2 J	< 0.02	< 0.2	< 0.6	< 6	NA	< 1 R
	MW-21-1205	12/6/2005	FD	< 1	< 1	< 2	< 2	< 2	< 2	< 1	< 1	< 0.00025	< 0.00025	2.8 J	2.4	< 0.2 J	< 0.2 J	< 0.2	< 0.2	< 6	< 6	NA	< 1 R
	MW-213-0306	3/29/2006	N	NA	1.62 J-	NA	0.466	NA	1.11	NA	0.405 J	NA	< 0.00122	NA	3.68 J	NA	0.007 J	NA	< 0.02	NA	16	NA	< 5
	MW-213-0606	6/7/2006	N	NA	1.04 J-	NA	0.391	NA	4.35	NA	1.41	NA	0.00248	NA	1.26	NA	0.009 J	NA	< 0.02	NA	23	NA	< 5
	MW-213-0906	9/20/2006	N	NA	3.3	NA	0.3	NA	4.25	NA	1.11	NA	0.00444	NA	2.39	NA	< 0.007 R	NA	< 0.02	NA	26.6 J-	NA	< 5
	MW-213-1206	12/20/2006	N	NA	2.68	NA	1.47	NA	3.65	NA	2.24	NA	0.00304	NA	2.3 J	NA	< 0.02	NA	0.032	NA	80 J	< 2	< 5
	MW-213-0307	3/6/2007	N	NA	4.45	NA	0.907	NA	8.93	NA	6.07	NA	0.01009	NA	5.13 J	NA	0.013 J	NA	< 0.0099	NA	85.6	< 2 J	< 5
	MW-213-0607	6/6/2007	N	NA	1.8	NA	0.264	NA	5.6	NA	4.88	NA	0.00915	NA	3.89	NA	< 0.020	NA	< 0.020	NA	74.7	< 2 R	< 5 J
	MW-213-1207	12/6/2007	N	NA	0.19 J-	NA	0.476	NA	0.768	NA	0.641	NA	0.00104	NA	0.28 J-	NA	< 0.02	NA	< 0.02	NA	6.26	< 2	< 5
	MW-213-0608	6/17/2008	N	NA	< 0.32	NA	1.17	NA	2.04	NA	0.583	NA	0.00161	NA	0.33 J-	NA	< 0.02	NA	< 0.02	NA	6.62	< 2	< 5
	MW-213-1208	12/9/2008	N	NA	0.13 J	NA	1.6	NA	2.4	NA	0.685	NA	0.00154 J	NA	< 0.60	NA	< 0.020	NA	< 0.020	NA	6.28 J-	< 2	< 5
	MW-213-0310	3/23/2010	N	NA	< 0.31	NA	0.086	NA	0.641 J+	NA	0.113 J+	NA	0.004	NA	0.29	NA	< 0.020	NA	< 0.030	NA	4.50 J+	< 2 J	< 5 J
TD-06A																							
	TD-06A-0609	6/24/2009	N	NA	< 0.27	NA	< 0.008	NA	< 0.071	NA	0.135 J+	NA	0.00034 J	NA	0.26 J+	NA	0.008 J	NA	< 0.004	NA	< 0.49	0.85 J	< 5
	TD-06A-0909	9/28/2009	N	NA	0.25 J-	NA	< 0.011	NA	1.05	NA	0.289 J+	NA	0.0003 J	NA	0.3	NA	< 0.009	NA	< 0.020	NA	28.5	< 2	< 5
	TD-06A-1209	12/16/2009	N	NA	0.21 J	NA	< 0.006	NA	0.8	NA	0.369	NA	0.00109	NA	0.4	NA	0.003 J	NA	< 0.02	NA	19.7	4.4	< 5 J
	TD-06A-0310	3/23/2010	N	NA	< 0.1	NA	< 0.003	NA	< 0.07	NA	< 0.014	NA	< 0.00029	NA	0.12 J	NA	< 0.020	NA	< 0.030	NA	0.52 J+	< 2 J	< 5 J

Table 6-3. S&G-OU1, Long-Term Groundwater Monitoring Data (Continued)

			Chemical Name:	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Benzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Carbon Tetrachloride	Tetrachloro-ethene
			Total/Dissolved:	T	T	T	T	T	T	T	T	T	T	T	T	T	T
			Unit:	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Sample ID		Sample Date	Sample Type														
HI-17																	
	HI-17-0609	6/25/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	< 1 J	< 1 J	< 1 J	< 1 J
	HI-170-0609	6/25/2009	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	< 1 J	< 1 J	< 1 J	< 1 J
	HI-17-0909	9/29/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.10 J	< 0.50	< 0.50	< 0.50	< 0.50
	HI-170-0909	9/29/2009	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.10 J	< 0.50	< 0.50	< 0.50	< 0.50
	HI-17-1209	12/16/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.04 J	< 0.5	< 0.5	< 0.5	< 0.5
	HI-170-1209	12/16/2009	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 J	< 0.5	< 0.5	< 0.5	< 0.5
	HI-17-0310	3/26/2010	N	< 0.005 Y	< 0.029 Y	< 0.0098 Y	< 0.0053 Y	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.15 J	< 0.50	< 0.50	< 0.50	< 0.50
	HI-170-0310	3/26/2010	FD	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.15 J	< 0.50	< 0.50	< 0.50	< 0.50
HI-18																	
	HI-18-0609	6/25/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	< 1 J	< 1 J	< 1 J	< 1 J
	HI-18-0909	9/28/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
	HI-18-1209	12/16/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	HI-18-0310	3/26/2010	N	< 0.005 Y	< 0.036 Y	< 0.013 Y	< 0.0057 Y	< 0.005 Y	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
MW-01																	
	MW-01-0905	9/20/2005	N	< 0.035	< 0.02	< 0.03	< 0.035	< 0.01	< 0.02	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	MW-01-1205	12/7/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01 J	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	MW-01-0306	3/29/2006	N	< 0.01	< 0.03	< 0.015	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	MW-10-0306	3/29/2006	FD	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	MW-01-0606	6/8/2006	N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	MW-01-0906	9/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-101-0906	9/20/2006	FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-01-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-1-0307	3/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-01-0607	6/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	MW-1-1207	12/5/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-01-0608	6/19/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-01-1208	12/10/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	MW-01-0609	6/23/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1 J	NA	NA	NA	NA
	MW-01-0310	3/23/2010	N	< 0.005	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
MW-213																	
	MW-213-0905	9/20/2005	N	< 0.02	< 0.025	< 0.045	< 0.025	< 0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	MW-213-1205	12/6/2005	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	MW-21-1205	12/6/2005	FD	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 1	< 1	< 1	< 1	< 1
	MW-213-0306	3/29/2006	N	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NA	NA	< 1	< 1	< 1	< 1	< 1
	MW-213-0606	6/7/2006	N	< 0.010	< 0.05	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 1	< 1	< 1	< 1	< 1
	MW-213-0906	9/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-213-1206	12/20/2006	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-213-0307	3/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-213-0607	6/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	MW-213-1207	12/6/2007	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-213-0608	6/17/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA
	MW-213-1208	12/9/2008	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	NA	NA	NA	NA
	MW-213-0310	3/23/2010	N	< 0.005 Y	< 0.0099 Y	< 0.005 Y	< 0.005 Y	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
TD-06A																	
	TD-06A-0609	6/24/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	TD-06A-0909	9/28/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	TD-06A-1209	12/16/2009	N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	TD-06A-0310	3/23/2010	N	< 0.005	< 0.0099	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.050 J	< 0.50	< 0.50	< 0.50	< 0.50

Notes:

FD = Field Duplicate
N = Normal Sample
T = Total
D = Dissolved
J- = Estimated Concentration, biased low
J = Estimated Concentration
R = Result Rejected
J+ = Estimated Concentration, biased high
NA = Not Analyzed
Y = Reporting limit was raised due to the presence of interference (AECOM qualifier)

Table 6-4. S&G-OU1, Five-Year Review Groundwater Monitoring Event Data (March 2010)

Chemical Name	Unit	ROD CUGs (µg/L)	NRWQC (µg/L)	Location ID:	AC-06A	FW-01	TD-06A	HI-1	HI-2	HI-3	HI-4	HI-5	HI-6	HI-6A	HI-7	HI-8	HI-9	HI-9A	HI-9A
				Sample ID:	AC-06A-0310	FW-01-0310	TD-06A-0310	HI-1-0310	HI-2-0310	HI-3-0310	HI-4-0310	HI-5-0310	HI-6-0310	HI-6A-0310	HI-7-0310	HI-8-0310	HI-9-0310	HI-9A-0310	HI-90A-0310
				Sample Date:	3/25/2010	3/23/2010	3/23/2010	3/24/2010	3/24/2010	3/24/2010	4/5/2010	3/25/2010	3/23/2010	3/23/2010	3/25/2010	3/25/2010	3/22/2010	3/22/2010	3/22/2010
				Sample Type:	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD
Metals																			
Antimony	µg/L		640		NA	NA	< 1.00	0.04 J	< 1.00	< 1.00	0.02 J	< 1.00	NA	< 1.00	NA	NA	NA	< 1.00	< 1.00
Arsenic	µg/L	36			< 0.4	0.69 J+	< 0.1	1.08	1.43	< 0.05	< 0.27	< 0.50	< 0.47	< 0.48	0.87	0.61 J+	0.75	< 0.15	< 0.17
Cadmium	µg/L	8			0.011 J	0.073	< 0.003	0.016 J	< 0.009	0.178	0.023 J+	< 0.020	< 0.012	< 0.021	0.023	0.04	0.087	< 0.006	< 0.013
Chromium	µg/L				NA	NA	0.78 J+	1.57	0.41 J+	0.23 J+	1.18 J+	0.22 J+	NA	3.25	NA	NA	NA	1.13 J	2.31 J
Copper	µg/L	2.9			0.75 J+	**15.4**	< 0.07	0.30 J+	< 0.048	0.101 J+	0.39 J+	0.134 J+	0.478 J+	1.47	1.01 J+	0.47 J+	1.39	0.147 J+	< 0.247
Lead	µg/L	5.8			0.250 J	1.500 J+	< 0.014	0.045 J+	< 0.013	0.046 J+	0.032 J+	< 0.018	0.093 J+	0.270 J+	0.033 J+	< 0.011	0.051	0.163 J	< 0.034
Mercury	µg/L	0.025			0.00196 J+	0.00615	< 0.00029	< 0.00049	< 0.00022	< 0.00035	< 0.00017	0.00172	**0.0265**	0.0029	< 0.00093	< 0.0005	0.00149	0.00087 J	0.00045 J
Nickel	µg/L	7.9			0.76	3.04	0.12 J	0.36	0.17 J	0.12 J	0.61	< 0.6	0.63	0.81	2.01	0.96	2.49	0.59	0.40 J
Silver	µg/L	1.2			< 0.020	< 0.020	< 0.020	0.006 J	< 0.020	< 0.020	< 0.004	< 0.020	< 0.020	< 0.050	< 0.020	< 0.020	0.009 J	0.010 J	0.021 J
Thallium	µg/L	6.3			< 0.020	< 0.013	< 0.030	< 0.007	< 0.030	< 0.004	< 0.040	< 0.030	< 0.030	< 0.075	< 0.012	< 0.012	< 0.022	< 0.033	< 0.075
Zinc	µg/L	76.6			4.28	73	0.52 J+	0.75 J+	< 0.34	0.81 J+	1.44 J+	< 0.29	0.67 J+	2.31 J+	0.93 J+	2.54 J+	1.07 J+	0.60 J+	< 0.46
Cyanide																			
Available Cyanide	µg/L				< 2	< 2 J	< 2 J	< 2 J	< 2 J	< 2 J	< 2	< 2 J	< 2 J	< 2 J	< 2	< 2	< 2 J	< 2 J	< 2 J
Cyanide (total)	µg/L	1			< 5	< 5 J	< 5 J	**5.4**	**4.5 J**	< 5	< 10	**13.8**	**1.4 J**	< 5 J	< 5	**12.6**	< 5	< 5	< 5
PCBs																			
Aroclor 1016	µg/L	0.03			< 0.005 Y	< 0.005 Y	< 0.005	< 0.005	< 0.005	< 0.005 Y	< 0.0049	< 0.005 J	< 0.005	< 0.005	< 0.005	< 0.005	< 0.020 Y	< 0.020	< 0.020 Y
Aroclor 1221	µg/L	0.03			< 0.032 Y	< 0.037 Y	< 0.0099	< 0.0099	< 0.01	< 0.0099 Y	< 0.023 Y	< 0.01 J	< 0.0099	< 0.01 Y	< 0.01	< 0.01	< 0.040 Y	< 0.071 Y	< 0.052 Y
Aroclor 1232	µg/L	0.03			< 0.0078 Y	< 0.0073 Y	< 0.005	< 0.005	< 0.005	< 0.014 Y	< 0.0049 Y	< 0.005 J	< 0.005	< 0.019 Y	< 0.005	< 0.005	< 0.020	< 0.020 Y	< 0.020 Y
Aroclor 1242	µg/L	0.03			< 0.005 Y	< 0.0097 Y	< 0.005	< 0.005	< 0.005	< 0.0061 Y	< 0.0049	< 0.005 J	< 0.005	< 0.005 Y	< 0.005	< 0.005	< 0.020	< 0.020 Y	< 0.020 Y
Aroclor 1248	µg/L	0.03			< 0.005 Y	< 0.0082 Y	< 0.005	< 0.005	< 0.005	< 0.005 Y	< 0.0049 Y	< 0.005 J	< 0.005	< 0.005 Y	< 0.005	< 0.005	< 0.020 Y	< 0.020	< 0.020 Y
Aroclor 1254	µg/L	0.03			< 0.005 Y	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005 Y	< 0.0049	< 0.005 J	< 0.005	< 0.005 Y	< 0.005	< 0.005	< 0.020 Y	< 0.020 Y	< 0.020
Aroclor 1260	µg/L	0.03			< 0.005 Y	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005 Y	< 0.0049 Y	< 0.005 J	< 0.005	< 0.005 Y	< 0.005	< 0.005	< 0.020	< 0.020	< 0.020
Aroclor 1262	µg/L	0.03			< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005 Y	< 0.0049	< 0.005 J	< 0.005	< 0.005	< 0.005	< 0.005	< 0.020	< 0.020	< 0.020
Aroclor 1268	µg/L	0.03			< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0049	< 0.005 J	< 0.005	< 0.005	< 0.005	< 0.005	< 0.020	< 0.020	< 0.020
Volatile Organic Compounds																			
1,1,1,2-Tetrachloroethane	µg/L				NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,1,1-Trichloroethane	µg/L	42			< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	µg/L		4		NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,1,2-Trichloroethane	µg/L	42			< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethane	µg/L				NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,1-Dichloroethene	µg/L		7100		NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,1-Dichloropropene	µg/L				NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,2,3-Trichlorobenzene	µg/L				NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0 J	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
1,2,3-Trichloropropane	µg/L				NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,2,4-Trichlorobenzene	µg/L		70		NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
1,2,4-Trimethylbenzene	µg/L				NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
1,2-Dibromo-3-chloropropane	µg/L				NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
1,2-Dibromoethane	µg/L				NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
1,2-Dichlorobenzene	µg/L		1300		NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,2-Dichloroethane	µg/L		37		NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	0.080 J
1,2-Dichloropropane	µg/L		15		NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,3,5-Trimethylbenzene	µg/L				NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
1,3-Dichlorobenzene	µg/L		960		NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,3-Dichloropropane	µg/L				NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
1,4-Dichlorobenzene	µg/L		190		NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
2,2-Dichloropropane	µg/L				NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50 J	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
2-Butanone	µg/L				NA	NA	< 20	< 20	< 20	< 20	< 20	< 20	NA	< 20	NA	NA	NA	< 20	< 20
2-Chlorotoluene	µg/L				NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
2-Hexanone	µg/L				NA	NA	< 20	< 20	< 20	< 20	< 20	< 20	NA	< 20	NA	NA	NA	< 20	< 20
4-Chlorotoluene	µg/L				NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
4-Isopropyltoluene	µg/L				NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
4-Methyl-2-Pentanone (MIBK)	µg/L				NA	NA	< 20	< 20	< 20	< 20	< 20	< 20	NA	< 20	NA	NA	NA	< 20	< 20
Acetone	µg/L				NA	NA	< 20	< 20	< 20	< 20	3.7 J	< 20	NA	< 20	NA	NA	NA	< 20	< 20

Table 6-4. S&G-OU1, Five-Year Review Groundwater Monitoring Event Data (March 2010) (Continued)

Chemical Name	Unit	ROD CUGs (µg/L)	NRWQC (µg/L)	Location ID:	HI-10	HI-10A	HI-11	HI-12	HI-12A	HI-13	HI-14	HI-15	HI-16	HI-17	HI-17	HI-18	MW-01	MW-213	FieldQC	FieldQC
				Sample ID:	HI-10-0310	HI-10A-0310	HI-11-0310	HI-12-0310	HI-12A-0310	HI-13-0310	HI-14-0310	HI-15-0310	HI-16-0310	HI-17-0310	HI-170-0310	HI-18-0310	MW-01-0310	MW-213-0310	EB-01-0310	FB-01-0310
				Sample Date:	3/22/2010	3/22/2010	3/25/2010	3/24/2010	3/24/2010	3/24/2010	3/24/2010	3/24/2010	3/25/2010	3/26/2010	3/26/2010	3/26/2010	3/23/2010	3/23/2010	3/29/2010	3/25/2010
				Sample Type:	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	EB	FB
Metals																				
Antimony	µg/L		640		NA	< 1.00	0.18	NA	< 1.00	NA	NA	NA	< 1.00	NA	NA	NA	0.06	< 1.00	NA	NA
Arsenic	µg/L	36			0.73	< 0.1	< 0.22	< 0.24	< 0.18	2.12	< 0.31	0.98	< 0.06	**139**	**144**	3.59	5.38	< 0.31	0.07 J	NA
Cadmium	µg/L	8			0.022 J+	< 0.007	0.006 J	0.409	< 0.004	< 0.020	< 0.011	0.031	< 0.008	**85.9**	**85.5**	0.007 J	0.009 J	0.086	< 0.020	NA
Chromium	µg/L				NA	0.17 J	< 0.17	NA	0.32 J+	NA	NA	NA	< 0.17	NA	NA	NA	0.27 J+	0.28 J+	NA	NA
Copper	µg/L	2.9			**3.61**	< 0.069	0.20 J+	2.54	< 0.035	1.21	0.101 J+	< 0.07	< 0.018	2.56	2.53	0.40 J+	1.7	0.641 J+	0.12	NA
Lead	µg/L	5.8			< 0.020	0.026	0.059 J+	0.284 J+	0.032 J+	0.104 J	< 0.017	< 0.007	0.030 J+	**5.950 J**	**5.9 J**	< 0.01	0.272 J	0.113 J+	0.009 J	NA
Mercury	µg/L	0.025			0.0027	0.00028 J	< 0.0002	< 0.00094	< 0.00018	0.00308	0.00205	< 0.00016	< 0.00023	0.00308 J	0.00584 J	< 0.00068	0.00227	0.004	< 0.00011	NA
Nickel	µg/L	7.9			0.94	0.48	0.4	3.12	0.08 J	0.63	0.71	0.43	0.14 J	**138**	**140**	2	1.83	0.29	< 0.20	NA
Silver	µg/L	1.2			< 0.020	< 0.020	< 0.020	0.029	< 0.020	0.006 J	< 0.020	0.004 J	< 0.020	0.007 J	0.004 J	< 0.020	< 0.020	< 0.020	< 0.020	NA
Thallium	µg/L	6.3			< 0.012	< 0.030	< 0.007	< 0.025	< 0.030	< 0.01	< 0.030	< 0.003	< 0.030	0.021	0.024	< 0.020	< 0.020	< 0.030	< 0.020	NA
Zinc	µg/L	76.6			1.28 J+	2.03 J+	< 0.44	69	1.23 J+	< 0.4	< 0.44	< 0.29	< 0.1	**314**	**316**	1.03 J+	42.6	4.50 J+	0.28 J	NA
Cyanide																				
Available Cyanide	µg/L				< 2 J	< 2 J	< 2 J	< 2 J	< 2 J	< 2 J	< 2 J	< 2	< 2	< 2	< 2	< 2	< 2 J	< 2 J	< 2	NA
Cyanide (total)	µg/L	1			**104 J**	**38 J**	**2.6 J**	**5.1**	**4.1 J**	**22**	**27.5**	< 5	< 5	**5.3**	< 5	**1.3 J**	**69 J**	< 5 J	< 5	NA
PCBs																				
Aroclor 1016	µg/L	0.03			< 0.020	< 0.020 Y	< 0.005	< 0.005	< 0.005	< 0.026 Y	< 0.0049	< 0.005 Y	< 0.005 Y	< 0.005 Y	< 0.005	< 0.005 Y	< 0.005	< 0.005 Y	< 0.005	NA
Aroclor 1221	µg/L	0.03			< 0.039 Y	< 0.11 Y	< 0.01	< 0.01	< 0.01	< 0.15 Y	< 0.0098	< 0.041 Y	< 0.015 Y	< 0.029 Y	< 0.01	< 0.036 Y	< 0.01	< 0.0099 Y	< 0.0099	NA
Aroclor 1232	µg/L	0.03			< 0.020	< 0.020 Y	< 0.005	< 0.005	< 0.005	< 0.081 Y	< 0.0049	< 0.0058 Y	< 0.012 Y	< 0.0098 Y	< 0.005	< 0.013 Y	< 0.005	< 0.005 Y	< 0.005	NA
Aroclor 1242	µg/L	0.03			< 0.020 Y	< 0.020 Y	< 0.005	< 0.005	< 0.005	< 0.03 Y	< 0.0049	< 0.0054 Y	< 0.0082 Y	< 0.0053 Y	< 0.005	< 0.0057 Y	< 0.005	< 0.005 Y	< 0.005	NA
Aroclor 1248	µg/L	0.03			< 0.020	< 0.020	< 0.005	< 0.005	< 0.005	< 0.039 Y	< 0.0049	< 0.005 Y	< 0.0077 Y	< 0.005	< 0.005	< 0.005 Y	< 0.005	< 0.005	< 0.005	NA
Aroclor 1254	µg/L	0.03			< 0.020	< 0.020	< 0.005	< 0.005	< 0.005	< 0.017 Y	< 0.0049	< 0.005 Y	< 0.005 Y	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	NA
Aroclor 1260	µg/L	0.03			< 0.020	< 0.020	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0049	< 0.005 Y	< 0.005 Y	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	NA
Aroclor 1262	µg/L	0.03			< 0.020	< 0.020	< 0.005	< 0.005	< 0.005	< 0.005 Y	< 0.0049	< 0.005 Y	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	NA
Aroclor 1268	µg/L	0.03			< 0.020	< 0.020	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0049	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	NA
Volatile Organic Compounds																				
1,1,1,2-Tetrachloroethane	µg/L				NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,1,1-Trichloroethane	µg/L	42			< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.3	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	µg/L		4		NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2-Trichloroethane	µg/L	42			< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.3	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethane	µg/L				NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethene	µg/L		7100		NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloropropene	µg/L				NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,2,3-Trichlorobenzene	µg/L				NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0
1,2,3-Trichloropropane	µg/L				NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,2,4-Trichlorobenzene	µg/L		70		NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0
1,2,4-Trimethylbenzene	µg/L				NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0
1,2-Dibromo-3-chloropropane	µg/L				NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0
1,2-Dibromoethane	µg/L				NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0
1,2-Dichlorobenzene	µg/L		1300		NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloroethane	µg/L		37		NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloropropane	µg/L		15		NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,3,5-Trimethylbenzene	µg/L				NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0
1,3-Dichlorobenzene	µg/L		960		NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,3-Dichloropropane	µg/L				NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
1,4-Dichlorobenzene	µg/L		190		NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
2,2-Dichloropropane	µg/L				NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50
2-Butanone	µg/L				NA	< 20	< 20	NA	< 20	NA	NA	NA	< 20	NA	NA	NA	< 20	< 20	< 20	< 20
2-Chlorotoluene	µg/L				NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0
2-Hexanone	µg/L				NA	< 20	< 20	NA	< 20	NA	NA	NA	< 20	NA	NA	NA	< 20	< 20	< 20	< 20
4-Chlorotoluene	µg/L				NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0
4-Isopropyltoluene	µg/L				NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0
4-Methyl-2-Pentanone (MIBK)	µg/L				NA	< 20	< 20	NA	< 20	NA	NA	NA	< 20	NA	NA	NA	< 20	< 20	< 20	< 20
Acetone	µg/L				NA	< 20	< 20	NA	< 20	NA	NA	NA	< 20	NA	NA	NA	11 J	< 20	< 20	< 20

Table 6-4. S&G-OU1, Five-Year Review Groundwater Monitoring Event Data (March 2010) (Continued)

				Location ID:	AC-06A	W-01	TD-06A	HI-1	HI-2	HI-3	HI-4	HI-5	HI-6	HI-6A	HI-7	HI-8	HI-9	HI-9A	HI-9A
				Sample ID:	AC-06A-0310	FW-01-0310	TD-06A-0310	HI-1-0310	HI-2-0310	HI-3-0310	HI-4-0310	HI-5-0310	HI-6-0310	HI-6A-0310	HI-7-0310	HI-8-0310	HI-9-0310	HI-9A-0310	HI-90A-0310
				Sample Date:	3/25/2010	3/23/2010	3/23/2010	3/24/2010	3/24/2010	3/24/2010	4/5/2010	3/25/2010	3/23/2010	3/23/2010	3/25/2010	3/25/2010	3/22/2010	3/22/2010	3/22/2010
				Sample Type:	N F	N	N	N	N	N	N	N	N	N	N	N	N	N	FD
Chemical Name		Unit	ROD CUGs (µg/L)	NRWQC (µg/L)															
Volatile Organic Compounds (Cont.)																			
	Benzene	µg/L	71		< 0.50	< 0.50	0.050 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
	Bromobenzene	µg/L			NA	A	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	A	A	< 2.0	< 2.0
	Bromochloromethane	µg/L			NA	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	A	A	< 0.50	< 0.50
	Bromodichloromethane	µg/L		17	NA	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	A	A	< 0.50	< 0.50
	Bromoform	µg/L		140	NA	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50 J	< 0.50	NA	< 0.50	NA	A	A	< 0.50	< 0.50
	Bromomethane	µg/L			NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50 J	< 0.50	NA	< 0.50	NA N	A N	A	< 0.50	< 0.50
	Carbon Disulfide	µg/L			NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	A N	A	< 0.50	< 0.50
	Carbon Tetrachloride	µg/L	4.4		< 0.50 N	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50 N	< 0.50 N	< 0.50	< 0.50	< 0.50
	Chlorobenzene	µg/L		1600	NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	A N	A	< 0.50	< 0.50
	Chloroethane	µg/L			NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	A N	A	< 0.50	< 0.50
	Chloroform	µg/L		470	NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	A N	A	< 0.50	< 0.50
	Chloromethane	µg/L			NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.13	< 0.50	NA	< 0.50	NA N	A N	A	< 0.50	< 0.50
	cis-1,2-Dichloroethene	µg/L			NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	A N	A	0.42 J	0.42 J
	cis-1,3-Dichloropropene	µg/L			NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	A N	A	< 0.50	< 0.50
	Dibromochloromethane	µg/L		13	NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	A N	A	< 0.50	< 0.50
	Dibromomethane	µg/L			NA N	A	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	A N	A	< 0.50	< 0.50
	Dichlorodifluoromethane	µg/L			NA N	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	NA N	NA	< 0.50	< 0.50
	Ethylbenzene	µg/L		2100	NA N	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	NA N	NA	< 0.50	< 0.50
	Hexachlorobutadiene	µg/L		18	NA N	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA N	NA N	NA	< 2.0	< 2.0
	Isopropylbenzene	µg/L			NA N	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA N	NA N	NA	< 2.0	< 2.0
	m,p-Xylenes	µg/L			NA N	NA	0.13 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA N	NA N	NA	< 0.50	< 0.50
	Methylene Chloride	µg/L		590	NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
	Naphthalene	µg/L			NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 0.2	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0 J	< 2.0 J
	n-Butylbenzene	µg/L			NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
	n-Propylbenzene	µg/L			NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
	o-Xylene	µg/L			NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
	sec-Butylbenzene	µg/L			NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
	Styrene	µg/L			NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
	tert-Butylbenzene	µg/L			NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0
	Tetrachloroethene	µg/L	8.8		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.2	< 0.50	< 0.50	< 0.50	< 0.50
	Toluene	µg/L		15000	NA	NA	< 0.21	< 0.2	< 0.25	< 0.15	< 0.50	< 0.18	NA	< 0.19	NA	NA	NA	< 0.50	< 0.07
	trans-1,2-Dichloroethene	µg/L		10000	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
	trans-1,3-Dichloropropene	µg/L			NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50 J	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
	Trichloroethene	µg/L		30	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
	Trichlorofluoromethane	µg/L			NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50
	Vinyl Chloride	µg/L		2.4	NA	NA	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	0.10 J	0.10 J
Semi-volatile Organic Compounds																			
	1,2,4-Trichlorobenzene	µg/L		70	NA	A	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	A	A	< 0.19	< 0.19
	1,2-Dichlorobenzene	µg/L		1300	NA	A	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	A	A	< 0.19	< 0.19
	1,3-Dichlorobenzene	µg/L		960	NA	A	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	A	A	< 0.19	< 0.19
	1,4-Dichlorobenzene	µg/L		190	NA	A	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	A	A	< 0.19	< 0.19
	2,4,5-Trichlorophenol	µg/L			NA	A	< 0.49	< 0.48	< 0.49	< 0.48	< 0.48	< 0.49	NA	< 0.49	NA	A	A	< 0.48	< 0.48
	2,4,6-Trichlorophenol	µg/L		2.4	NA N	A	< 0.49	< 0.48	< 0.49	< 0.48	< 0.48	< 0.49	NA	< 0.49	NA N	A N	A	< 0.48	< 0.48
	2,4-Dichlorophenol	µg/L		290	NA N	A	< 0.49	< 0.48	< 0.49	< 0.48	< 0.48	< 0.49	NA	< 0.49	NA N	A N	A	< 0.48	< 0.48
	2,4-Dimethylphenol	µg/L		850	NA N	A	< 3.9	< 3.9	< 3.9	< 3.9	< 3.9	< 3.9	NA	< 3.9	NA N	A N	A	< 3.8	< 3.8
	2,4-Dinitrophenol	µg/L		5300	NA N	A	< 3.9	< 3.9	< 3.9	< 3.9	< 3.9	< 3.9	NA	< 3.9	NA N	A N	A	< 3.8	< 3.8
	2,4-Dinitrotoluene	µg/L		3.4	NA N	A	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA N	A N	A	< 0.19	< 0.19
	2,6-Dinitrotoluene	µg/L			NA N	A	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA N	A N	A	< 0.19	< 0.19
	2-Chloronaphthalene	µg/L		1600	NA N	A	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA N	A N	A	< 0.19	< 0.19
	2-Chlorophenol	µg/L		150	NA N	A	< 0.49	< 0.48	< 0.49	< 0.48	< 0.48	< 0.49	NA	< 0.49	NA N	A N	A	< 0.48	< 0.48
	2-Methylphenol	µg/L			NA N	A	< 0.49	< 0.48	< 0.49	< 0.48	< 0.48	< 0.49	NA	< 0.49	NA N	A N	A	< 0.48	< 0.48
	2-Nitroaniline	µg/L			NA N	A	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA N	A N	A	< 0.19	< 0.19
	2-Nitrophenol	µg/L			NA N	A	< 0.49	< 0.48	< 0.49	< 0.48	< 0.48	< 0.49	NA	< 0.49	NA N	A N	A	< 0.48	< 0.48
	3,3'-Dichlorobenzidine	µg/L		0.028	NA N	A	< 2.0 J	< 2.0 J	< 2.0 J	< 2.0 J	< 2.0 J	< 2.0 J	NA	< 2.0 J	NA N	A N	A	< 1.9	< 1.9

Table 6-4. S&G-OU1, Five-Year Review Groundwater Monitoring Event Data (March 2010) (Continued)

				Location ID:	HI-10	HI-10A	HI-11	HI-12	HI-12A	HI-13	HI-14	HI-15	HI-16	HI-17	HI-17	HI-18	MW-01	MW-213	FieldQC
				Sample ID:	HI-10-0310	HI-10A-0310	HI-11-0310	HI-12-0310	HI-12A-0310	HI-13-0310	HI-14-0310	HI-15-0310	HI-16-0310	HI-17-0310	HI-170-0310	HI-18-0310	MW-01-0310	MW-213-0310	EB-01-0310
				Sample Date:	3/22/2010	3/22/2010	3/25/2010	3/24/2010	3/24/2010	3/24/2010	3/24/2010	3/24/2010	3/25/2010	3/26/2010	3/26/2010	3/26/2010	3/23/2010	3/23/2010	3/29/2010
				Sample Type:	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	EB
	Chemical Name	Unit	ROD CUGs (µg/L)	NRWQC (µg/L)															
	Volatile Organic Compounds cont'd																		
	3-Nitroaniline	µg/L			NA	A	< 0.97	< 0.96	< 0.97	< 0.96	< 0.96	< 0.97	NA	< 0.97	NA	A	A	< 0.95	< 0.95
	4,6-Dinitro-2-Methylphenol	µg/L			NA	A	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	A	A	< 1.9	< 1.9
	Benzene	µg/L	71		< 0.50 N	< 0.50	< 0.50	< 0.50	< 0.50	0.13 J	< 0.50	< 0.50	0.070 J	0.15 J	0.15 J N	< 0.50 N	< 0.50	< 0.50	< 0.50
	Bromobenzene	µg/L			NA N	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA N	NA N	< 2.0	< 2.0	< 2.0
	Bromochloromethane	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Bromodichloromethane	µg/L		17	NA	< 0.50	0.63	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Bromoform	µg/L		140	NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Bromomethane	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Carbon Disulfide	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Carbon Tetrachloride	µg/L	4.4		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.3	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
	Chlorobenzene	µg/L		1600	NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Chloroethane	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Chloroform	µg/L		470	NA	< 0.50	18	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Chloromethane	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	0.080 J
	cis-1,2-Dichloroethene	µg/L			NA	< 0.50	< 0.50	NA	0.18 J	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	cis-1,3-Dichloropropene	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Dibromochloromethane	µg/L		13	NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Dibromomethane	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Dichlorodifluoromethane	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Ethylbenzene	µg/L		2100	NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Hexachlorobutadiene	µg/L		18	NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0
	Isopropylbenzene	µg/L			NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0
	m,p-Xylenes	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	0.32 J	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Methylene Chloride	µg/L		590	NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0
	Naphthalene	µg/L			NA	< 2.0 J	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0
	n-Butylbenzene	µg/L			NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0
	n-Propylbenzene	µg/L			NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0
	o-Xylene	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	sec-Butylbenzene	µg/L			NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0
	Styrene	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	tert-Butylbenzene	µg/L			NA	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 2.0	< 2.0
	Tetrachloroethene	µg/L	8.8		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.3	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
	Toluene	µg/L		15000	NA	< 0.50	< 0.36	NA	< 0.3	NA	NA	NA	< 0.32	NA	NA	NA	< 0.23	< 0.16	0.16 J
	trans-1,2-Dichloroethene	µg/L		10000	NA	< 0.50	< 0.50	NA	0.13 J	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	trans-1,3-Dichloropropene	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Trichloroethene	µg/L		30	NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Trichlorofluoromethane	µg/L			NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Vinyl Chloride	µg/L		2.4	NA	< 0.50	< 0.50	NA	< 0.50	NA	NA	NA	< 0.50	NA	NA	NA	< 0.50	< 0.50	< 0.50
	Semi-volatile Organic Compounds																		
	1,2,4-Trichlorobenzene	µg/L		70	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20
	1,2-Dichlorobenzene	µg/L		1300	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20
	1,3-Dichlorobenzene	µg/L		960	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20
	1,4-Dichlorobenzene	µg/L		190	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20
	2,4,5-Trichlorophenol	µg/L			NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48	< 0.48
	2,4,6-Trichlorophenol	µg/L		2.4	NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48	< 0.48
	2,4-Dichlorophenol	µg/L		290	NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48	< 0.48
	2,4-Dimethylphenol	µg/L		850	NA	< 3.8	< 3.9	NA	< 3.9	NA	NA	NA	< 3.9	NA	NA	NA	< 3.9	< 3.8	< 3.9
	2,4-Dinitrophenol	µg/L		5300	NA	< 3.8	< 3.9	NA	< 3.9	NA	NA	NA	< 3.9	NA	NA	NA	< 3.9	< 3.8	< 3.9
	2,4-Dinitrotoluene	µg/L		3.4	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20
	2,6-Dinitrotoluene	µg/L			NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20
	2-Chloronaphthalene	µg/L		1600	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20
	2-Chlorophenol	µg/L		150	NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48	< 0.48

Table 6-4. S&G-OU1, Five-Year Review Groundwater Monitoring Event Data (March 2010) (Continued)

Chemical Name	Unit	ROD CUGs (µg/L)	NRWQC (µg/L)	Location ID: AC-06A Sample ID: AC-06A-0310 Sample Date: 3/25/2010 Sample Type: N	FW-01 FW-01-0310 3/23/2010 N	TD-06A TD-06A-0310 3/23/2010 N	HI-1 HI-1-0310 3/24/2010 N HI-2	HI-2-0310 3/24/2010 N HI-3	3/24/2010 N HI-3-0310	HI-4 HI-4-0310 4/5/2010 N	HI-5 HI-5-0310 3/25/2010 N HI-6	HI-6-0310 3/23/2010 N	HI-6A HI-6A-0310 3/23/2010 N	HI-7 HI-7-0310 3/25/2010 N	HI-8 HI-8-0310 3/25/2010 N HI-9	3/22/2010 N HI-9-0310	HI-9A HI-9A-0310 3/22/2010 N	HI-9A HI-90A-0310 3/22/2010 FD
Semi-volatile Organic Compounds																		
2-Methylphenol	µg/L			NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48	< 0.48
2-Nitroaniline	µg/L			NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20
2-Nitrophenol	µg/L			NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48	< 0.48
3,3'-Dichlorobenzidine	µg/L		0.028	NA	< 1.9	< 2.0 J	NA	< 2.0 J	NA	NA	NA	< 2.0 J	NA	NA	NA	< 2.0 J	< 1.9 J	< 2.0 J
3-Nitroaniline	µg/L			NA	< 0.95	< 0.96	NA	< 0.96	NA	NA	NA	< 0.98	NA	NA	NA	< 0.96	< 0.95	< 0.96
4,6-Dinitro-2-Methylphenol	µg/L			NA	< 1.9	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 1.9	< 2.0
4-Bromophenyl-phenylether	µg/L			NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
4-Chloro-3-methylphenol	µg/L			NA	NA	< 0.49	< 0.48	< 0.49	< 0.48	< 0.48	< 0.49	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48
4-Chloroaniline	µg/L			NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
4-Chlorophenyl-phenylether	µg/L			NA	NA	< 0.20	< 0.20	< 0.20	< 0.28 Y	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
4-Methylphenol	µg/L			NA	NA	< 0.49	< 0.48	< 0.49	< 0.48	0.27 J	< 0.49	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48
4-NITROPHENOL	µg/L			NA	NA	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NA	< 2.0	NA	NA	NA	< 1.9	< 1.9
Benzoic Acid	µg/L			NA	NA	< 4.9	1.3 J	1.5 J	< 4.8	2.1 J	1.8 J	NA	< 4.9	NA	NA	NA	< 4.8	< 4.8
Benzyl Alcohol	µg/L			NA	NA	< 0.49	< 0.48	< 0.49	< 0.48	< 0.48	< 0.49	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48
bis(2-Chloroethoxy) Methane	µg/L			NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
Bis(2-Chloroethyl) Ether	µg/L		0.53	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
Bis(2-chloroisopropyl)ether	µg/L		65000	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
bis(2-Ethylhexyl)phthalate	µg/L		2.2	NA	NA	< 0.97	0.15 J	< 0.97	< 0.96	< 0.96	**7.3**	NA	0.41 J	NA	NA	NA	< 0.95	< 0.95
Butylbenzylphthalate	µg/L		1900	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.14	NA	NA	NA	< 0.19	< 0.024
Diethylphthalate	µg/L		44000	NA	NA	< 0.20	0.029 J	< 0.20	< 0.20	< 0.20	0.033 J	NA	< 0.037	NA	NA	NA	< 0.022	< 0.026
Dimethylphthalate	µg/L		1100000	NA	NA	< 0.20	< 0.056	< 0.046	< 0.20	< 0.20	< 0.058	NA	< 0.022	NA	NA	NA	< 0.029	< 0.025
Di-n-Butylphthalate	µg/L		4500	NA	NA	< 0.063	< 0.076	< 0.063	< 0.20	0.17 J	< 0.061	NA	< 0.1	NA	NA	NA	< 0.048	< 0.036
Di-n-Octyl phthalate	µg/L			NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
Hexachlorobenzene	µg/L		0.00029	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
Hexachlorobutadiene	µg/L		18	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
Hexachlorocyclopentadiene	µg/L		1100	NA	NA	< 0.97	< 0.96	< 0.97	< 0.96	< 0.96	< 0.97	NA	< 0.97	NA	NA	NA	< 0.95 J	< 0.95 J
Hexachloroethane	µg/L		3.3	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
Isophorone	µg/L		960	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
Nitrobenzene	µg/L		690	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
N-Nitroso-Di-N-Propylamine	µg/L		0.51	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
N-Nitrosodiphenylamine	µg/L		6	NA	NA	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	NA	< 0.20	NA	NA	NA	< 0.19	< 0.19
Pentachlorophenol	µg/L		3	NA	NA	< 0.97	< 0.96	< 0.97	< 0.96	< 0.96	< 0.97	NA	< 0.97	NA	NA	NA	< 0.95	< 0.95
Phenol	µg/L		860000	NA	NA	< 0.49	< 0.48	< 0.49	< 0.48	< 0.48	< 0.49	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48
P-NITROANILINE	µg/L			NA	NA	< 0.97	< 0.96	< 0.97	< 0.96	< 0.96	< 0.97	NA	< 0.97	NA	NA	NA	< 0.95	< 0.95
SIM PAHs																		
2-Methylnaphthalene	µg/L			NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	0.076	< 0.019	NA	< 0.020	NA	NA	NA	< 0.0032	< 0.003
Acenaphthene	µg/L		990	NA	NA	0.054	< 0.020	< 0.020	< 0.020	0.053	0.48	NA	< 0.020	NA	NA	NA	0.0052 J	0.0075 J
Acenaphthylene	µg/L			NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Anthracene	µg/L		40000	NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Benzo(a)anthracene	µg/L		0.018	NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	0.0039 J	NA	NA	NA	< 0.020	< 0.019
Benzo(a)pyrene	µg/L		0.018	NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Benzo(b)fluoranthene	µg/L		0.018	NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Benzo(g,h,i)perylene	µg/L			NA	NA	< 0.020	< 0.020	< 0.020	< 0.012	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Benzo(k)fluoranthene	µg/L		0.018	NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Chrysene	µg/L		0.018	NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Dibenzo(a,h)anthracene	µg/L		0.018	NA	NA	< 0.020	< 0.020	< 0.020	< 0.0054	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Dibenzofuran	µg/L			NA	NA	< 0.020	< 0.020	0.0048 J	< 0.020	0.033	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Fluoranthene	µg/L		140	NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Fluorene	µg/L		5300	NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.016	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Indeno(1,2,3-cd)pyrene	µg/L		0.018	NA	NA	< 0.020	< 0.020	< 0.020	< 0.0063	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Naphthalene	µg/L			NA	NA	< 0.037	< 0.033	< 0.026	< 0.037	< 0.33	< 0.026	NA	< 0.014	NA	NA	NA	< 0.03	< 0.038
Phenanthrene	µg/L			NA	NA	< 0.0053	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019
Pyrene	µg/L		4000	NA	NA	< 0.020	< 0.020	< 0.020	< 0.020	< 0.019	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	< 0.019

Table 6-4. S&G-OU1, Five-Year Review Groundwater Monitoring Event Data (March 2010) (Continued)

			Location ID:	HI-10	HI-10A	HI-11	HI-12	HI-12A	HI-13	HI-14	HI-15	HI-16	HI-17	HI-17	HI-18	MW-01	MW-213	FieldQC	FieldQC
			Sample ID:	HI-10-0310	HI-10A-0310	HI-11-0310	HI-12-0310	HI-12A-0310	HI-13-0310	HI-14-0310	HI-15-0310	HI-16-0310	HI-17-0310	HI-170-0310	HI-18-0310	MW-01-0310	MW-213-0310	EB-01-0310	FB-01-0310
			Sample Date:	3/22/2010	3/22/2010	3/25/2010	3/24/2010	3/24/2010	3/24/2010	3/24/2010	3/24/2010	3/25/2010	3/26/2010	3/26/2010	3/26/2010	3/23/2010	3/23/2010	3/29/2010	3/25/2010
			Sample Type:	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	EB	FB
Chemical Name	Unit	ROD CUGs (µg/L)	NRWQC (µg/L)																
4-Bromophenyl-phenylether	µg/L			NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
4-Chloro-3-methylphenol	µg/L			NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48	< 0.48	NA
4-Chloroaniline	µg/L			NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
4-Chlorophenyl-phenylether	µg/L			NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
4-Methylphenol	µg/L			NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	1.7	< 0.48	< 0.48	NA
4-NITROPHENOL	µg/L			NA	< 1.9	< 2.0	NA	< 2.0	NA	NA	NA	< 2.0	NA	NA	NA	< 2.0	< 1.9	< 2.0	NA
Benzoic Acid	µg/L			NA	1.1 J	< 4.8	NA	1.4 J	NA	NA	NA	1.8 J	NA	NA	NA	2.2 J	1.7 J	< 4.8	NA
Benzyl Alcohol	µg/L			NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48	< 0.48	NA
bis(2-Chloroethoxy) Methane	µg/L			NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
Bis(2-Chloroethyl) Ether	µg/L		0.53	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
Bis(2-chloroisopropyl)ether	µg/L		65000	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
bis(2-Ethylhexyl)phthalate	µg/L		2.2	NA	< 0.95	< 0.96	NA	1.6	NA	NA	NA	< 0.98	NA	NA	NA	0.14 J	< 0.95	< 0.96	NA
Butylbenzylphthalate	µg/L		1900	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.082	< 0.19	< 0.20	NA
Diethylphthalate	µg/L		44000	NA	< 0.024	0.017 J	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.015	< 0.19	< 0.20	NA
Dimethylphthalate	µg/L		1100000	NA	< 0.023	< 0.057	NA	< 0.047	NA	NA	NA	< 0.20	NA	NA	NA	< 0.025	< 0.038	0.038 J	NA
Di-n-Butylphthalate	µg/L		4500	NA	< 0.05	< 0.043	NA	< 0.042	NA	NA	NA	< 0.051	NA	NA	NA	< 0.067	< 0.06	< 0.096	NA
Di-n-Octyl phthalate	µg/L			NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
Hexachlorobenzene	µg/L		0.00029	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
Hexachlorobutadiene	µg/L		18	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
Hexachlorocyclopentadiene	µg/L		1100	NA	< 0.95 J	< 0.96	NA	< 0.96	NA	NA	NA	< 0.98	NA	NA	NA	< 0.96	< 0.95	< 0.96	NA
Hexachloroethane	µg/L		3.3	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
Isophorone	µg/L		960	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
Nitrobenzene	µg/L		690	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
N-Nitroso-Di-N-Propylamine	µg/L		0.51	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
N-Nitrosodiphenylamine	µg/L		6	NA	< 0.19	< 0.20	NA	< 0.20	NA	NA	NA	< 0.20	NA	NA	NA	< 0.20	< 0.19	< 0.20	NA
Pentachlorophenol	µg/L		3	NA	< 0.95	< 0.96	NA	< 0.96	NA	NA	NA	< 0.98	NA	NA	NA	< 0.96	0.58 J	< 0.96	NA
Phenol	µg/L		860000	NA	< 0.48	< 0.48	NA	< 0.48	NA	NA	NA	< 0.49	NA	NA	NA	< 0.48	< 0.48	< 0.081	NA
P-NITROANILINE	µg/L			NA	< 0.95	< 0.96	NA	< 0.96	NA	NA	NA	< 0.98	NA	NA	NA	< 0.96	< 0.95	< 0.96	NA
SIM PAHs																			
2-Methylnaphthalene	µg/L			NA	< 0.020 Y	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.0043	< 0.020	0.0033 J	NA
Acenaphthene	µg/L		990	NA	< 0.056 Y	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Acenaphthylene	µg/L			NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Anthracene	µg/L		40000	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Benzo(a)anthracene	µg/L		0.018	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Benzo(a)pyrene	µg/L		0.018	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Benzo(b)fluoranthene	µg/L		0.018	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Benzo(g,h,i)perylene	µg/L			NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.0046	< 0.020	< 0.019	NA
Benzo(k)fluoranthene	µg/L		0.018	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Chrysene	µg/L		0.018	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Dibenzo(a,h)anthracene	µg/L		0.018	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Dibenzofuran	µg/L			NA	< 0.036 Y	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	< 0.019	NA
Fluoranthene	µg/L		140	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	0.0064 J	< 0.020	< 0.019	NA
Fluorene	µg/L		5300	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.020	< 0.020	0.0054 J	NA
Indeno(1,2,3-cd)pyrene	µg/L		0.018	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.0027	< 0.020	< 0.019	NA
Naphthalene	µg/L			NA	< 0.053	< 0.034	NA	< 0.025	NA	NA	NA	< 0.023	NA	NA	NA	< 0.027	< 0.02	0.05	NA
Phenanthrene	µg/L			NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	< 0.005	< 0.020	0.011 J	NA
Pyrene	µg/L		4000	NA	< 0.020	< 0.019	NA	< 0.020	NA	NA	NA	< 0.020	NA	NA	NA	0.0060 J	< 0.020	< 0.019	NA

Notes

These results are validated; this table replaces the 05/14/10 version.
ROD CUG = Record of Decision cleanup goal
NRWQC = National Recommended Water Quality Criteria
http://www.epa.gov/waterscience/criteria/wqctable/
Human Health for the consumption of organism only
Bold indicates detected concentration exceeds cleanup goal or NRWQC
Underlined indicates reporting limit exceeds cleanup goal or NRWQC

N = Normal Sample
FD = Field Duplicate
EB = Equipment Blank
NA = Not Analyzed
FB = Field Blank
J = Estimated concentration (+ = high bias based on laboratory QC)
Y = Reporting limit raised due to the presence of interference

Table 6-5. TF-OU2, Summary of TPH in Groundwater, 2005-2009

Analyte:			TPH-G (mg/L)				TPH-D (mg/L)				TPH-O (mg/L)			
Cleanup Level (CUL):			1				10				10			
Facility	Location	Well	Number of Samples	Samples above CUL	Min	Max	Number of Samples	Samples above CUL	Min	Max	Number of Samples	Samples above CUL	Min	Max
BP	Plant 1	AMW-01	19	1	ND	1.65 J	18	0	ND	0.342	18	0	ND	ND
BP	Plant 1	AMW-02	19	0	ND	0.0759	18	0	ND	0.366	18	0	ND	ND
BP	Plant 1	AMW-03	17	0	ND	ND	16	0	ND	ND	16	0	ND	ND
BP	Plant 1	AMW-04	19	0	ND	ND	18	0	ND	ND	18	0	ND	ND
BP	Plant 1	AMW-05	19	0	ND	0.054	18	0	ND	ND	18	0	ND	ND
BP	Plant 1	AR-03	19	8	0.157	2.58	18	0	ND	0.947	18	0	ND	ND
BP	Plant 1	GM-14S	9	6	0.172	2.68	9	0	ND	3.4	9	0	ND	2.6
BP	Plant 1	GM-15S	17	0	0.18	0.984 J	17	0	ND	ND	17	0	ND	ND
BP	Plant 1	GM-16S	7	0	ND	0.3	7	0	ND	0.75	7	0	ND	ND
BP	Plant 1	GM-17S	7	0	ND	0.053	7	0	ND	ND	7	0	ND	ND
BP	Plant 1	GM-24S	19	17	ND	4.19	18	0	ND	0.85	18	0	ND	ND
BP	Plant 1	MW-1-T9	16	4	0.12	1.6	15	0	ND	0.785	15	0	ND	ND
BP	Plant 1	MW-2-T9	16	13	0.748	8.07	15	0	ND	2.27	15	0	ND	ND
BP	Plant 1	MW-3-T9	13	0	0.275	0.749	12	0	ND	0.86	12	0	ND	ND
BP	Plant 1	MW-4-T9	16	0	ND	0.0814	15	0	ND	ND	15	0	ND	ND
BP	Plant 2	GM-19S	16	2	0.0879	1.71	–	–	–	–	17	0	0.0148	1.4
BP	Plant 2	MW-03R	–	–	–	–	1	1	10.2	10.2	1	0	2.5	2.5
Kinder Morgan		A-10	10	0	ND	0.6	10	1	ND	68	10	0	ND	2.1
Kinder Morgan		A-14R	10	0	ND	ND	10	0	ND	ND	10	0	ND	ND
Kinder Morgan		A-21	20	4	ND	1.6	8	0	ND	0.35	8	0	ND	ND
Kinder Morgan		A-23R	18	2	ND	2.1	8	0	ND	0.31	8	0	ND	ND
Kinder Morgan		A-27	20	20	2.5	6.3	8	0	0.82	7.8	8	0	ND	ND
Kinder Morgan		A-28R (DUP)	19	19	1.4	10	7	0	ND	1.2	7	0	ND	0.73
Kinder Morgan		A-5	21	4	ND	1.5	9	0	0.31	5.2	9	0	ND	1.7
Kinder Morgan		A-8	11	0	ND	0.27	11	0	0.46	3.5	11	0	ND	1.5
Kinder Morgan		MW-07R	11	0	ND	ND	11	0	ND	0.7	11	0	ND	ND
Kinder Morgan		MW-1	11	0	ND	ND	11	0	ND	0.8	11	0	ND	ND
Kinder Morgan		MW-12R	11	0	ND	0.26	10	0	ND	0.78	10	0	ND	ND
Kinder Morgan		MW-13R	11	0	ND	ND	10	0	ND	0.49	10	0	ND	ND
Kinder Morgan		MW-14	20	10	ND	4.2	8	1	1.4	10	8	0	ND	1.1
Kinder Morgan		MW-16	11	0	ND	0.39	10	0	ND	0.43	10	0	ND	ND
Kinder Morgan		MW-18	20	4	ND	4.9	8	0	ND	ND	8	0	ND	ND

Table 6-5. TF-OU2, Summary of TPH in Groundwater, 2005-2009 (Continued)

Analyte:			TPH-G (mg/L)				TPH-D (mg/L)				TPH-O (mg/L)			
Cleanup Level (CUL):			1				10				10			
Facility	Location	Well	Number of Samples	Samples above CUL	Min	Max	Number of Samples	Samples above CUL	Min	Max	Number of Samples	Samples above CUL	Min	Max
Kinder Morgan		MW-19	17	17	5.3	27	5	0	0.5	9.1	5	0	ND	ND
Kinder Morgan		MW-2	11	0	ND	ND	11	0	ND	0.91	11	0	ND	ND
Kinder Morgan		MW-20	11	0	ND	ND	11	0	ND	0.55	11	0	ND	ND
Kinder Morgan		MW-21	18	5	ND	2.4	18	7	0.87	140	18	0	ND	3.3
Kinder Morgan		MW-22	11	0	ND	0.4	11	0	0.45	3	11	0	ND	ND
Kinder Morgan		MW-23	16	16	4.8	19	4	0	ND	1.3	4	0	ND	ND
Kinder Morgan		MW-24	15	15	5.5	46	3	0	ND	1.1	3	0	ND	ND
Kinder Morgan		MW-25	11	0	ND	0.4	11	0	ND	3.7	11	0	ND	ND
Kinder Morgan		MW-3	11	0	ND	ND	10	0	ND	ND	10	0	ND	ND
Kinder Morgan		MW-4	10	0	ND	ND	9	3	1.2	19	9	0	ND	2.1
Kinder Morgan		MW-5	10	0	ND	ND	10	0	ND	ND	10	0	ND	ND
Kinder Morgan		MW-6	20	2	ND	1.2	8	0	ND	0.42	8	0	ND	ND
Kinder Morgan		MW-7	18	18	2.4	27	6	0	0.32	2.3	6	0	ND	ND
Kinder Morgan		MW-8	11	0	ND	ND	11	0	ND	1.8	11	0	ND	0.61
Kinder Morgan		MW-9	21	16	ND	4.7	8	0	0.46	3.9	8	0	ND	ND
Kinder Morgan		SH-02R	11	0	ND	ND	11	0	ND	0.77	11	0	ND	ND
Kinder Morgan		SH-05R	11	0	ND	0.78	11	0	0.56	4.3	11	0	ND	1
Shell		MW-05	7	0	ND	0.25	7	0	ND	ND	7	0	ND	ND
Shell		MW-101	7	0	ND	0.58	7	0	ND	ND	7	0	ND	ND
Shell		MW-102	7	0	ND	0.077	7	0	ND	ND	7	0	ND	ND
Shell		MW-104	10	6	ND	4	9	0	0.17	3.73	9	0	ND	ND
Shell		MW-105	7	0	ND	ND	6	0	0.17	3.95	6	0	ND	0.78
Shell		MW-111	7	0	0.096	0.683	7	0	ND	0.998	7	0	ND	ND
Shell		MW-112A	7	0	ND	0.44	7	0	ND	1.4	7	0	ND	ND
Shell		MW-201	7	0	ND	0.22	7	0	ND	4.6	7	0	ND	2.3
Shell		MW-202	12	12	2.3	7.7	12	5	1.8	20	12	0	ND	0.834
Shell		MW-203	12	5	ND	6.22	12	0	ND	7.39	12	0	ND	1.34
Shell		MW-204	10	0	ND	0.13	9	0	0.45	6.2	9	0	ND	1.11
Shell		MW-206A	7	0	ND	ND	7	0	0.1	4.41	7	0	ND	7.9
Shell		MW-213	8	0	ND	ND	8	0	ND	0.653	8	0	ND	ND
Shell		MW-214	9	0	ND	ND	10	0	ND	0.91	10	0	ND	ND

Table 6-5. TF-OU2, Summary of TPH in Groundwater, 2005-2009 (Continued)

Analyte:			TPH-G (mg/L)				TPH-D (mg/L)				TPH-O (mg/L)			
Cleanup Level (CUL):			1				10				10			
Facility	Location	Well	Number of Samples	Samples above CUL	Min	Max	Number of Samples	Samples above CUL	Min	Max	Number of Samples	Samples above CUL	Min	Max
Shell		SH-04	7	6	ND	20	6	0	2.7	8.23	6	0	ND	2.52
Shell		TES-MW-1	8	0	ND	0.23	8	0	ND	ND	8	0	ND	ND
Shell		TX-03A	8	7	ND	10	3	0	0.32	0.54	3	0	ND	ND
Shell		TX-04	7	0	0.076	0.87	7	0	ND	1.1	7	0	ND	ND
Shell		TX-06A	7	0	ND	0.26	7	0	0.24	6.3	7	0	ND	ND

Notes:

Highlighted — Exceeds Cleanup Level
– — Not Analyzed
NA — Not Available
ND — Not Detected

Table 6-6. TF-OU2, Summary of BTEX in Groundwater, 2005-2009

Analyte:			Benzene (ug/L)				Ethylbenzene (ug/L)				Toluene (ug/L)				Xylenes (ug/L)			
Cleanup Level (CUL):			**71**				**29,000**				**200,000**				**NA**			
Facility	**Location**	**Well**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**
BP	Plant 1	AMW-01	19	16	7.38	*1130*	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	AMW-02	19	7	2.16	*442*	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	AMW-03	17	0	ND	2.77	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	AMW-04	19	0	ND	0.646	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	AMW-05	19	0	ND	1.11	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	AR-03	19	6	ND	*451*	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	GM-14S	9	0	ND	7.98	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	GM-15S	17	0	ND	19.6	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	GM-16S	7	0	ND	ND	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	GM-17S	7	0	ND	ND	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	GM-24S	19	0	ND	3.68	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	MW-1-T9	16	1	ND	*78.9*	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	MW-2-T9	16	0	ND	63.9	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	MW-3-T9	13	0	ND	7	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 1	MW-4-T9	16	0	ND	1.55	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 2	GM-19S	17	14	15	*1400*	–	–	–	–	–	–	–	–	–	–	–	–
BP	Plant 2	MW-03R	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Kinder Morgan		A-10	10	0	ND	0.69	10	0	ND	ND	10	0	ND	ND	10	0	ND	0.5
Kinder Morgan		A-14R	10	0	ND	ND	10	0	ND	ND	10	0	ND	ND	10	0	ND	ND
Kinder Morgan		A-21	20	0	ND	24	20	0	ND	150	20	0	ND	2.1	20	0	ND	21
Kinder Morgan		A-23R	18	4	ND	*520*	18	0	ND	53	18	0	ND	6.6	18	0	ND	31
Kinder Morgan		A-27	20	16	35	*250*	20	0	22	240	20	0	5.1	19	20	0	35	340
Kinder Morgan		A-28R (DUP)	19	16	26	*2100*	19	0	6	110	19	0	2	19	19	0	6.9	64
Kinder Morgan		A-5	21	10	1.1	*190*	21	0	ND	4.1	21	0	ND	4.5	21	0	0.88	21
Kinder Morgan		A-8	11	0	ND	1.2	11	0	ND	ND	11	0	ND	1.1	11	0	ND	1.5
Kinder Morgan		MW-07R	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND
Kinder Morgan		MW-1	11	0	ND	ND	11	0	ND	ND	11	0	ND	0.5	11	0	ND	1.3
Kinder Morgan		MW-12R	11	0	ND	ND	11	0	ND	ND	11	0	ND	1	11	0	ND	1
Kinder Morgan		MW-13R	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND
Kinder Morgan		MW-14	20	0	ND	12	20	0	ND	180	20	0	ND	9.4	20	0	ND	130
Kinder Morgan		MW-16	11	0	ND	ND	11	0	ND	1.2	11	0	ND	0.62	11	0	ND	1

Table 6-6. TF-OU2, Summary of BTEX in Groundwater, 2005-2009 (Continued)

Analyte:			Benzene (ug/L)				Ethylbenzene (ug/L)				Toluene (ug/L)				Xylenes (ug/L)			
Cleanup Level (CUL):			**71**				**29,000**				**200,000**				**NA**			
Facility	**Location**	**Well**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**
Kinder Morgan		MW-18	20	6	ND	*1200*	20	0	ND	25	20	0	ND	35	20	0	ND	120
Kinder Morgan		MW-19	17	9	ND	*150*	17	0	120	610	17	0	6.3	280	17	0	290	3400
Kinder Morgan		MW-2	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND
Kinder Morgan		MW-20	11	0	ND	0.74	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND
Kinder Morgan		MW-21	18	0	ND	ND	18	0	ND	4.9	18	0	ND	1.5	18	0	ND	3.4
Kinder Morgan		MW-22	11	0	ND	9.4	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND
Kinder Morgan		MW-23	16	16	*210*	*2400*	16	0	48	590	16	0	6.1	61	16	0	25	3200
Kinder Morgan		MW-24	15	15	*1100*	*4400*	15	0	27	1900	15	0	13	81	15	0	27	9200
Kinder Morgan		MW-25	11	0	ND	5.2	11	0	ND	1.4	11	0	ND	ND	11	0	ND	ND
Kinder Morgan		MW-3	11	0	ND	1.1	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND
Kinder Morgan		MW-4	10	0	ND	12	10	0	ND	3.2	10	0	ND	ND	10	0	ND	13
Kinder Morgan		MW-5	10	0	ND	ND	10	0	ND	ND	10	0	ND	ND	10	0	ND	0.78
Kinder Morgan		MW-6	20	0	ND	3.2	20	0	ND	0.62	20	0	ND	0.55	20	0	ND	2.5
Kinder Morgan		MW-7	18	4	ND	*160*	18	0	90	870	18	0	29	350	18	0	270	6600
Kinder Morgan		MW-8	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND	11	0	ND	1.3
Kinder Morgan		MW-9	21	1	ND	*160*	21	0	ND	120	21	0	ND	23	21	0	4.3	550
Kinder Morgan		SH-02R	11	0	ND	ND	11	0	ND	ND	11	0	ND	ND	11	0	ND	1.6
Kinder Morgan		SH-05R	11	0	ND	ND	11	0	ND	ND	11	0	ND	0.58	11	0	ND	1
Shell		MW-05	7	0	ND	ND	7	0	ND	ND	7	0	ND	ND	7	0	ND	ND
Shell		MW-101	7	0	ND	1.6	7	0	ND	ND	7	0	ND	ND	7	0	ND	1.1
Shell		MW-102	7	0	ND	4.98	7	0	ND	1.74	7	0	ND	ND	7	0	ND	2.01
Shell		MW-104	6	0	ND	2.45	6	0	1.2	330	6	0	ND	1.29	6	0	ND	27.3
Shell		MW-105	7	0	ND	ND	7	0	ND	ND	7	0	ND	ND	7	0	ND	ND
Shell		MW-111	7	2	ND	95.6	7	0	ND	0.796	7	0	ND	1.89	7	0	ND	3.7
Shell		MW-112A	7	0	ND	3	7	0	ND	ND	7	0	ND	1.2	7	0	ND	1
Shell		MW-201	7	0	ND	ND	7	0	ND	ND	7	0	ND	ND	7	0	ND	2.1
Shell		MW-202	7	0	ND	22.4	7	0	ND	82.8	7	0	ND	5.98	7	0	ND	23.7
Shell		MW-203	8	0	1.86	23	8	0	0.53	21	8	0	ND	5.53	8	0	ND	6.52
Shell		MW-204	9	0	ND	ND	9	0	ND	ND	9	0	ND	ND	9	0	ND	ND
Shell		MW-206A	7	0	ND	ND	7	0	ND	ND	7	0	ND	ND	7	0	ND	ND
Shell		MW-213	9	0	ND	ND	9	0	ND	ND	9	0	ND	ND	9	0	ND	ND

Table 6-6. TF-OU2, Summary of BTEX in Groundwater, 2005-2009 (Continued)

Analyte:			Benzene (ug/L)				Ethylbenzene (ug/L)				Toluene (ug/L)				Xylenes (ug/L)			
Cleanup Level (CUL):			**71**				**29,000**				**200,000**				**NA**			
Facility	**Location**	**Well**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**	**Number of Samples**	**Samples above CUL**	**Min**	**Max**
Shell		MW-214	10	0	ND	ND	10	0	ND	ND	10	0	ND	ND	10	0	ND	ND
Shell		SH-04	7	7	*480*	*1250*	7	0	68	650	7	0	23	89	7	0	16	2310
Shell		TES-MW-1	8	0	ND	3.9	8	0	ND	13	8	0	ND	ND	8	0	ND	43.7
Shell		TX-03A	8	8	*880*	*3100*	8	0	ND	60.1	8	0	ND	24	8	0	ND	65
Shell		TX-04	7	0	ND	31	7	0	ND	ND	7	0	ND	7.1	7	0	ND	20.4
Shell		TX-06A	7	0	ND	ND	7	0	ND	ND	7	0	ND	ND	7	0	ND	ND

Notes:

Highlighted	Exceeds Cleanup Level
–	Not Analyzed
NA	Not Available
ND	Not Detected

Table 6-7. TF-OU2, Summary of CPAHs in Groundwater, 2005-2009

		Analyte:	Benzo(a) anthracene (ug/L)		Benzo(a) pyrene (ug/L)		Benzo(b) fluoranthene (ug/L)		Benzo(k) fluoranthene (ug/L)		Chrysene (ug/L)		Dibenz(a,h) anthracene (ug/L)		Indeno(1,2,3-cd)pyrene (ug/L)		Total CPAHs (ug/L)			
		Cleanup Level:	NA		NA		NA		NA		NA		NA		NA		0.031			
Facility	Location	Well	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Number of Samples	Samples above CUL	Min	Max
BP	Plant 1	AMW-01	ND	0.212	ND	0.177	ND	0.22	ND	0.29	ND	0.215	ND	0.237	ND	0.229	14	3	ND	*1.58*
BP	Plant 1	AMW-02	ND	0.201	ND	0.191	ND	0.207	ND	0.237	ND	0.215	ND	0.226	ND	0.232	14	2	ND	*1.509*
BP	Plant 1	AMW-03	ND	0.0835	ND	0.0689	ND	0.157	ND	0.0773	ND	0.0851	ND	0.116	ND	0.125	15	3	ND	*0.5986*
BP	Plant 1	AMW-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14	0	ND	ND
BP	Plant 1	AMW-05	ND	0.0771	ND	0.0534	ND	0.157	ND	0.51	ND	0.0832	ND	0.121	ND	0.129	14	4	ND	*0.8389*
Shell		MW-213	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9	0	ND	ND
Shell		MW-214	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	0	ND	ND

Notes:

Highlighted	Exceeds Cleanup Level
NA	Not Available
ND	Not Detected

Table 6-8. TF-OU2, Summary of Arsenic and Lead in Groundwater, 2005-2009

Analyte:		Total Arsenic (ug/L)				Dissolved Arsenic (ug/L)				Total Lead (ug/L)				Dissolved Lead (ug/L)			
Cleanup Level (CUL):		36				36				5.8				5.8			
Facility	Well	Number of Samples	Samples above CUL	Min	Max	Number of Samples	Samples above CUL	Min	Max	Number of Samples	Samples above CUL	Min	Max	Number of Samples	Samples above CUL	Min	Max
Kinder Morgan	A-14R	–	–	–	–	–	–	–	–	10		ND	ND	–	–	–	–
Kinder Morgan	A-21	–	–	–	–	–	–	–	–	11	2	ND	*20*	–	–	–	–
Kinder Morgan	A-23R	–	–	–	–	–	–	–	–	11	7	ND	*35*	–	–	–	–
Kinder Morgan	A-28R (DUP)	–	–	–	–	–	–	–	–	10	5	ND	*19*	–	–	–	–
Kinder Morgan	MW-07R	–	–	–	–	–	–	–	–	11	1	ND	*6.5*	–	–	–	–
Kinder Morgan	MW-1	–	–	–	–	–	–	–	–	11	0	ND	5.2	–	–	–	–
Kinder Morgan	MW-12R	–	–	–	–	–	–	–	–	10	0	ND	5	–	–	–	–
Kinder Morgan	MW-13R	–	–	–	–	–	–	–	–	10	0	ND	ND	–	–	–	–
Kinder Morgan	MW-2	–	–	–	–	–	–	–	–	11	3	ND	*36*	–	–	–	–
Kinder Morgan	MW-23	–	–	–	–	–	–	–	–	7	0	ND	ND	–	–	–	–
Kinder Morgan	MW-24	–	–	–	–	–	–	–	–	6	5	ND	*22*	–	–	–	–
Kinder Morgan	MW-25	–	–	–	–	–	–	–	–	11	1	ND	*59*	–	–	–	–
Kinder Morgan	MW-3	–	–	–	–	–	–	–	–	11	0	ND	ND	–	–	–	–
Kinder Morgan	MW-4	–	–	–	–	–	–	–	–	1	0	ND	ND	–	–	–	–
Kinder Morgan	MW-5	–	–	–	–	–	–	–	–	10	6	ND	*110*	–	–	–	–
Kinder Morgan	MW-6	–	–	–	–	–	–	–	–	11	0	ND	ND	–	–	–	–
Kinder Morgan	MW-7	–	–	–	–	–	–	–	–	9	9	*7.2*	*79*	–	–	–	–
Kinder Morgan	MW-8	–	–	–	–	–	–	–	–	11	11	*6*	*64*	–	–	–	–
Kinder Morgan	MW-9	–	–	–	–	–	–	–	–	11	11	*7.6*	*25*	–	–	–	–
Kinder Morgan	SH-02R	–	–	–	–	–	–	–	–	11	2	ND	*7.8*	–	–	–	–
Kinder Morgan	SH-05R	–	–	–	–	–	–	–	–	11	1	ND	*7.4*	–	–	–	–
Shell	MW-05	5	0	ND	ND	5	0	ND	ND	5	0	ND	ND	5	0	ND	ND
Shell	MW-101	5	0	ND	4.92	5	0	ND	5.02	5	0	ND	3.43	5	0	ND	ND
Shell	MW-102	6	0	ND	ND	6	0	ND	ND	7	1	ND	*35.3*	7	0	ND	3.05
Shell	MW-104	5	0	ND	1.77	5	0	ND	6.67	9	2	ND	*7.78*	5	1	ND	*7.57*
Shell	MW-105	12	0	ND	9.76	12	0	ND	7.89	15	4	ND	*21*	12	0	ND	ND
Shell	TES-MW-1	6	0	ND	ND	6	0	ND	ND	6	0	ND	ND	6	0	ND	ND
Shell	TX-03A	3	0	ND	6.8	3	0	ND	6.23	3	0	ND	ND	3	0	ND	ND
Shell	TX-04	6	0	ND	6.86	6	0	ND	2.88	6	1	ND	*16.9*	6	0	ND	ND
Shell	TX-06A	5	0	6.34	10.4	5	0	ND	11.9	5	0	ND	ND	5	0	ND	ND

Notes:

Highlighted Exceed Cleanup Level
– Not Analyzed
ND Not Detected

Table 6-9. LU-OU3 Groundwater Monitoring Network

Monitor Well	Construction Date	Well Screen Interval (ft bgs)	Location	Chemical Analyses
LMW3 [a]	6/4/1991	5-20	Impacted Area	VOCs, Copper, Zinc
LMW4 [a]	Decommissioned October 2000		Impacted Area	VOCs and Copper
LMW7 [a]	5/29/1991	5-20	Impacted Area	VOCs and Lead
LMW9 [a]	5/30/1991	5-20	Impacted Area	VOCs
LMW10 [a]	Decommissioned October 2000		Down-gradient	VOCs and Copper
LMW12 [a]	6/17/1992	5-20	Down-gradient	VOCs
LMW15 [a]	Well Destroyed (removed) in 2003		Down-gradient	Copper
LMW18 [a]	6/17/1992	5-20	Impacted Area/Down-gradient	VOCs, Copper, and Lead
LMW25 [a]	6/24/1992	5-15	Down-gradient	VOCs, Copper, Zinc
LMW26 [a]	8/1/1995	5-20	Down-gradient	VOCs
LMW27 [a]	8/1/1995	5-20	Impacted Area	VOCs
LMW30[b]	2/22/06	5-20	Shoreline	Metals, VOCs
LMW31[b]	11/9/05	6.5-21.5	Shoreline	Metals, VOCs
LMW32D[b]	11/8/05	40-55	Shoreline	Metals, VOCs
LMW32S[b]	11/8/05	5-20	Shoreline	Metals, VOCs
LMW33[b]	11/9/05	6.5-21.5	Shoreline	Metals, VOCs
LMW34[b]	11/10/05	6.5-21.5	Shoreline	Metals, VOCs
BG-01[b]	11/9/05	6.5-21.5	Background	Metals, VOCs
BG-02[b]	11/8/05	10-25	Background	Metals, VOCs
BG-03[b]	11/9/05	5-20	Background	Metals, VOCs

[a] Monitoring program original wells.

[b] Installed for LSSOU source monitoring.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data

Sample ID	1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane (TCA)	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane (1,1-DCA)	1,1-Dichloroethene (1,1-DCE)	1,1-Dichloropropene	1,2,3-Trichlorobenzene	1,2,3-Trichloropropane	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,2-Dibromoethane (EDB)
Screening Level [a]		*200*	*4*	*16*		*7100*				*70*		
ROD Cleanup Goal												
LMW3-030210	0.11 U	0.075 U	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW7-030410	0.11 U	0.13 J	0.16 U	0.14 U	0.78	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW9-030410	0.11 U	0.37 J	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW12-030410	0.11 U	3.1	0.16 U	0.14 U	1.1	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW18-030310	0.11 U	0.075 U	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW19-030310	0.11 U	0.075 U	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW26-030310	0.11 U	0.64	0.16 U	0.14 U	0.08 J	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW27-030410	0.11 U	2.1	0.16 U	0.14 U	0.49 J	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW30-030210	0.11 U	0.075 U	0.16 U	0.14 U	0.26 J	0.08 J	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW31-030210	0.11 U	0.075 U	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW32D-030210	0.11 U	0.075 U	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW32S-030210	0.11 U	0.075 U	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW33-030310	0.11 U	0.075 U	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW34-030310	0.11 U	0.075 U	0.16 U	0.14 U	0.94	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
LMW35-030210	0.11 U	0.075 U	0.16 U	0.14 U	0.23 J	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
BG-01-030310	0.11 U	0.075 U	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
BG02-030210	0.11 U	0.09 J	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U
BG-03-030310	0.11 U	0.075 U	0.16 U	0.14 U	0.077 U	0.074 U	0.089 U	0.11 U	0.2 U	0.096 U	0.069 U	0.1 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	1,2-Dichlorobenzene	1,2-Dichloroethane (EDC)	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene	1,3-Dichloropropane	1,4-Dichlorobenzene	2,2-Dichloropropane	2,2'-Oxybis(1-chloropropane)	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol
Screening Level [a]	*1300*	*37*	*15*		*960*		*190*				*2.4*	*290*
ROD Cleanup Goal												
LMW3-030210	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW7-030410	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW9-030410	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW12-030410	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW18-030310	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW19-030310	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW26-030310	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW27-030410	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW30-030210	1.2	0.08 U	0.095 U	0.089 U	0.4 J	0.14 U	11	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW31-030210	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW32D-030210	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW32S-030210	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW33-030310	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW34-030310	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
LMW35-030210	1	0.08 U	0.095 U	0.089 U	0.35 J	0.14 U	8.9	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
BG-01-030310	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
BG02-030210	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U
BG-03-030310	0.12 U	0.08 U	0.095 U	0.089 U	0.1 U	0.14 U	0.12 U	0.06 U	0.32 U	0.39 U	0.21 U	0.3 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	2,4-Dimethylphenol	2,4-Dinitrophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Butanone (MEK)	2-Chloronaphthalene	2-Chlorophenol	2-Chlorotoluene	2-Hexanone	2-Methylnaphthalene	2-Methylphenol	2-Nitroaniline	2-Nitrophenol
Screening Level [a]	*850*		*3.4*			*1600*	*150*						
ROD Cleanup Goal													
LMW3-030210	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW7-030410	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW9-030410	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW12-030410	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW18-030310	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW19-030310	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW26-030310	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW27-030410	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW30-030210	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW31-030210	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW32D-030210	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW32S-030210	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW33-030310	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW34-030310	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
LMW35-030210	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
BG-01-030310	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
BG02-030210	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U
BG-03-030310	0.27 U	2.3 U	0.28 U	0.35 U	1.9 U	0.29 U	0.32 U	0.1 U	2.7 U	0.24 U	0.33 U	0.34 U	0.38 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	3,3'-Dichlorobenzidine	3-Nitroaniline	4,4'-DDD	4,4'-DDE	4,4'-DDT	4,6-Dinitro-2-methylphenol	4-Bromophenyl-Phenylether	4-Chloro-3-methylphenol	4-Chloroaniline	4-Chlorophenyl-Phenylether	4-Chlorotoluene	4-Isopropyltoluene
Screening Level [a]			*0.00031*	*0.00022*	*0.00022*	*280*						
ROD Cleanup Goal												
LMW3-030210	0.27 U	3.3 U	0.0015 U	0.0013 J	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW7-030410	0.27 U	3.3 U	0.003 JP	0.0015 J	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW9-030410	0.27 U	3.3 U	0.0044 Ui	0.0017 Ui	0.00084 Ui	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW12-030410	0.27 U	3.3 U	0.0039 JP	0.00036 U	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW18-030310	0.27 U	3.3 U	0.0015 U	0.00036 U	0.00069 Ui	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW19-030310	0.27 U	3.3 U	0.0015 U	0.00036 U	0.0011 Ui	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW26-030310	0.27 U	3.3 U	0.0015 U	0.00036 U	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW27-030410	0.27 U	3.3 U	0.0028 Ui	0.00063 Ui	0.00084 Ui	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW30-030210	0.27 U	3.3 U	0.0015 U	0.00036 U	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW31-030210	0.27 U	3.3 U	0.0015 U	0.00036 U	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW32D-030210	0.27 U	3.3 U	0.0019 Ui	0.0016 Ui	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW32S-030210	0.27 U	3.3 U	0.0015 U	0.00036 U	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW33-030310	0.27 U	3.3 U	0.003 Ui	0.00036 U	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW34-030310	0.27 U	3.3 U	0.0015 U	0.00036 U	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
LMW35-030210	0.27 U	3.3 U	0.002 Ui	0.00037 Ui	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
BG-01-030310	0.27 U	3.3 U	0.0015 U	0.00036 U	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
BG02-030210	0.27 U	3.3 U	0.0034 Ui	0.0011 Ui	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U
BG-03-030310	0.27 U	3.3 U	0.0015 U	0.00065 J	0.00058 U	2.2 U	0.28 U	0.49 U	0.38 U	0.28 U	0.13 U	0.051 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	4-Methyl-2-pentanone (MIBK)	4-Methylphenol	4-Nitroaniline	4-Nitrophenol	Acenaphthene	Acenaphthylene	Acetone	Aldrin	alpha-BHC	alpha-Chlordane	Aniline	Anthracene	Antimony	Antimony-Dissolved
Screening Level [a]					*990*			*0.00005*	*0.049*			*40000*	*640*	*640*
ROD Cleanup Goal														
LMW3-030210	2.6 U	0.48 U	4.1 U	2 U	0.94 J	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	3 U	3 U
LMW7-030410	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	20 U	20 U
LMW9-030410	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.00077 Ui	0.00033 U	0.004 U	0.49 U	0.62 U	20 U	20 U
LMW12-030410	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	20 U	20 U
LMW18-030310	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	9.9 J	5.9 J
LMW19-030310	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	10.8 J	7.4 J
LMW26-030310	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	4.4 J	3.9 J
LMW27-030410	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	20 U	20 U
LMW30-030210	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.0006 Ui	0.004 U	0.49 U	0.62 U	3 U	3 U
LMW31-030210	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	8.5 J	5.8 J
LMW32D-030210	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0013 Ui	0.00033 U	0.004 U	0.49 U	0.62 U	3 U	3 U
LMW32S-030210	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	3 U	3 U
LMW33-030310	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	9.5 J	4.9 J
LMW34-030310	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	6.6 J	4.4 J
LMW35-030210	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	3 U	3 U
BG-01-030310	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	5.4 J	3.6 J
BG02-030210	2.6 U	0.48 U	4.1 U	2 U	0.29 U	0.24 U	3.3 U	0.00081 Ui	0.00061 Ui	0.004 U	0.49 U	0.62 U	3 U	3 U
BG-03-030310	2.6 U	0.48 U	4.1 U	2 U	2.9 J	0.24 U	3.3 U	0.0004 U	0.00033 U	0.004 U	0.49 U	0.62 U	5.4 J	3.2 J

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	Arsenic	Arsenic-Dissolved	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Benzyl Alcohol	beta-BHC
Screening Level [a]	*0.14*	*0.14*	*51*	*0.018*	*0.018*	*0.018*		*0.018*			*0.017*
ROD Cleanup Goal			*71*								
LMW3-030210	0.3 J	0.2 J	0.05 J	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.0017 Ui
LMW7-030410	0.8	0.4 J	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00083 U
LMW9-030410	1.2	1	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00099 Ui
LMW12-030410	0.8	0.6	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00083 U
LMW18-030310	9.1	5.4	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00093 Ui
LMW19-030310	9.8	5.3	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.0017 Ui
LMW26-030310	2.2	2.5	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.002 Ui
LMW27-030410	0.5	0.8	0.07 J	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.0014 Ui
LMW30-030210	0.18 J	0.17 J	0.14 J	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00083 U
LMW31-030210	2.03	1.76	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.0012 Ui
LMW32D-030210	0.27 J	0.29 J	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.0012 Ui
LMW32S-030210	3.71	3.91	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.0012 Ui
LMW33-030310	0.53 J	0.54 J	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00083 U
LMW34-030310	1.6	1.5	0.24 J	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00083 U
LMW35-030210	0.14 J	0.21 J	0.12 J	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00083 U
BG-01-030310	0.7	0.6	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00083 U
BG02-030210	0.3 J	0.1 J	0.038 U	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.0019 Ui
BG-03-030310	1.3	0.9	0.04 J	0.6 U	0.66 U	0.59 U	0.82 U	0.83 U	5.9 U	0.38 U	0.00083 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	Bis(2-chloroethoxy)methane	Bis(2-chloroethyl)ether	Bis(2-ethylhexyl)phthalate	Boron	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	Butylbenzylphthalate
Screening Level [a]		*0.53*	*2.2*					*140*		*1900*
ROD Cleanup Goal										
LMW3-030210	0.28 U	0.34 U	1.9 U	86.5	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW7-030410	0.28 U	0.34 U	1.9 U	108	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW9-030410	0.28 U	0.34 U	1.9 U	112	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW12-030410	0.28 U	0.34 U	1.9 U	191	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW18-030310	0.28 U	0.34 U	1.9 U	17.9 J	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW19-030310	0.28 U	0.34 U	1.9 U	19.3 J	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW26-030310	0.28 U	0.34 U	1.9 U	369	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW27-030410	0.28 U	0.34 U	1.9 U	484	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW30-030210	0.28 U	0.34 U	1.9 U	1390	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW31-030210	0.28 U	0.34 U	1.9 U	2360	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW32D-030210	0.28 U	0.34 U	1.9 U	2040	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW32S-030210	0.28 U	0.34 U	1.9 U	2600	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW33-030310	0.28 U	0.34 U	1.9 U	857	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW34-030310	0.28 U	0.34 U	5.9 J	255	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
LMW35-030210	0.28 U	0.34 U	1.9 U	1360	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
BG-01-030310	0.28 U	0.34 U	1.9 U	137	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
BG02-030210	0.28 U	0.34 U	1.9 U	114	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U
BG-03-030310	0.28 U	0.34 U	8.8 J	175	0.12 U	0.16 U	0.091 U	0.16 U	0.09 U	0.47 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	Cadmium	Cadmium-Dissolved	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	Chrysene	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene
Screening Level [a]	*8.8*	*8.8*		*1.6*	*1600*		*470*		*0.018*		
ROD Cleanup Goal											
LMW3-030210	0.3 U	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.064 U	0.053 U	0.79 U	1.1	0.18 U
LMW7-030410	2 U	2 U	0.1 U	0.096 U	0.11 U	0.16 U	0.3 J	0.053 U	0.79 U	1.1	0.18 U
LMW9-030410	2 U	2 U	0.1 U	0.096 U	0.11 U	0.16 U	0.24 J	0.053 U	0.79 U	0.067 U	0.18 U
LMW12-030410	2 U	2 U	0.1 U	0.23 J	0.11 U	0.16 U	0.87	0.053 U	0.79 U	1.1	0.18 U
LMW18-030310	0.3 U	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.36 J	0.053 U	0.79 U	0.15 J	0.18 U
LMW19-030310	0.3 U	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.37 J	0.053 U	0.79 U	0.15 J	0.18 U
LMW26-030310	0.6 J	0.7 J	0.1 U	0.096 U	0.11 U	0.16 U	0.21 J	0.053 U	0.79 U	0.4 J	0.18 U
LMW27-030410	3.1 J	3.3 J	0.1 U	0.11 J	0.11 U	0.16 U	0.62	0.053 U	0.79 U	0.95	0.18 U
LMW30-030210	0.3 U	0.3 U	0.1 U	0.096 U	17	0.16 U	0.064 U	0.053 U	0.79 U	0.067 U	0.18 U
LMW31-030210	1.1 J	1 J	0.1 U	0.096 U	0.11 U	0.16 U	0.064 U	0.053 U	0.79 U	0.067 U	0.18 U
LMW32D-030210	0.3 U	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.064 U	0.053 U	0.79 U	0.67	0.18 U
LMW32S-030210	0.3 J	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.064 U	0.053 U	0.79 U	0.067 U	0.18 U
LMW33-030310	0.3 U	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.064 U	0.053 U	0.79 U	0.067 U	0.18 U
LMW34-030310	0.3 U	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.21 J	0.053 U	0.79 U	6.6	0.18 U
LMW35-030210	0.3 U	0.3 U	0.1 U	0.096 U	14	0.16 U	0.064 U	0.053 U	0.79 U	0.067 U	0.18 U
BG-01-030310	0.3 U	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.064 U	0.053 U	0.79 U	0.067 U	0.18 U
BG02-030210	0.3 U	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.064 U	0.053 U	0.79 U	0.067 U	0.18 U
BG-03-030310	0.3 U	0.3 U	0.1 U	0.096 U	0.11 U	0.16 U	0.064 U	0.053 U	0.79 U	1.1	0.18 U

Notes: All concentrations in µg/L.
Highlight indicates concentration above screening level or ROD cleanup goal.
[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	Copper	Copper-Dissolved	Cyanide, Total	DBCP	DCDFMA	delta-BHC	Dibenz(a,h)anthracene	Dibenzofuran	Dibromochloromethane	Dibromomethane	Dieldrin
Screening Level [a]	*3.1*	*3.1*	*1*				*0.018*		*17*		*0.000054*
ROD Cleanup Goal	*2.9*	*2.9*									
LMW3-030210	2.14	1.27	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.0011 Ui
LMW7-030410	2.47	2.5	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.00088 JP
LMW9-030410	1.97	1.88	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.00092 Ui
LMW12-030410	3.36	2.92	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.0011 J
LMW18-030310	3.9	1.91	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.00089 Ui
LMW19-030310	4.01	1.95	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.003 JP
LMW26-030310	5.6	5.42	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.00086 Ui
LMW27-030410	4.08	2.98	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.001 J
LMW30-030210	1.04	1.22	0.003 J	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.0011 JP
LMW31-030210	29.5	21.5	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.0012 Ui
LMW32D-030210	0.195 J	0.059 J	0.003 J	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.00035 U
LMW32S-030210	1.94	1.81	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.0026 JP
LMW33-030310	4.93	4.99	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.0015 J
LMW34-030310	3.15	3.27	0.003 U	0.2 U	0.13 U	0.00064 Ui	0.76 U	0.33 U	0.14 U	0.15 U	0.0014 Ui
LMW35-030210	0.823	1.39	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.0013 JP
BG-01-030310	1.1	1	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.0012 J
BG02-030210	0.76	0.77	0.006 J	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.0018 JP
BG-03-030310	0.55	0.43	0.003 U	0.2 U	0.13 U	0.00057 U	0.76 U	0.33 U	0.14 U	0.15 U	0.00065 Ui

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	Diesel Range Organics (DRO)	Diethylphthalate	Dimethylphthalate	Di-n-butylphthalate	Di-n-octylphthalate	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Endrin	Endrin Aldehyde	Endrin Ketone	Ethylbenzene
Screening Level [a]	*500*	*44000*	*1100000*	*4500*		*0.0087*	*0.0087*	*89*	*0.0023*	*0.3*		*2100*
ROD Cleanup Goal												
LMW3-030210	78 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0004 U	0.00054 Ui	0.00091 Ui	0.002 JP	0.00066 U	0.05 U
LMW7-030410	100 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0004 U	0.00047 U	0.0017 Ui	0.0019 Ui	0.00066 U	0.05 U
LMW9-030410	180 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0004 U	0.0012 Ui	0.00068 U	0.0019 J	0.00066 U	0.05 U
LMW12-030410	45 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0014 Ui	0.00047 U	0.00068 U	0.0019 JP	0.00066 U	0.05 U
LMW18-030310	27 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00063 Ui	0.00044 Ui	0.00047 U	0.00095 Ui	0.0018 JP	0.00066 U	0.05 U
LMW19-030310	24 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00049 Ui	0.0004 U	0.00059 Ui	0.00068 U	0.0019 JP	0.00066 U	0.05 U
LMW26-030310	35 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0004 U	0.00047 U	0.00068 U	0.0013 JP	0.00066 U	0.05 U
LMW27-030410	110 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0011 Ui	0.00047 U	0.00087 Ui	0.00087 Ui	0.00066 U	0.05 U
LMW30-030210	250 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0004 U	0.00047 U	0.0018 Ui	0.00079 Ui	0.00066 U	0.37 J
LMW31-030210	39 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0004 U	0.00047 U	0.00068 U	0.0011 Ui	0.00066 U	0.05 U
LMW32D-030210	46 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0004 U	0.00047 U	0.0014 Ui	0.002 JP	0.00066 U	0.05 U
LMW32S-030210	22 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0019 Ui	0.00047 U	0.00068 U	0.0015 JP	0.00066 U	0.05 U
LMW33-030310	32 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0004 U	0.00047 U	0.0015 Ui	0.0005 Ui	0.00066 U	0.05 U
LMW34-030310	280 Y	0.29 U	0.26 U	0.37 U	0.63 U	0.00099 Ui	0.01 Ui	0.0008 Ui	0.0027 Ui	0.0016 Ui	0.00066 U	0.05 U
LMW35-030210	220 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00079 Ui	0.0004 U	0.00086 Ui	0.0017 Ui	0.00078 Ui	0.00066 U	0.31 J
BG-01-030310	33 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0011 Ui	0.00047 U	0.00068 U	0.001 J	0.00066 U	0.05 U
BG02-030210	110 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0019 JP	0.00047 U	0.00097 Ui	0.00046 U	0.00066 U	0.05 U
BG-03-030310	94 J	0.29 U	0.26 U	0.37 U	0.63 U	0.00044 U	0.0016 Ui	0.00047 U	0.00076 JP	0.0014 JP	0.00066 U	0.05 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	Fluoranthene	Fluorene	gamma-BHC (Lindane)	gamma-Chlordane	Gasoline Range Organics-NWTPH	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene
Screening Level [1]	*140*	*5300*	*1.8*		*800*	*0.000079*	*0.000039*	*0.00029*	*18*	*1100*
ROD Cleanup Goal										
LMW3-030210	0.66 U	0.33 U	0.00044 U	0.0004 Ui	13 J	0.00036 U	0.00043 Ui	0.63 U	0.11 U	1.3 U
LMW7-030410	0.66 U	0.33 U	0.00044 U	0.00089 Ui	13 U	0.00036 U	0.00048 Ui	0.63 U	0.11 U	1.3 U
LMW9-030410	0.66 U	0.33 U	0.00044 U	0.0011 Ui	13 U	0.00036 U	0.00055 Ui	0.63 U	0.11 U	1.3 U
LMW12-030410	0.66 U	0.33 U	0.00044 U	0.00032 U	16 J	0.00036 U	0.00032 U	0.63 U	0.11 U	1.3 U
LMW18-030310	0.66 U	0.33 U	0.00044 U	0.00032 U	13 U	0.00036 U	0.00032 U	0.63 U	0.11 U	1.3 U
LMW19-030310	0.66 U	0.33 U	0.00044 U	0.00032 U	13 U	0.00036 U	0.00095 Ui	0.63 U	0.11 U	1.3 U
LMW26-030310	0.66 U	0.33 U	0.00044 U	0.00032 U	13 U	0.00067 Ui	0.00032 U	0.63 U	0.11 U	1.3 U
LMW27-030410	0.66 U	0.33 U	0.00044 U	0.00032 U	14 J	0.00036 U	0.00044 Ui	0.63 U	0.11 U	1.3 U
LMW30-030210	0.66 U	0.33 U	0.00044 U	0.00048 Ui	57 J	0.00036 U	0.00032 U	0.63 U	0.11 U	1.3 U
LMW31-030210	0.66 U	0.33 U	0.00044 U	0.00032 U	13 U	0.00036 U	0.00037 Ui	0.63 U	0.11 U	1.3 U
LMW32D-030210	0.66 U	0.33 U	0.00065 Ui	0.0009 Ui	13 U	0.00036 U	0.00032 U	0.63 U	0.11 U	1.3 U
LMW32S-030210	0.66 U	0.33 U	0.00044 U	0.00032 U	13 U	0.00036 U	0.00032 U	0.63 U	0.11 U	1.3 U
LMW33-030310	0.66 U	0.33 U	0.00044 U	0.00035 Ui	13 U	0.00039 Ui	0.00032 U	0.63 U	0.11 U	1.3 U
LMW34-030310	0.66 U	0.33 U	0.00069 Ui	0.00052 Ui	13 U	0.00036 U	0.0011 J	0.63 U	0.11 U	1.3 U
LMW35-030210	0.66 U	0.33 U	0.00088 J	0.00032 U	62 J	0.00036 U	0.00057 Ui	0.63 U	0.11 U	1.3 U
BG-01-030310	0.66 U	0.33 U	0.00044 U	0.00032 U	13 U	0.00036 U	0.00032 U	0.63 U	0.11 U	1.3 U
BG02-030210	0.66 U	0.33 U	0.00044 U	0.00088 Ui	13 U	0.0013 Ui	0.0013 Ui	0.63 U	0.11 U	1.3 U
BG-03-030310	0.66 U	0.38 J	0.00044 U	0.00043 Ui	13 U	0.00036 U	0.00032 U	0.63 U	0.11 U	1.3 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	Hexachloroethane	Indeno(1,2,3-cd)pyrene	Isophorone	Isopropylbenzene	Lead	Lead-Dissolved	m,p-Xylenes	MECL	Mercury	Mercury-Dissolved	Methoxychlor
Screening Level [a]	*3.3*	*0.018*	*960*		*8.1*	*8.1*			*0.3*	*0.3*	
ROD Cleanup Goal					*5.8*	*5.8*					
LMW3-030210	0.29 U	0.69 U	0.25 U	0.091 U	0.027	0.013 J	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW7-030410	0.29 U	0.69 U	0.25 U	0.091 U	0.086	0.026	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW9-030410	0.29 U	0.69 U	0.25 U	0.091 U	0.125	0.029	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW12-030410	0.29 U	0.69 U	0.25 U	0.091 U	0.216	0.03	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW18-030310	0.29 U	0.69 U	0.25 U	0.091 U	0.409	0.077	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW19-030310	0.29 U	0.69 U	0.25 U	0.091 U	0.428	0.073	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW26-030310	0.29 U	0.69 U	0.25 U	0.091 U	0.236	0.035	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW27-030410	0.29 U	0.69 U	0.25 U	0.091 U	0.22	0.032	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW30-030210	0.29 U	0.69 U	0.25 U	0.091 U	0.029 J	0.089	0.091 U	0.17 U	0.02 U	0.02 J	0.00093 U
LMW31-030210	0.29 U	0.69 U	0.25 U	0.091 U	0.649	0.181	0.091 U	0.17 U	0.02 J	0.02 J	0.00093 U
LMW32D-030210	0.29 U	0.69 U	0.25 U	0.091 U	0.077	0.029 U	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW32S-030210	0.29 U	0.69 U	0.25 U	0.091 U	0.186	0.038 J	0.091 U	0.17 U	0.02 J	0.02 J	0.00093 U
LMW33-030310	0.29 U	0.69 U	0.25 U	0.091 U	0.03 U	0.03 U	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
LMW34-030310	0.29 U	0.69 U	0.25 U	0.091 U	0.05	0.024	0.091 U	0.17 U	0.02 J	0.02 U	0.00093 U
LMW35-030210	0.29 U	0.69 U	0.25 U	0.091 U	0.03 U	0.042 U	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
BG-01-030310	0.29 U	0.69 U	0.25 U	0.091 U	0.031	0.007 J	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
BG02-030210	0.29 U	0.69 U	0.25 U	0.091 U	0.408	0.315	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U
BG-03-030310	0.29 U	0.69 U	0.25 U	0.091 U	0.021	0.014 J	0.091 U	0.17 U	0.02 U	0.02 U	0.00093 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	Naphthalene	n-Butylbenzene	Nickel	Nickel-Dissolved	Nitrobenzene	N-Nitrosodimethylamine	N-Nitroso-di-n-propylamine	N-Nitrosodiphenylamine (1)	n-Propylbenzene	o-Xylene
Screening Level [a]			*8.2*	*8.2*	*690*	*3*	*0.51*	*6*		
ROD Cleanup Goal										
LMW3-030210	0.41 J	0.42 U	3.65	3.42	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW7-030410	0.088 U	0.42 U	19.8	19.3	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW9-030410	0.088 U	0.42 U	3.76	3.72	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW12-030410	0.088 U	0.42 U	5.99	5.87	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW18-030310	0.088 U	0.42 U	0.91	0.81	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW19-030310	0.088 U	0.42 U	0.94	0.76	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW26-030310	0.088 U	0.42 U	22.7	23.1	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW27-030410	0.088 U	0.42 U	106	107	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW30-030210	0.088 U	0.42 U	1.36	1.47	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW31-030210	0.088 U	0.42 U	3.45	3.18	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW32D-030210	0.088 U	0.42 U	0.16 J	0.1 U	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW32S-030210	0.088 U	0.42 U	5.46	5.12	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW33-030310	0.088 U	0.42 U	11.9	12.1	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW34-030310	0.088 U	0.42 U	2.84	2.9	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
LMW35-030210	0.088 U	0.42 U	0.97	1.88	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
BG-01-030310	0.088 U	0.42 U	2	1.86	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
BG02-030210	0.088 U	0.42 U	5.87	5.97	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U
BG-03-030310	0.27 J	0.42 U	1.88	2.08	0.57 U	0.48 U	0.5 U	0.48 U	0.53 U	0.074 U

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260	Pentachlorophenol	Phenanthrene	Phenol	Pyrene	Residual Range Organics (RRO)
Screening Level [a]	*0.000064*	*0.000064*	*0.000064*	*0.000064*	*0.000064*	*0.000064*	*0.000064*	*3*		*1700000*	*4000*	
ROD Cleanup Goal												
LMW3-030210	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	74 J
LMW7-030410	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	96 J
LMW9-030410	0.0094 U	0.0094 U	0.014 Ui	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	170 J
LMW12-030410	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	74 J
LMW18-030310	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	47 J
LMW19-030310	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	48 J
LMW26-030310	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	73 J
LMW27-030410	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	120 J
LMW30-030210	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	360 J
LMW31-030210	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	87 J
LMW32D-030210	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	69 J
LMW32S-030210	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	49 J
LMW33-030310	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	59 J
LMW34-030310	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	260 J
LMW35-030210	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	320 J
BG-01-030310	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	66 J
BG02-030210	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	96 J
BG-03-030310	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	2.5 U	0.49 U	0.33 U	0.74 U	62 J

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	sec-Butylbenzene	Selenium	Selenium-Dissolved	Strontium	Styrene	TCFMA	tert-Butylbenzene	Tetrachloroethene (PCE)	Thallium	Thallium-Dissolved	Toluene	Toxaphene
Screening Level [a]		*71*	*71*					*3.3*	*0.47*	*0.47*	*15000*	*0.00028*
ROD Cleanup Goal								*8.8*				
LMW3-030210	0.048 U	0.2 U	0.2 U	111	0.12 U	0.12 U	0.053 U	9.1	0.016 J	0.014 J	0.09 J	0.091 Ui
LMW7-030410	0.048 U	0.2 U	0.2 U	118	0.12 U	0.12 U	0.053 U	3.5	0.009 J	0.009 J	0.1 J	0.083 Ui
LMW9-030410	0.048 U	0.2 U	0.2 U	154	0.12 U	0.12 U	0.053 U	2.8	0.045	0.042	0.16 J	0.11 Ui
LMW12-030410	0.048 U	0.2 U	0.2 U	181	0.12 U	0.12 U	0.053 U	26	0.035	0.029	0.052 U	0.071 Ui
LMW18-030310	0.048 U	0.2 U	0.2 U	83.3	0.12 U	0.12 U	0.053 U	1.3	0.005 U	0.005 U	0.052 U	0.044 Ui
LMW19-030310	0.048 U	0.2 U	0.2 U	82.4	0.12 U	0.12 U	0.053 U	1.3	0.005 U	0.005 U	0.052 U	0.043 Ui
LMW26-030310	0.048 U	0.2 U	0.2 U	502	0.12 U	0.12 U	0.053 U	16	0.028	0.022	0.052 U	0.064 Ui
LMW27-030410	0.048 U	0.2 U	0.2 U	136	0.12 U	0.12 U	0.053 U	25	0.028	0.03	0.07 J	0.066 Ui
LMW30-030210	0.048 U	0.4 J	0.2 U	2900	0.12 U	0.12 U	0.053 U	0.11 J	0.008 J	0.006 U	0.06 J	0.13 Ui
LMW31-030210	0.048 U	0.2 J	0.2 U	5590	0.12 U	0.12 U	0.053 U	0.73	0.014 J	0.012 J	0.07 J	0.094 Ui
LMW32D-030210	0.048 U	0.2 U	0.2 U	2970	0.12 U	0.12 U	0.053 U	0.066 U	0.007 J	0.006 U	0.18 J	0.028 U
LMW32S-030210	0.048 U	0.2 U	0.2 J	5580	0.12 U	0.12 U	0.053 U	0.066 U	0.027 J	0.027 J	0.052 U	0.11 Ui
LMW33-030310	0.048 U	0.2 U	0.4 J	449	0.12 U	0.12 U	0.053 U	0.26 J	0.052 J	0.054 J	0.06 J	0.095 Ui
LMW34-030310	0.048 U	0.2 U	0.2 U	222	0.12 U	0.12 U	0.053 U	4.9	0.013 J	0.012 J	0.12 J	0.17 Ui
LMW35-030210	0.048 U	0.2 U	0.2 U	2770	0.12 U	0.12 U	0.053 U	0.1 J	0.011 J	0.01 J	0.09 J	0.15 Ui
BG-01-030310	0.048 U	0.2 U	0.2 U	170	0.12 U	0.12 U	0.053 U	0.066 U	0.013 J	0.013 J	0.1 J	0.049 Ui
BG02-030210	0.048 U	0.2 U	0.2 U	59.3	0.12 U	0.12 U	0.053 U	1.4	0.012 J	0.012 J	0.052 U	0.14 Ui
BG-03-030310	0.048 U	0.2 U	0.2 U	244	0.12 U	0.12 U	0.053 U	0.13 J	0.006 J	0.005 U	0.12 J	0.087 Ui

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-10. LU-OU3, Five-Year Review Groundwater Monitoring Event Data (Continued)

Sample ID	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	Trichloroethene (TCE)	Vinyl Chloride	Zinc	Zinc-Dissolved
Screening Level [a]	*10000*		*30*	*150*	*81*	*81*
ROD Cleanup Goal					*76.6*	*76.6*
LMW3-030210	0.091 U	0.068 U	0.26 J	0.075 U	213	199
LMW7-030410	0.091 U	0.068 U	0.28 J	0.075 U	11.2	11.6
LMW9-030410	0.091 U	0.068 U	0.1 U	0.075 U	17.9	18.1
LMW12-030410	0.091 U	0.068 U	1.1	0.075 U	39.4	37
LMW18-030310	0.091 U	0.068 U	0.38 J	0.075 U	9.4	4
LMW19-030310	0.091 U	0.068 U	0.4 J	0.075 U	9.8	4.8
LMW26-030310	0.091 U	0.068 U	0.42 J	0.075 U	60.4	59.5
LMW27-030410	0.091 U	0.068 U	0.32 J	0.075 U	365	379
LMW30-030210	0.091 U	0.068 U	0.1 U	0.075 U	3.7	3.98
LMW31-030210	0.091 U	0.068 U	0.1 U	0.075 U	71.3	63.4
LMW32D-030210	0.091 U	0.068 U	0.1 U	0.075 U	0.89 J	0.19 U
LMW32S-030210	0.091 U	0.068 U	0.1 U	0.075 U	92.8	93
LMW33-030310	0.091 U	0.068 U	0.1 U	0.075 U	7.44	7.29
LMW34-030310	0.091 U	0.068 U	0.53	0.075 U	6.4	6.4
LMW35-030210	0.091 U	0.068 U	0.1 U	0.075 U	2.74	5.07
BG-01-030310	0.091 U	0.068 U	0.1 U	0.075 U	7.8	7.6
BG02-030210	0.091 U	0.068 U	0.13 J	0.075 U	89.5	89.6
BG-03-030310	0.091 U	0.068 U	0.1 U	0.24 J	0.7	0.9

Notes: All concentrations in µg/L.

Highlight indicates concentration above screening level or ROD cleanup goal.

[a] Screening Levels based on National Recommended Water Quality Criteria for Marine (acute or chronic) and Human Health for Consumption of Organism Only.

Table 6-11. LU-OU3, Long-Term Monitoring Groundwater Data

Sample ID	Sample Date	Benzene (µg/L)	Tetrachloroethene (µg/L)	Copper (µg/L)	Copper, Dissolved (µg/L)	Lead (µg/L)	Lead, Dissolved (µg/L)	Zinc (µg/L)	Zinc, Dissolved (µg/L)
	ROD Cleanup Goal:	***71***	***8.8***	***2.9***	***2.9***	***5.8***	***5.8***	***76.6***	***76.6***
UPLANDS									
LMW12-102105	10/21/2005	ND		–	–	–	–	–	–
LMW18-102105	10/21/2005	ND		ND	–	ND	–	–	–
LMW26-102105	10/21/2005	ND		–	–	–	–	–	–
LMW27-102105	10/21/2005	ND		–	–	–	–	–	–
LMW7-102105	10/21/2005	ND		–	–	ND	–	–	–
LMW9-102105	10/21/2005	ND		–	–	–	–	–	–
LMW12-040406	4/4/2006	0.5 U 0.81	***9.1***	–	–	–	–	–	–
LMW18-040406	4/4/2006	0.5 U ND	1.4	***5.63***	2.46			–	–
LMW26-040406	4/4/2006	0.5 U 4.2	6.6	–	–	–	–	–	–
LMW27-040406	4/4/2006	0.5 U 0.81	0.66	–	–	–	–	–	–
LMW7-040406	4/4/2006	0.5 U ND	1.2	–	–	2 U	2 U	–	–
LMW9-040406	4/4/2006	0.5 U ND	0.63	–	–	–	–	–	–
LM18-102406	10/24/2006	0.5 U	0.26 J	***3.51***	***8.23*** 1.1	0.671 0.11		–	–
LMW12-102406	10/24/2006	0.31 J	6.5	–	–	–	–	–	–
LMW26-102406	10/24/2006	0.5 U	6.5	–	–	–	–	–	–
LMW27-102406	10/24/2006	0.5 U	0.23 J	–	–	–	–	–	–
LMW7-102406	10/24/2006	0.5 U	0.5 U	–	–	0.035	0.05	–	–
LMW9-102406	10/24/2006	0.5 U	0.5 U	–	–	– 0.336	–	–	–
LMW25-102606	10/26/2006	0.39 J	0.5 U	***3.15***	0.38		–	14.6	4.98
LMW3-102606	10/26/2006	0.5 U	***12***	1.99	1.92	–	–	65.8	67.8
LMW12-041007	4/10/2007	0.5 U	***17***	–	–	–	–	–	–
LMW26-041007	4/10/2007	0.5 U	***9.9***	–	–	–	–	–	–
LMW27-041007	4/10/2007	0.5 U	***9.8***	–	–	–	–	–	–
LMW18-041107	4/11/2007	0.5 U	1.4	***3.28***	1.96	0.534	0.31	–	–
LMW3-041107	4/11/2007	0.5 U	***9.3***	***4***	***3.89***	–	–	237	235
LMW7-041107	4/11/2007	0.5 U	3.2	–	–	0.03	0.02 U	–	–
LMW9-041107	4/11/2007	0.5 U	0.5 U	–	–	–	–	–	–
LMW12-101007	10/10/2007	0.55	8.1	–	–	–	–	–	–
LMW18-101007	10/10/2007	0.5 U	1.1	***25.4***	2.26	***7.39***	0.137	–	–
LMW26-101007	10/10/2007	0.5 U	7.8	–	–	–	–	–	–
LMW27-101007	10/10/2007	0.15 J	0.25 J	–	–	–	–	–	–

Table 6-11. LU-OU3, Long-Term Monitoring Groundwater Data (Continued)

Sample ID	Sample Date	Benzene (µg/L)	Tetrachloroethene (µg/L)	Copper (µg/L)	Copper, Dissolved (µg/L)	Lead (µg/L)	Lead, Dissolved (µg/L)	Zinc (µg/L)	Zinc, Dissolved (µg/L)
	ROD Cleanup Goal:	***71***	***8.8***	***2.9***	***2.9***	***5.8***	***5.8***	***76.6***	***76.6***
LMW3-101007	10/10/2007	0.5 U	6.4	2.38	2.3	–	–	50.2	46.7
LMW7-101007	10/10/2007	0.5 U	0.25 J	–	–	0.047	0.036	–	–
LMW9-101007	10/10/2007	0.5 U	0.5 U	–	–	–	–	–	–
LMW26-042208	4/22/2008	0.5 U	***12***	–	–	–	–	–	–
LMW12-042308	4/23/2008	0.5 U	***18***	–	–	–	–	–	–
LMW18-042308	4/23/2008	0.5 U	1.3	***7.19***	2.05	2.08	0.095	–	–
LMW27-042308	4/23/2008	0.5 U	***11***	–	–	–	–	–	–
LMW3-042308	4/23/2008	0.5 U	4.4	1.5	1.44	–	–	43.7	41.6
LMW7-042308	4/23/2008	0.5 U	3.9	–	–	0.029	ND	–	–
LMW9-042308	4/23/2008	0.5 U	0.5 U	–	–	–	–	–	–
LMW-26-102808	10/28/2008	0.060 J	8.6	–	–	–	–	–	–
LMW12-102908	10/29/2008	0.46 J	7.6	–	–	–	–	–	–
LMW18-102908	10/29/2008	0.5 U	0.5 U	2.83	0.41	0.614	0.027	–	–
LMW27-102908	10/29/2008	0.070 J	0.9	–	–	–	–	–	–
LMW3-102908	10/29/2008	0.5 U	1.8	0.77	0.61	–	–	6.7	5.9
LMW7-102908	10/29/2008	0.5 U	0.81	–	–	0.055	0.02	–	–
LMW9-102908	10/29/2008	0.5 U	0.5 U	–	–	–	–	–	–
LMW25-103008	10/30/2008	0.64	0.5 U	12.2	***11.2***	–	–	***358***	***373***
LMW26-041409	4/14/2009	0.5 U	***14***	–	–	–	–	–	–
LMW27-041409	4/14/2009	0.060 J	***14***	–	–	–	–	–	–
LMW12-041509	4/15/2009	0.5 U	***20***	–	–	–	–	–	–
LMW18-041509	4/15/2009	0.5 U	1.6	***3.83***	1.66	0.997	0.046	–	–
LMW3-041509	4/15/2009	0.5 U	4.8	1.46	1.34	–	–	69	71.4
LMW7-041509	4/15/2009	0.5 U	2.7	–	–	0.084	0.007 B	–	–
LMW9-041509	4/15/2009	0.5 U	1	–	–	–	–	–	–
LMW12-100709	10/7/2009	0.25 J	2.4	–	–	–	–	–	–
LMW18-100709	10/7/2009	0.12 J	0.5 U	2.71	0.39	0.663	0.008 J	–	–
LMW25-100709	10/7/2009	0.53	0.5 U	1.62	0.45	–	–	13.4	1.24
LMW27-100709	10/7/2009	0.10 J	2.6	–	–	–	–	–	–
LMW3-100709	10/7/2009	0.10 J	3.5	1.29	0.78	–	–	8.65	7.27
LMW7-100709	10/7/2009	0.5 U	1.9	–	–	0.6 J	2 U	–	–
LMW9-100709	10/7/2009	0.5 U	0.5 U	–	–	–	–	–	–
LMW26-100809	10/8/2009	0.060 J	***11***	–	–	–	–	–	–

Table 6-11. LU-OU3, Long-Term Monitoring Groundwater Data (Continued)

Sample ID	Sample Date	Benzene (µg/L)	Tetrachloroethene (µg/L)	Copper (µg/L)	Copper, Dissolved (µg/L)	Lead (µg/L)	Lead, Dissolved (µg/L)	Zinc (µg/L)	Zinc, Dissolved (µg/L)
	ROD Cleanup Goal:	***71***	***8.8***	***2.9***	***2.9***	***5.8***	***5.8***	***76.6***	***76.6***
SHORELINE									
LMW18-111705	11/17/2005	0.5 U	2.1	10 U	–	0.45	–	10.8	–
LMW26-111705	11/17/2005	0.5 U	6	***13.4***	–	3.53	–	31.2	–
LMW-31-111705	11/17/2005	0.5 U	0.85	10 U	–	0.2	–	9.5 B, N	–
LMW33-111705	11/17/2005	0.5 U	0.22 J	10 U	–	0.16 B	–	***85.9***	–
LMW34-111705	11/17/2005	0.5 U	0.93	10 U	–	0.39 B	–	70.5	–
BG-01-111805	11/18/2005	0.5 U	0.5 U	10 U	–	0.14	–	10 U	–
BG-02-111805	11/18/2005	0.5 U	0.22 J	10 U	–	0.03	–	5.2 B	–
BG-03-111805	11/18/2005	0.5 U	0.5 U	10 U	–	0.02 U	–	10 U	–
LMW32D-111805	11/18/2005	0.5 U	0.5 U	10 U	–	0.72	–	7.6 B	–
LMW32S-111805	11/18/2005	0.5 U	0.5 U	10 U	–	0.17 B	–	65.9	–
LMW18-040406	4/4/2006	0.5 U	1.4	***5.63***	2.46	1.1	0.11	18.8	8.4 B
LMW26-040406	4/4/2006	0.5 U	6.6	***6.61***	***6.33***	0.11	0.03	***83.2***	***78.5***
BG-01-040506	4/5/2006	0.5 U	0.5 U	2.19	2.06	0.02 U	0.02 U	10 U	10 U
BG-02-040506	4/5/2006	0.5 U	1.2	1.53	1.52	0.02 U	0.01 B	31.4	32
BG-03-040506	4/5/2006	0.5 U	0.5 U	1.77	0.62	0.06	0.02 U	7.7 B	9.3 B
LMW30-040606	4/6/2006	2	0.5 U	10 U	10 U	0.14 B, N	0.18 B, N	10 U	10 U
LMW31-040606	4/6/2006	0.5 U	0.51	***17.4***	***8.7 B***	1.91 N	0.15 B, N	52	46
LMW32D-040606	4/6/2006	0.5 U	0.5 U	10 U	10 U	0.18 B, N	ND	10 U	7.4 B
LMW32S-040606	4/6/2006	0.5 U	0.5 U	10 U	10 U	0.2 N	0.11 B, N	***83.7***	***81.4***
LMW33-040606	4/6/2006	0.5 U	0.25 J	10 U	10 U	ND	ND	12.5	13.6
LMW34-040606	4/6/2006	0.5 U	1.4	10 U	10 U	ND	ND	***82.6***	75.1
LM18-102406	10/24/2006	0.5 U	0.26 J	***3.51***	***8.23***	0.671	0.336	15.9	10.3
LMW26-102406	10/24/2006	0.5 U	6.5	***6.5***	***13.7***	0.478	0.43	41.3	40.8
LMW30-102506	10/25/2006	0.39 J	0.5 U	0.08 B	0.06 B	0.033	0.01 B	10 U	10 U
LMW31-102506	10/25/2006	0.5 U	0.4 J	***4.63***	0.95	0.126	0.029	21.6	15.9
LMW33-102506	10/25/2006	0.5 U	0.23 J	***3.34***	2.36	0.028	0.047	***112***	***109***
LMW34-102506	10/25/2006	0.5 U	0.87	1.98	0.79	0.055	0.027	***120***	***110***
BG-01-102606	10/26/2006	0.5 U	0.5 U	1.17	1.17	0.018 B	0.014 B	10 U	10 U
BG-02-102606	10/26/2006	0.5 U	0.56	2.21	0.72	0.092	0.027	10.4	10.2
BG-03-102606	10/26/2006	0.5 U	0.5 U	0.32	***7.93***	0.025	0.314	10 U	10 U
LMW32D-102606	10/26/2006	0.5 U	0.5 U	0.27	0.12	0.09	0.007 B	10 U	10 U
LMW32S-102606	10/26/2006	0.5 U	0.5 U	2.76	2.41	0.079	0.06	76.3	76
LMW26-041007	4/10/2007	0.5 U	9.9	***6.33***	***4.61***	0.558	0.049	37.4	37.3

Table 6-11. LU-OU3, Long-Term Monitoring Groundwater Data (Continued)

Sample ID	Sample Date	Benzene (µg/L)	Tetrachloroethene (µg/L)	Copper (µg/L)	Copper, Dissolved (µg/L)	Lead (µg/L)	Lead, Dissolved (µg/L)	Zinc (µg/L)	Zinc, Dissolved (µg/L)
	ROD Cleanup Goal:	***71***	***8.8***	***2.9***	***2.9***	***5.8***	***5.8***	***76.6***	***76.6***
LMW31-041007	4/10/2007	0.5 U	0.53	***39.4***	***6.88***	1.46	0.051 X	34.8	10 U
LMW32D-041007	4/10/2007	0.5 U	0.5 U	0.794	0.12	0.31	0.029	10 U	10 U
LMW32S-041007	4/10/2007	0.5 U	0.5 U	***5.94***	***4.3***	0.729	0.083	21	23.1
LMW34-041007	4/10/2007	0.5 U	1.1	2	1.76	0.044	0.029	15.9	14.2
BG01-041107	4/11/2007	0.5 U	0.99	1.15	1.12	0.02 U	0.02 U	10 U	10 U
BG02-041107	4/11/2007	0.5 U	0.96	0.78	0.61	0.024	0.02 U	38	35.3
BG03-041107	4/11/2007	0.5 U	0.5 U	0.753	0.251	0.022 X	0.015 B	4 B	10 U
LMW18-041107	4/11/2007	0.5 U	1.4	***3.28***	1.96	0.534	0.31	79	63.8
LMW33-041107	4/11/2007	0.5 U	0.2 J	***10.9***	***10.2***	0.096	0.044	3.5 B	10 U
LMW30-041207	4/12/2007	0.71	0.5 U	0.483	0.087 B	0.101	0.022	10 U	10 U
LMW30-100907	10/9/2007	0.21 J	0.5 U	0.345	0.156	0.12	0.059	10 U	10 U
LMW31-100907	10/9/2007	0.5 U	0.68	***23***	***5.77***	0.765	0.031	43.4	25
LMW32D-100907	10/9/2007	0.5 U	0.5 U	0.394	0.106	0.135	0.061	10 U	10 U
LMW32S-100907	10/9/2007	0.5 U	0.5 U	2.42	2.28	0.227	0.033	***84.7***	***83.3***
LMW33-100907	10/9/2007	0.5 U	0.21 J	***3.24***	2.8	0.123	0.027	***117***	***118***
LMW18-101007	10/10/2007	0.5 U	1.1	***25.4***	2.26	***7.39***	0.137	***112***	21.3
LMW26-101007	10/10/2007	0.5 U	7.8	***12.8***	***8.63***	0.836 X	0.065 X	47.4	45.4
BG-01-101107	10/11/2007	0.5 U	0.5 U	1.55	1.54	0.015 B	0.008 B	3.4 B	3 B
BG-02-101107	10/11/2007	0.5 U	1	1.76	1.44	0.008 B	0.003 B	45.6	39.5
BG-03-101107	10/11/2007	0.5 U	0.5 U	0.713	0.402	0.006 B	0.02 U	3.1 B	3.1 B
LMW34-101107	10/11/2007	0.5 U	1.6	1.2	1.19	0.004 B	0.034	***85.6***	***81.7***
LMW26-042208	4/22/2008	0.5 U	12	***7.71***	***6.08***	0.911	0.019 B	35.2	33.5
LMW31-042208	4/22/2008	0.5 U	0.48 J	***76.8***	***6.52***	2.38	0.04	***76.7***	21.9
LMW32D-042208	4/22/2008	0.5 U	0.5 U	0.268	0.079 B	0.087	0.012 B	4.8 B	2.6 B
LMW32S-042208	4/22/2008	0.5 U	0.5 U	***3.19***	2.55	0.249	0.03	55.8	53.6
LMW33-042208	4/22/2008	0.5 U	0.25 J	***5.68***	***5.39***	0.03	0.018 B	22.4	22.9
LMW34-042208	4/22/2008	0.5 U	0.92	1.3	***286***	0.074	68400	17.6	- -
LMW18-042308	4/23/2008	0.5 U	1.3	***7.19***	2.05	2.08	0.095	42.2	16.4
BG01-042408	4/24/2008	0.5 U	0.5 U	1.93	1.8	0.021	0.006 B	2.2 B	2.5 B
BG02-042408	4/24/2008	0.5 U	1.3	1.16	1.18	0.007 B	0.007 B	70.3	68.5
BG03-042408	4/24/2008	0.5 U	0.5 U	0.86	0.33	0.018 B	0.006 B	2.5 B	3.3 B
LMW30-042408	4/24/2008	1.3	0.16 J	0.772	0.057 B	0.176	0.018 B	3.8 B	3.4 B
BG-01-102808	10/28/2008	0.5 U	0.5 U	1.03	1.03	0.02 U	0.009 B	2 B	3.1 B
BG-02-102808	10/28/2008	0.5 U	0.65	0.62	0.55	0.007 B	0.018 B	44.9	44

Table 6-11. LU-OU3, Long-Term Monitoring Groundwater Data (Continued)

Sample ID	Sample Date	Benzene (µg/L)	Tetrachloroethene (µg/L)	Copper (µg/L)	Copper, Dissolved (µg/L)	Lead (µg/L)	Lead, Dissolved (µg/L)	Zinc (µg/L)	Zinc, Dissolved (µg/L)
	ROD Cleanup Goal:	***71***	***8.8***	***2.9***	***2.9***	***5.8***	***5.8***	***76.6***	***76.6***
BG-03-102808	10/28/2008	0.06 J	0.5 U	0.55	0.55	0.008 B	0.02 U	10 U	10 U
LMW-26-102808	10/28/2008	0.06 J	8.6	***8.57***	***6.98***	0.18	0.029	40.4	45.8
LMW-33-102808	10/28/2008	0.5 U	0.21 J	***3.72***	2.68	0.097	0.027	65.1	67.5
LMW-34-102808	10/28/2008	0.5 U	0.37 J	0.683	0.47	0.018 B	0.017 B	13	15
LMW18-102908	10/29/2008	0.5 U	0.5 U	2.83	0.41	0.614	0.027	14.7	8.4 B
LMW30-103008	10/30/2008	0.48 J	0.5 U	2.6	0.038 B	0.907	0.018 B	2.3 B, N	ND
LMW31-103008	10/30/2008	0.5 U	0.62	***51.8***	***11.9***	1.27	0.048	***89.1 N***	48.9 N
LMW32D-103008	10/30/2008	0.5 U	0.5 U	0.485	0.407	0.091	0.031	ND	2.1 B, N
LMW32S-103008	10/30/2008	0.5 U	0.5 U	2.74	2.24	0.099	0.037	69.7 N	69.4 N
BG-01-041409	4/14/2009	0.5 U	0.5 U	0.87	0.95	0.02 U	0.02 U	2.2 B	2.2 B
BG-02-041409	4/14/2009	0.5 U	1.4	1.13	0.8	0.008 B	0.014 B	***130***	***118***
BG-03-041409	4/14/2009	0.5 U	0.5 U	0.17	0.17	0.02 U	0.02 U	1.3 B	2 B
LMW26-041409	4/14/2009	0.5 U	***14***	***10.2***	***7.52***	0.925	0.038	40.7	32.1
LMW34-041409	4/14/2009	0.5 U	1.5	1.93	1.66	0.017 B	0.006 B	14.9	13.3
LMW18-041509	4/15/2009	0.5 U	1.6	***3.83***	1.66	0.997	0.046	22.2 N	9.3 B, N
LMW30-041509	4/15/2009	2.7	0.5 U	0.253	0.031 B	2.55	0.203	2.3 B, N	2.5 B, N
LMW31-041609	4/16/2009	0.5 U	0.53	***87.8***	***8.15***	3.06	0.075	***88.3 N***	19.9 N
LMW32D-041609	4/16/2009	0.5 U	0.5 U	0.265	0.069 B	0.137	0.012 B	3.2 B, N	4.3 B, N
LMW32S-041609	4/16/2009	0.5 U	0.08 J	***4.18***	***2.96***	0.377	0.113	22.6 N	26.6 N
LMW33-041609	4/16/2009	0.5 U	0.23 J	***5.57***	***7.41***	0.132	0.082	11 N	10.4 N
BG-01-100609	10/6/2009	0.5 U	0.5 U	1.12	1.16	0.082	0.028	0.7	0.6
LMW30-100609	10/6/2009	0.35 J	0.5 U	0.603	0.017 J	0.176	0.02 U	0.73	0.16 J
LMW31-100609	10/6/2009	0.5 U	0.48 J	***15.5***	***6.85***	0.532	0.257	56.3	45.5
LMW32D-100609	10/6/2009	0.5 U	0.5 U	0.275	0.049 J	0.242	0.018 J	2.46	0.47 J
LMW32S-100609	10/6/2009	0.5 U	0.09 J	2.77	2.67	0.206	0.131	***82.8***	***84.9***
LMW33-100609	10/6/2009	0.5 U	0.18 J	2.74	2.85	0.265	0.075	57.4	62.8
LMW18-100709	10/7/2009	0.12 J	0.5 U	2.71	0.39	0.663	0.008 J	8.4	4.9
BG-02-100809	10/8/2009	0.5 U	0.6	0.79	0.7	0.013 J	0.023	***77.2***	68.3
BG-03-100809	10/8/2009	0.06 J	0.5 U	0.33	0.32	0.015 J	0.02 U	0.3 J	0.44 J
LMW26-100809	10/8/2009	0.06 J	***11***	***26.3***	***15.6***	0.816	0.18	24.7	24.6
LMW34-100809	10/8/2009	0.5 U	0.99	1.76	1.7	0.044	0.01 J	6.65	6.33

Notes: Highlight indicates concentration exceeds ROD Cleanup Goal.
– = Not analyzed
B = Indicates compound is reported at an estimated concentration below the laboratory reporting limit but above the method detection limit.
J = Estimated.
N = Indicates the Matrix Spike sample recovery is not within control limits.
ND = Not detected.
U = Not detected at or above the stated limit.

APPENDIX A

Lockheed Upland OU3, Site Visit Photos

APPENDIX A – LOCKHEED UPLAND OU, SITE VISIT PHOTOS

Photograph 1. Hay bales along boundary with the West Waterway.

Photograph 2. Hay bales and ponded water near Monitoring Well 33.

Photograph 3. Ponded water within central portion of Lockheed Upland OU.

Photograph 4. Ponded water at southern boundary of Lockheed Upland OU.