
Memorandum

To	Ken Thiessen, R.G., C.E.G. Oregon Dept. of Environmental Quality	File no.	0060-003-004
		cc	Victoria Wark, NuStar Energy L.P
From	Ian Maguire, P.E. Cascadia Associates, LLC		
Date	April 14, 2020		
Subject	Summary of Outfall WR-209 Investigations and Sampling Shore Terminals LLC, 9420 NW St. Helens Road (U.S. Highway 30)		

Cascadia Associates, LLC (Cascadia) has prepared this memorandum on behalf of Shore Terminals LLC (Shore Terminals) to summarize the status of source control activities; specifically, this memorandum documents the rationale for evaluating Shore Terminals' contribution to the discharge from outfall WR-209 as an element of the source control evaluation (SCE) groundwater pathway rather than the stormwater pathway.

On January 2, 2020, representatives of Shore Terminals met with the Oregon Department of Environmental Quality (DEQ) to provide an update on the status of ongoing work at the Shore Terminals Portland facility (the Facility; see Figure 1). One discussion topic during the January 2020 meeting was the status of outfall WR-209.¹ Stormwater from the Facility does not drain to the conveyance system connected to outfall WR-209; however, dry weather discharge has been observed at outfall WR-209, which indicates that groundwater intrusion can occur when groundwater elevations are sufficiently high. Based on the understanding that the Facility's contribution to the discharge is limited to groundwater, DEQ indicated Shore Terminals should evaluate outfall WR-209 as an element of the groundwater pathway rather than an element of the stormwater pathway. DEQ then requested that Shore Terminals prepare a summary of information related to outfall WR-209 to assist in the evaluation of discharges from outfall, including previously conducted investigations and sampling activities associated with the conveyance line to document that Shore Terminals' contribution is restricted to groundwater.

This summary memorandum includes a brief background on the Facility; a summary of the configuration of the conveyance line to outfall WR-209; a summary of the scope and findings of the historical investigations of outfall WR-209 conducted prior to the acquisition of the Facility by Shore Terminals; a description of the investigations performed by Shore Terminals as part of the SCE of the Facility; and conclusions and recommendations for a source control decision for Shore Terminals' discharge of groundwater at outfall WR-209.

¹ Historical documents referred to outfall WR-209 as WP-209. The identification WR-209 is used in this document for clarity and consistency.

BACKGROUND

The Facility is an approximately 29-acre bulk petroleum storage terminal located on the western bank of the Willamette River near River Mile 5. The Facility site plan is presented on Figure 2.

The Facility is bounded by St. Helens Road (Highway 30) on the west, by the Willamette River on the east, and is bisected by a set of north-south-running railroad tracks. On the north, the Facility is bordered by the Arco/BP bulk petroleum terminal (dba Seaport Midstream) and to the south by the Foss Maritime (dba Brix Maritime) property. The Facility is divided into two operations areas: the Northern Facility Area, consisting of approximately 21 acres which was owned by Exxon Mobil and its predecessors from approximately 1928 until December 2001, when it was sold to Shore Terminals; and the Southern Facility Area, which consists of approximately 8 acres and was owned by Time Oil Co. (Time Oil) until it was acquired by Shore Terminals in September 1999. Exxon Mobil still operates a lubricant distribution facility which is located directly north of the Facility as shown on Figure 2.

The Northern Facility Area consists of three tank fields (Tank Fields 1 through 3), the Loading Rack, and a dock for offloading/loading bulk petroleum (referred to as the P-2 Dock), as well as shop and office buildings. The Southern Facility Area was largely undeveloped until 1979 when Tank Field 4 was constructed. The former Time Oil tract now includes Tank Fields 4 and 5 and a dock for offloading/loading bulk petroleum (referred to as the P-3 Dock), as well as an office building. Tank Field 5 was constructed in 2007 and contains two aboveground storage tanks. Each tank field is surrounded by a concrete containment wall.

A number of investigations, several including assessments of the conveyance line to outfall WR-209, were completed by Kleinfelder and Acton Mickelson Environmental (AME) on behalf of Exxon Mobil between 2001 and 2011 pursuant to a 1997 record of decision (ROD) by the DEQ (referred to herein as the Facility ROD) and the Voluntary Cleanup Agreement No. ECVC-NWR-01-15 (VCP Agreement; DEQ, 2002) between the DEQ and Exxon Mobil finalized in 2002. Effective December 22, 2011, Shore Terminals agreed to comply with this VCP Agreement. Stormwater sampling activities performed by Shore Terminals were completed to support source control activities pursuant to the VCP Agreement and included sampling discharge from outfall WR-209.

CONFIGURATION OF CONVEYANCE TO OUTFALL WR-209

Outfall WR-209 is a 24-inch-diameter concrete pipe that discharges stormwater that collects in a ditch (the WR-209 ditch) located on property owned by the Oregon Department of Transportation and leased to the Portland & Western Railroad (PNWR) for use as a short line railroad. The short line railroad bisects the Facility, as shown on Figure 2. The location of the WR-209 ditch relative to the short line railroad is shown on Figure 3.

The conveyance line that connects the ditch to outfall WR-209 travels beneath Tank Field 3, as shown on Figure 3. The WR-209 ditch receives runoff from Saint Helens Road (U.S. Highway 30) as well as overflow discharge from the bioswale built for stormwater discharging from the Olympic

Pipeline Company (OPLC) facility, located northwest of the WR-209 ditch inlet as shown on Figure 2. A small catch basin located on the driveway into the Facility discharges to the hillside above the WR-209 ditch and some of this surface water could theoretically reach the ditch via overland flow, however, it appears that most, if not all percolates into the ground. The catch basin is near the entrance to the facility from Highway 30 and is located upgradient of any operational or storage areas. Nevertheless, Shore Terminals plans to abandon the catch basin by mid-May 2020.

Shore Terminals does not own or maintain the WR-209 outfall, ditch, or conveyance line beneath Tank Field 3. Ownership of the outfall and associated conveyance line has not been determined. Outfall WR-209 was included in the SCE conducted at the Facility during which it was determined that no stormwater from the Facility contributed to this conveyance line or discharged from outfall WR-209 (Apex, 2015).

SUMMARY OF OUTFALL WR-209 INVESTIGATIONS PRIOR TO SHORE TERMINALS OWNERSHIP

A number of investigations were completed by Kleinfelder and AME on behalf of ExxonMobil between 2001 and 2009. The objectives of the investigations were to:

- Map the route of the conveyance piping;
- Evaluate whether groundwater intrusion was occurring into the conveyance line prior to discharge from outfall WR-209; and
- Determine whether the water quality in the ditch where water enters the conveyance line leading to outfall WR-209 differed from the water quality discharged from the outfall.

The scope of each investigation is presented below and a summary of the key findings of the historical investigations is then provided.

October 2001 – 2002. Between October 2001 and October 2002, Kleinfelder conducted an investigation of the storm sewer outfalls present at the Facility. The investigation included a review City of Portland records and provided a description of the outfalls. The investigation work included collecting a water sample from outfall WR-209. The sample was analyzed for total petroleum hydrocarbons (TPH; gasoline range [TPHg]; diesel range [TPHd]; and oil range [TPHo]); benzene, toluene, ethylbenzene, and xylene (BTEX); methyl-tert-butyl-ether (MTBE); naphthalene; and total and dissolved arsenic, copper, lead, and zinc. The results were reported in the *Storm Sewer Outfall Sampling and Abandoning Storm Sewer Outfall* report (Kleinfelder, 2003) and a copy of the report is included in Attachment A of this memorandum for reference. Analytical results for the sample collected from WR-209 are included on tables in Appendix A of this memorandum.

2003/2004. On May 17, 2004, Kleinfelder submitted the Storm Sewer WR-209 Sampling Report documenting investigation activities completed in 2003. The purpose of the WR-209 investigation was to identify drainage areas contributing flow, identify placement of the conveyance line, and characterize the flow from outfall WR-209. Flow measurements and surface water samples were

collected at the WR-209 ditch inlet and outfall WR-209 on May 13 and August 14, 2003. The samples were analyzed for TPHg, TPHd, TPHo, BTEX, polycyclic aromatic hydrocarbons (PAHs), and total and dissolved arsenic, copper, lead, and zinc. In addition, a video inspection of the conveyance line to outfall WR-209 was conducted on July 3, 2003 using a track mounted camera. Results were reported in the *Storm Sewer WP-209 Sampling Report* (Kleinfelder, 2004); a copy of the report is included in Attachment B of this memorandum for reference. The results of the samples collected from outfall WR-209 are tabulated in Appendix A.

2006/2007. Additional investigation activities were completed by AME on behalf of ExxonMobil in 2006 and 2007. The results of the investigation were presented in the *Report on Additional Investigation of Storm Sewer WR-209* (AME, 2007), which is included in Attachment C of this memorandum for reference. AME investigated the origin and configuration of storm sewer lines in the Facility vicinity to identify which lines might be contributing to outfall WR-209 and to assess possible sources for the petroleum constituents and MTBE identified in the WR-209 outfall samples in 2003. The scope of work included:

- Accessing a manhole within Highway 30 adjacent to the entrance to the terminal and completed a video inspection of the storm sewer line from Highway 30 towards the river.
- Obtaining a water samples from the sewer line beneath Highway 30.
- Obtaining a sample of water flowing into an unidentified sewer line from the ditch next to the railroad tracks.
- Obtaining a sample of water discharged at outfall WR-209.
- Comparing the concentration of constituents observed in the collected samples to groundwater analytical data from monitoring wells present in Tank Field 3 and adjacent to the OLPC.

Results of the water samples are included on the tables contained in Appendix A.

2008/2009. The 2009 *Updated Focused Feasibility Study* prepared by AME on behalf of Exxon Mobil summarized additional investigations and results for the WR-209 conveyance line. The scope of the storm sewer investigations conducted in 2008 and 2009 included:

- Mapping of the layout and elevations of the storm sewers.
- Characterization of the flow at outfall WR-209, at the highway outfall, and at the inlet of the sewer line adjacent to the railroad tracks during dry conditions.
- Characterization of the flow at outfall WR-209, at the highway outfall, and at the inlet of the sewer line adjacent to the railroad tracks during a rainfall event.

The 2009 *Updated Focused Feasibility Study* is included in Attachment D of this memorandum for reference. Some of the findings presented below were included as background material in the *Work Plan for Slurry Wall Repairs*, submitted to DEQ on September 16, 2011, which is included in

Attachment E of this memorandum as the details were not included in the 2009 *Updated Focused Feasibility Study*. The results of the 2008 and 2009 sampling events completed at outfall WR-209 are listed in the tables included in Appendix A.

Summary of Key Findings of the Exxon Mobil investigations of WR-209:

- Flow into the WR-209 conveyance line originates on the slope west of the railroad tracks and from the area west of the railroad tracks; the flow gathers in the WR-209 ditch adjacent to the inlet to the conveyance line to the WR-209 outfall.
- Dry weather discharge from the WR-209 outfall was identified in 2002, suggesting groundwater intrusion into the conveyance line.
- Flow measurements collected in 2003 at the WR-209 outfall and WR-209 ditch inlet identified increased flow at the outfall relative to the inlet during both events, supporting the occurrence of groundwater intrusion when groundwater levels were high. Comparison of the estimated invert level of the conveyance line under Tank Farm 3 with groundwater elevations, confirmed that seasonal high groundwater elevations could intersect with the conveyance line in the center to western portion of Tank Farm 3.
- Several rounds of water samples were collected contemporaneously from the WR-209 ditch inlet and discharge from the WR-209 outfall, and the results typically indicated higher petroleum constituent concentrations in the discharge at the WR-209 outfall than in the WR-209 ditch inlet sample (see tables in Appendix A of this memorandum for a tabulation of results); however, the discharge results decreased with time. Results from the sampling conducted in 2008 and 2009 indicated petroleum hydrocarbon concentrations that were consistent between inlet and discharge. The metals results were comparable between the inlet and discharge samples in each of the investigations.
- Comparison of the discharge sample results to groundwater analytical data from wells located near the conveyance line showed that the petroleum hydrocarbon concentrations were much greater in the discharge samples collected from the WR-209 outfall than in the groundwater samples from nearby wells.
- A video inspection initiated from the outfall encountered wood debris up the pipe at 59 feet which prevented the camera from advancing further. Radial cracks were observed in the concrete pipe and groundwater intrusion into the concrete pipe was observed approximately 43 feet from the end of the pipe. Video inspection of the pipe starting at the WR-209 ditch inlet encountered debris at approximately 30 feet downpipe and the camera was unable to progress further.

SOURCE CONTROL EVALUATION

Outfall WR-209 was included in the SCE to evaluate potential Facility contributions via groundwater intrusion to discharge at the outfall. Stormwater samples were collected from both the WR-209 ditch inlet and from the WR-209 outfall on November 16, 2011, November 29, 2012, September 27, 2013, and January 29, 2014. The results of the WR-209 source control stormwater sampling were presented in the *Source Control Evaluation Report*, submitted to DEQ on March 16, 2015. The stormwater samples were analyzed for total and dissolved metals (aluminum, antimony, arsenic, cadmium, chromium, copper, lead, manganese, nickel, silver, and zinc), polychlorinated biphenyls (PCBs), organochlorine pesticides, volatile organic compounds (VOCs), phthalate esters, PAHs, TPH, and total suspended solids (TSS). Results for the samples collected from the outfall WR-209 are presented in Table 1; results for the samples collected from the WR-209 ditch inlet are tabulated in Table 2. The Portland Harbor Superfund Site Record of Decision (PHSS ROD) was not available at the time of the SCE, so the data were compared to Joint Source Control Strategy Screening Level Values (JSCS SLVs; DEQ, 2005). The PHSS ROD was published in January 2017; therefore, the tables included with the SCE have been updated herein to compare the collected data to the PHSS ROD Cleanup Levels (Table 17 of the ROD; EPA, 2017). If PHSS ROD Cleanup Levels are not available for a specific constituent, the comparison of the constituent concentrations to the JSCS SLV was retained.

Exceedances of the PHSS ROD Cleanup Levels or JSCS SLVs observed in the WR-209 samples were generally limited to metals and PAHs. The metals concentrations detected in the discharge from the WR-209 outfall were within typical ranges for industrial stormwater in Portland Harbor, with the exception of the November 16, 2011 sample from the outfall when several metals (arsenic, cadmium, chromium, lead, nickel, and silver) were above the typical range. During the November 16, 2011 sampling event, the metals concentrations in the discharge from the WR-209 outfall sample were typically higher than those detected in the WR-209 ditch sample; during the remaining sampling events, the metals concentrations were comparable between the ditch and outfall samples (see Tables 1 and 2).

The SCE concluded that groundwater intrusion was likely occurring based on the observance of higher flow rates of discharge at the WR-209 outfall relative to flow into the WR-209 ditch inlet to the conveyance line. Additionally, the SCE concluded that legacy sediments and debris in the conveyance line are likely impacting the quality of the discharge from the outfall based on the following evidence:

- Higher petroleum constituent concentrations in the discharge samples relative to the inlet samples;
- Significantly lower petroleum constituent concentrations in adjacent groundwater relative to WR-209 outfall discharge (based on the comparison completed by Exxon Mobil); and
- Intermittently higher concentrations of metals in the ditch inlet samples relative to the outfall samples.

RECENT DRY WEATHER FLOW SAMPLING

Dry weather flow was observed at the WR-209 outfall on August 16, 2017, and samples were collected for the following analyses: total and dissolved metals (aluminum, antimony, arsenic, cadmium, chromium, copper, lead, manganese, nickel, silver, and zinc), VOCs, semi-volatile organic compounds (SVOCs), PAHs, and TPH. Additional dry weather flow samples were collected on September 8, 2017, for organochlorine pesticides and phthalates esters analysis. Samples were not analyzed for PCBs because PCBs were not detected during the SCE stormwater sampling.

Prior to collecting the dry weather water samples from the WR-209 outfall, the WR-209 ditch was inspected to verify that no water was flowing into the conveyance line from the WR-209 ditch inlet. Groundwater elevations beneath the facility were higher than typical for the summer months of 2017 due to a particularly wet rainy season in 2016/2017. The observed dry weather discharge from the WR-209 outfall confirmed that groundwater intrusion into the conveyance line occurs when groundwater levels are elevated and intersect with the conveyance line.

The results of the dry weather samples are summarized in Table 1. Pesticides, VOCs, SVOCs, phthalates (except for bis(2-ethylhexyl)phthalate), and TPH were not detected in the dry weather sample or were detected below the PHSS ROD Cleanup Levels or JSCS SLVs. Bis(2-ethylhexyl)phthalate was detected in the dry weather sample at a concentration of 0.943 milligrams per liter (mg/L) which is above the PHSS ROD criteria of 0.2 mg/L. As shown on Table 1, metals concentrations were below applicable cleanup levels, with the exception of arsenic and manganese. PAH concentrations were below the PHSS ROD Cleanup Levels, with the exception of benzo(a)anthracene, benzo(b)fluorene, and chrysene, which were slightly above the low PHSS ROD Cleanup Levels for these compounds (Table 1).

In addition to comparing the constituents to the PHSS ROD criteria, Tables 3 and 4 compare concentrations of metals and PAHs, respectively, in the August 2017 dry weather sample to metals and PAH concentrations detected in groundwater samples collected from monitoring well KMW02. Based on the historical research performed by Exxon Mobil, well KMW02 is located adjacent to the WR-209 conveyance line and is in the approximate location of anticipated groundwater intrusion into the pipeline. As can be seen from Table 3, metals concentrations are comparable or lower in the groundwater samples relative to the dry weather sample from the WR-209 outfall, with the exception of manganese (which is not a constituent of concern at the Facility). As shown in Table 4, PAH concentrations are generally non-detect in the groundwater samples, and where detected, are lower than the concentrations detected in the dry weather sample from outfall WR-209 with just one exception. Benzo(a)pyrene is slightly higher in one groundwater sample than the estimated concentration for this compound in the dry weather sample from outfall WR-209. These results show that groundwater is not the source of the metals and PAHs observed in the discharge from outfall WR-209 and support that legacy sediments present within the conveyance line are contributing to the discharge from the outfall.

CONCLUSIONS AND RECOMMENDATION

The WR-209 outfall receives water from the ditch adjacent to the railroad tracks where water enters a conveyance line that is routed beneath Tank Field 3 before discharging to the Willamette River via the WR-209 outfall. Stormwater from the Facility does not discharge to the WR-209 outfall². The WR-209 ditch receives surface water contributions by overland migration from a pipe that discharges runoff from Highway 30 to the hillside above the ditch as well as discharge from the bioswale that accepts stormwater from the OPLC facility.

Groundwater intrusion from beneath the Facility into the conveyance line was researched by Exxon Mobil between 2002 and 2007 and was confirmed by Cascadia (on behalf of Shore Terminals) in August/September 2017. This groundwater intrusion enters the conveyance line near the location of monitoring well KMW02. As shown on Tables 3 and 4, concentrations of constituents of concern in the discharge from outfall WR-209 are either non-detect or below PHSS ROD surface water criteria in groundwater adjacent to the conveyance line. Comparison of groundwater data from well KMW02 collected between 2015 and 2020 to results of outfall WR-209 discharge support that groundwater is not contributing to exceedances of PHSS ROD surface water criteria. Higher concentrations in the discharge from the WR-209 outfall relative to groundwater from KMW02 can be explained by legacy sediments in the conveyance line. Furthermore, the legacy sediments in the conveyance line also explain the higher concentrations in the discharge from the WR-209 outfall relative to the WR-209 ditch inlet.

It is our opinion that there is sufficient data to render a source control decision relative to Shore Terminals contribution to the discharge from outfall WR-209. The summary and evaluation of data presented herein supports the conclusion that Shore Terminals' contribution to the discharge at outfall WR-209 is limited to groundwater intrusion and this groundwater does not represent a recontamination threat to the PHSS.

Maintenance of the conveyance line, including removal of legacy solids, is the responsibility of the owner of the line. Although both Shore Terminals and Exxon Mobil have conducted research to identify the owner of the conveyance line and outfall, no conclusive information has been found.

² With the exception of the limited potential from the catch basin near the facility entrance, which will be abandoned by Shore Terminals no later than mid-May 2020, barring delays due to the COVID-19 pandemic.

REFERENCES

- Acton Mickelson Environmental, Inc (AME, 2007). *Report on Additional Investigation of Storm Sewer WP-209, Former Mobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon.* February 15, 2007.
- AME, 2009. *Updated Focused Feasibility Study. NuStar Portland Terminal, Oregon.* May 28, 2009.
- AME, 2011. *Work Plan for Slurry Wall Repairs, NuStar Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon. September 16, 2011.*
- Apex Companies, LLC (Apex), 2015. *Source Control Evaluation, Shore Terminals LLC, Portland, Oregon.* March 16, 2015.
- Kleinfelder (2003). *Storm Sewer Outfall Sampling and Abandoning Storm Sewer Outfall, Former ExxonMobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon.* April 30, 2003.
- Kleinfelder (2004). *Storm Sewer WP-209 Sampling, Former ExxonMobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon.* May 17, 2004.
- Oregon Department of Environmental Quality (DEQ), 2002. *Voluntary Cleanup Agreement No. ECV- NWR-01-15 (VCP Agreement; DEQ, 2002).*
- DEQ and EPA, 2005. *Portland Harbor Joint Source Control Strategy.* December 2005; updated 2007.
- United States Environmental Protection Agency (EPA), 2017. *Record of Decision Portland Harbor Superfund Site Portland, Oregon.* January 2017; Table 17 updated January 14, 2020.

TABLES

Table 1	Stormwater Data for Outfall WP-209
Table 2	Stormwater Data for Outfall WP-209 Ditch
Table 3	Comparison of metals from WR-209 (Dry Weather) and Well KMW02
Table 4	Comparison of PAHs from WR-209 (Dry Weather) and Well KMW02

FIGURES

Figure 1	Facility Location Map
Figure 2	Facility Site Plan
Figure 3	Tank Field 3

APPENDIX

Appendix A	Tabulation of Historical WR-209/WR-209 Ditch Results (collected by others)

ATTACHMENTS

- Attachment A Kleinfelder (2003). *Storm Sewer Outfall Sampling and Abandoning Storm Sewer Outfall, Former ExxonMobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon*. April 30, 2003.
- Attachment B Kleinfelder (2004). *Storm Sewer WP-209 Sampling, Former ExxonMobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon*. May 17, 2004.
- Attachment C Acton Mickelson Environmental, Inc (AME, 2007). *Report on Additional Investigation of Storm Sewer WP-209, Former Mobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon*. February 15, 2007.
- Attachment D AME, 2009. *Updated Focused Feasibility Study. NuStar Portland Terminal, Oregon*. May 28, 2009.
- Attachment E AME, 2011. *Work Plan for Slurry Wall Repairs, NuStar Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon*. September 16, 2011.

TABLES

Table 1
Stormwater Data for Outfall WR-209
Shore Terminals, LLC – Portland Facility
Portland, Oregon

	Units	JSCS SLV ^{2,3}	Cleanup Level PHSS ROD	TEF ⁶	WR-209 Outfall																								
					11/16/2011										11/29/2012					9/27/2013					9/27/2013				
					Total					Dissolved					Total					Total					Total DUP				
					Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ
Organochlorine Pesticides by EPA Method 8081B																													
α - BHC	mg/L	0.0049	--	--	<1.95	U	1.95	--	--	<0.00415	U	0.00415	--	--	<0.00371	U	0.00371	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
β - BHC	mg/L	0.017	--	--	<1.37	U	1.37	--	--	<0.00291	U	0.00291	--	--	<0.0026	U	0.0026	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
γ - BHC (Lindane)	mg/L	0.052	--	--	<1.96	U	1.96	--	--	<0.00418	U	0.00418	--	--	<0.00374	U	0.00374	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
δ - BHC	mg/L	0.037	--	--	<1.02	U	1.02	--	--	<0.00217	U	0.00217	--	--	<0.00225	U	0.00225	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Heptachlor	mg/L	0.000079	--	--	<1.04	U	1.04	--	--	<0.00222	U	0.00222	--	--	<0.00199	U	0.00199	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Heptachlor epoxide	mg/L	0.000039	--	--	<0.682	U	0.682	--	--	<0.00145	U	0.00145	--	--	<0.0013	U	0.0013	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Aldrin	mg/L	0.00005	0.00000077	--	<0.951	U	0.951	--	--	<0.00203	U	0.00203	--	--	<0.00181	U	0.00181	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Chlordane	mg/L	0.00081	--	--	<1.03	U	1.03	--	--	<0.0213	U	0.0213	--	--	<0.019	U	0.019	--	--	<0.189	U,H	0.189	--	--	<0.19	U,H	0.19	--	--
Endosulfan alpha-	mg/L	0.056	--	--	<0.453	U	0.453	--	--	<0.000965	U	0.000965	--	--	<0.000863	U	0.000863	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Endosulfan beta-	mg/L	0.056	--	--	<0.684	U	0.684	--	--	<0.00146	U	0.00146	--	--	<0.0013	U	0.0013	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Endosulfan sulfate	mg/L	89	--	--	<0.549	U	0.549	--	--	<0.00117	U	0.00117	--	--	<0.00105	U	0.00105	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Dieldrin	mg/L	0.000054	--	--	<1.04	U	1.04	--	--	<0.00222	U	0.00222	--	--	<0.00198	U	0.00198	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Endrin	mg/L	0.036	--	--	<0.478	U	0.478	--	--	<0.00102	U	0.00102	--	--	<0.00091	U	0.00091	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Endrin aldehyde	mg/L	0.3	--	--	<0.513	U	0.513	--	--	<0.00109	U	0.00109	--	--	<0.000977	U	0.000977	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Endrin ketone	mg/L	--	--	--	<0.581	U	0.581	--	--	<0.00124	U	0.00124	--	--	<0.00111	U	0.00111	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Methoxychlor	mg/L	0.03	--	--	<1.87	U	1.87	--	--	<0.00399	U	0.00399	--	--	<0.00357	U	0.00357	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Toxaphene	mg/L	0.0002	--	--	<4	U	4	--	--	<0.0852	U	0.0852	--	--	<0.019	U	0.019	--	--	<0.189	U,H	0.189	--	--	<0.19	U,H	0.19	--	--
Oxy chlordane	mg/L	0.19	--	--	<0.168	U	0.168	--	--	<0.000358	U	0.000358	--	--	--	--	--	--	--	<0.038	U,H	0.0378	--	--	<0.038	U,H	0.038	--	--
cis - nonachlor	mg/L	0.19	--	--	<0.344	U	0.344	--	--	<0.000733	U	0.000733	--	--	--	--	--	--	--	<0.038	U,H	0.0378	--	--	<0.038	U,H	0.038	--	--
trans - nonachlor	mg/L	0.19	--	--	<0.284	U	0.284	--	--	<0.000605	U	0.000605	--	--	--	--	--	--	--	<0.189	U,H	0.189	--	--	<0.19	U,H	0.19	--	--
4,4'-DDD	mg/L	0.00031	0.000031	--	<0.442	U	0.442	--	--	<0.000941	U	0.000941	--	--	<0.000842	U	0.000842	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
4,4'-DDE	mg/L	0.00022	0.000018	--	<0.64	U	0.64	--	--	<0.00136	U	0.00136	--	--	<0.00122	U	0.00122	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
4,4'-DDT	mg/L	0.00022	0.000022	--	<0.508	U	0.508	--	--	<0.00108	U	0.00108	--	--	0.018	--	0.000968	82	818	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Total DDT	mg/L	0.2	--	--	--	--	--	--	--	--	--	--	--	--	0.018	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDX	mg/L	--	0.01	--	<0.64	U	--	--	--	<0.00136	U	--	--	--	0.019031	--	--	865	2	<0.00945	U	--	--	--	<0.00949	U	--	--	--
alpha-Chlordane	mg/L	--	--	--	<0.00634	U	0.00634	--	--	<0.00135	U	0.00135	--	--	<0.00121	U	0.00121	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
gamma-Chlordane	mg/L	--	--	--	<0.712	U	0.712	--	--	<0.00152	U	0.00152	--	--	0.00412	J	0.00136	--	--	<0.00945	U,H	0.00945	--	--	<0.00949	U,H	0.00949	--	--
Total Chlordanes	mg/L	--	0.000081	--	--	--	--	--	--	--	--	--	--	--	0.00412	T	--	--	51	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds by EPA Method 8260B																													
1,1,1,2- Tetrachloroethane	mg/L	2.5	--	--	<0.0495	U	0.0495	--	--	--	--	--	--	--	<0.057	U	0.057	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,1,1- Trichloroethane (TCA)	mg/L	11	--	--	<0.0559	U	0.0559	--	--	--	--	--	--	--	<0.0528	U	0.0528	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,1,2,2- Tetrachloroethane	mg/L	0.33	--	--	<0.0759	U	0.0759	--	--	--	--	--	--	--	<0.148	U	0.148	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,1,2- Trichloroethane	mg/L	1.2	--	--	<0.0793	U	0.0793	--	--	--	--	--	--	--	<0.204	U	0.204	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,1- Dichloroethane	mg/L	47	--	--	<0.0223	U	0.0223	--	--	--	--	--	--	--	<0.0851	U	0.0851	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,2,3- Trichlorobenzene	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	0.21	J,J3	0.118	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,2,3- Trichloropropane	mg/L	0.0095	--	--	<0.0679	U	0.0679	--	--	--	--	--	--	--	<0.167	U	0.167	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,2- Dichloroethane (EDC)	mg/L	0.73	--	--	<0.0551	U	0.0551	--	--	--	--	--	--	--	<0.087	U	0.087	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
cis-1,2-Dichloroethylene	mg/L	61	--	--	0.13	J,J3	0.035	--	--	--	--	--	--	--	--	--	--	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,2- Dichloropropane	mg/L	0.97	--	--	--	--	0.0165	--	--	--	--	--	--	--	<0.0964	U	0.0964	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,2- Dibromoethane (EDB)	mg/L	0.033	--	--	<0.0755	U	0.0755	--	--	--	--	--	--	--	<0.108	U	0.108	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
1,3,5- Trimethylbenzene	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	0.18	J	0.031	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--
2,2- Dichloropropane	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	0.09	J	0.088	--	--	<1.0	U	1.0							

Table 1
Stormwater Data for Outfall WR-209
Shore Terminals, LLC – Portland Facility
Portland, Oregon

	Units	JSCS SLV ^{2,3}	Cleanup Level PHSS ROD	TEF ⁶	WR-209 Outfall																									
					11/16/2011										11/29/2012					9/27/2013					9/27/2013					
					Total					Dissolved					Total					Total					Total DUP					
					Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ	
Volatile Organic Compounds by EPA Method 8260B (continued)																														
Methylene chloride	mg/L	8.9	--	--	<3.58	U	3.58	--	--	--	--	--	--	--	<0.681	U	0.681	--	--	<20	U	20	--	--	<20	U	20	--	--	
Styrene	mg/L	100	--	--	<0.0261	U	0.0261	--	--	--	--	--	--	--	<0.0281	U	0.0281	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
trans-1,4-Dichloro-2-butene	mg/L	7100	--	--	<0.0101	U	0.0101	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Trichlorofluoromethane	mg/L	1300	--	--	<0.0727	U	0.0727	--	--	--	--	--	--	--	<0.0848	U	0.0848	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
Vinyl Acetate	mg/L	16	--	--	<0.0134	U	0.0134	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Benzene	mg/L	1.2	--	--	<0.0135	U	0.0135	--	--	--	--	--	--	--	0.16	J	0.031	--	--	<0.3	U	0.3	--	--	<0.3	U	0.3	--	--	
Ethylbenzene	mg/L	7.3	7.3	--	0.13	J	0.00648	--	--	--	--	--	--	--	0.09	J,J3	0.0494	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
m,p-Xylene	mg/L	1.8	--	--	<0.0238	U	0.0238	--	--	--	--	--	--	--	0.3	J	0.186	--	--	<2	U	2.0	--	--	<2	U	2.0	--	--	
o-Xylene	mg/L	13	--	--	<0.0286	U	0.0286	--	--	--	--	--	--	--	<0.0312	U	0.0312	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
Xylenes (total)	mg/L	200	--	--	--	--	0.0286	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Methyl tert-butyl ether	mg/L	37	--	--	<0.0862	U	0.0862	--	--	--	--	--	--	--	1.65	--	0.0626	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
Tetrachloroethene (PCE)	mg/L	0.12	--	--	<0.103	U	0.103	--	--	--	--	--	--	--	<0.0672	U	0.0672	--	--	3.61	--	1.0	30	--	1.97	--	1.0	16	--	
Toluene	mg/L	9.8	--	--	<0.0343	U	0.0343	--	--	--	--	--	--	--	0.42	J	0.0572	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
trans-1,2-Dichloroethene	mg/L	100	--	--	<0.0366	U	0.0366	--	--	--	--	--	--	--	<0.083	U	0.083	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
trans-1,3-Dichloropropene	mg/L	0.055	--	--	<0.0575	U	0.0575	--	--	--	--	--	--	--	<0.0393	U	0.0393	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
Trichloroethene (TCE)	mg/L	0.17	--	--	<0.0273	U	0.0273	--	--	--	--	--	--	--	0.1	J	0.087	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
Vinyl Chloride	mg/L	0.015	--	--	<0.0171	U	0.0171	--	--	--	--	--	--	--	<0.155	U	0.155	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
n-Butylbenzene	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.0607	U	0.0607	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
n-Propylbenzene	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	18	--	0.0324	--	--	4.64	--	1.0	--	--	5.14	--	1.0	--	--	
Ethanol	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.13	U	1.13	--	--	<5.0	U	5.0	--	--	<5.0	U	5.0	--	--	
Semivolatile Organic Compounds by EPA Method 8270B																														
1,2-Dichlorobenzene	mg/L	49	--	--	--	--	--	--	--	--	--	--	--	--	<0.054	U	0.054	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
1,3-Dichlorobenzene	mg/L	14	--	--	--	--	--	--	--	--	--	--	--	--	<0.0655	U	0.0655	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
1,4-Dichlorobenzene	mg/L	2.8	--	--	--	--	--	--	--	--	--	--	--	--	0.05	J,J3	0.038	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
1,2,4-Trichlorobenzene	mg/L	8.2	--	--	--	--	--	--	--	--	--	--	--	--	0.12	J,J3	0.0872	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
Hexachlorobenzene	mg/L	0.00029	0.000029	--	<0.18	U	0.18	--	--	<0.18	U	0.18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
2-Chloronaphthalene	mg/L	490	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
Hexachloroethane	mg/L	3.3	--	--	<0.114	U	0.114	--	--	<0.114	U	0.114	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Hexachlorobutadiene	mg/L	0.86	--	--	<0.142	U	0.142	--	--	<0.142	U	0.142	--	--	0.21	J,J3	0.0934	--	--	<1.0	U	1.0	--	--	<1.0	U	1.0	--	--	
Hexachlorocyclopentadiene	mg/L	5.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
2,2'-oxybis(1-chloropropane)	mg/L	0.95	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Bis-(2-chloroethoxy) methane	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Bis-(2-chloroethyl) ether	mg/L	0.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
4-Chlorophenyl-phenyl ether	mg/L	0.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
4-bromophenyl-phenyl ether	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
3,3'-Dichlorobenzidine	mg/L	0.028	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
4-Chloroaniline	mg/L	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Phthalate Esters by EPA Method 8270B																														
Dimethylphthalate	mg/L	3	--	--	<0.277	U	0.277	--	--	<0.281	U	0.277	--	--	<0.262	U	0.262	--	--	<0.949	U	0.949	--	--	<0.952	U	0.952	--	--	
Diethylphthalate	mg/L	3	--	--	<0.309	U	0.309	--	--	3.62	--	0.309	1.2	--	<0.292	U	0.292	--	--	<0.949	U	0.949	--	--	<0.952	U	0.952	--	--	
Di-n-butylphthalate	mg/L	3	--	--	<0.379	U	0.379	--	--	3.63	--	0.379	1.2	--	<0.359	U	0.359	--	--	<0.949	U	0.949	--	--	<0.952	U	0.952	--	--	
Butylbenzylphthalate	mg/L	3	--	--	<0.168	U	0.168	--	--	<0.17	U	0.168	--	--	<0.159	U	0.159	--	--	<0.949	U	0.949	--	--	<0.952	U	0.952	--	--	
Di-n-octylphthalate	mg/L	3	--	--	<0.15	U	0.15	--	--	<0.152	U	0.15	--	--	<0.142	U	0.142	--	--	<0.949	U	0.949	--	--	<0.952	U	0.952	--	--	
bis(2-Ethylhexyl)phthalate	mg/L	2.2	0.2	--	<0.291	U	0.291	--	--	2.17	--	0.291	--	11	<0.275	U	0.275	--	--	<0.949	U	0.949	--	--	<0.952	U	0.952	--	--	
Polycyclic Aromatic Hydrocarbons by EPA Method 8270S1M																														
Naphthalene ¹⁵	mg/L	0.2	12	--	0.001	J	0.00041	--	--	0.0888	--	0.00404	--	--	0.0377	J,J3	0.0133	--	--	0.352	--	0.0489	1.8	--	<0.0474	U	0.0474	--	--	
2-Methylnaphthalene ¹⁵	mg/L	0.2	--	--	<0.000743	U	0.000743	--	--	<0.00732	U	0.00732	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Acenaphthylene ¹⁵	mg/L	0.2	--	--	<0.000671	U	0.000671	--	--	<0.00662	U	0.00662	--	--	0.0942	--	0.00936	--	--	<0.0489	U	0.0489	--	--	<0.0474	U	0.0474	--	--	
Acenaphthene ¹⁵	mg/L	0.2	--	--	<0.000568	U	0.000568	--	--	<0.00560	U	0.00560	--	--	1.21	--	0.00766	6	--	0.489	--	0.0489	2	--	0.502	--	0.0474	3	--	
Fluorene ¹⁵	mg/L	0.2	--	--	0.001	J	0.000617	--	--	<0.00608	U	0.00608	--	--	0.659	--	0.00124	3	--	0.42	--	0.0489	2	--	0.445	--	0.0474	2	--	
Phenanthrene ¹⁵	mg/L	0.2	--	--	0.003	J	0.000479	--	--	<0.00472	U																			

Table 1
Stormwater Data for Outfall WR-209
Shore Terminals, LLC – Portland Facility
Portland, Oregon

	Units	JSCS SLV ^{4,5}	Cleanup Level PHSS ROD	TEF ⁹	WR-209 Outfall																			
					1/29/2014					8/16/2017					8/16/2017					9/8/2017				
					Total					Total					Dissolved					Total				
					Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ
Metals/Inorganics by EPA 6000/7000 Series Methods																								
Aluminum (pH 6.5 - 9.0)	mg/L	50	--	--	384	--	10.0	8	--	87.9	J	5.15	2	--	10	B, J	5.15	--	--	--	--	--	--	--
Antimony	mg/L	6	--	--	<0.5	U	0.5	--	--	<0.754	U	0.754	--	--	<0.754	U	0.754	--	--	--	--	--	--	--
Arsenic	mg/L	0.045	0.018	--	1.67	--	0.1	37	93	11.5	--	0.25	256	639	0.816	J	0.25	18	45	--	--	--	--	--
Arsenic III	mg/L	190	--	--	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/L	0.094	--	--	<0.1	U	0.1	--	--	<0.16	U	0.16	--	--	<0.16	U	0.16	--	--	--	--	--	--	--
Chromium, total	mg/L	100	100	--	0.339	--	0.1	--	--	<0.54	U	0.54	--	--	<0.54	U	0.54	--	--	--	--	--	--	--
Chromium, hexavalent	mg/L	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/L	2.7	2.74	--	1.38	--	0.5	--	--	<0.52	U	0.52	--	--	<0.52	U	0.52	--	--	--	--	--	--	--
Lead	mg/L	0.54	--	--	0.452	--	0.1	--	--	<0.24	U	0.24	--	--	<0.24	U	0.24	--	--	--	--	--	--	--
Manganese	mg/L	50	--	--	176	--	5.0	4	--	1,040	--	0.25	21	--	941	--	0.25	19	--	--	--	--	--	--
Mercury	mg/L	0.77	--	--	<0.1	U	0.1	--	--	<0.049	U	0.049	--	--	<0.049	U	0.049	--	--	--	--	--	--	--
Methyl Mercury	mg/L	0.0028	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	mg/L	16	--	--	0.634	--	0.5	--	--	1.26	J	0.35	--	--	0.805	J	0.35	--	--	--	--	--	--	--
Selenium	mg/L	5	--	--	--	--	--	--	--	<0.38	U	0.38	--	--	<0.38	U	0.38	--	--	--	--	--	--	--
Silver	mg/L	0.12	--	--	<0.1	U	0.1	--	--	<0.31	U	0.31	--	--	<0.31	U	0.31	--	--	--	--	--	--	--
Zinc	mg/L	36	36.5	--	6.9	--	2.0	--	--	<2.56	U	2.56	--	--	4.77	J	2.56	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) as Aroclors by EPA Method 8082																								
Aroclor 1016	mg/L	0.96	--	--	<0.0198	U	0.0198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1221	mg/L	0.034	--	--	<0.0198	U	0.0198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1232	mg/L	0.034	--	--	<0.0198	U	0.0198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1242	mg/L	0.034	--	--	<0.0198	U	0.0198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1248	mg/L	0.034	--	--	<0.0198	U	0.0198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	mg/L	0.033	--	--	<0.0198	U	0.0198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1260	mg/L	0.034	--	--	<0.0198	U	0.0198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1262	mg/L	--	--	--	<0.0198	U	0.0198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1268	mg/L	--	--	--	<0.0198	U	0.0198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs	mg/L	0.000064	0.0000064	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Organochlorine Pesticides by EPA Method 8081B w/low MDLs																								
α - BHC	mg/L	0.0049	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
β - BHC	mg/L	0.017	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
γ - BHC (Lindane)	mg/L	0.052	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
δ - BHC	mg/L	0.037	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	mg/L	0.000079	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor epoxide	mg/L	0.000039	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aldrin	mg/L	0.00005	0.00000077	--	<0.00002	U	0.00002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlordane	mg/L	0.00081	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan alpha-	mg/L	0.056	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan beta-	mg/L	0.056	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan sulfate	mg/L	89	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	mg/L	0.000054	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	mg/L	0.036	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin aldehyde	mg/L	0.3	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin ketone	mg/L	--	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	mg/L	0.03	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toxaphene	mg/L	0.0002	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oxy chlordane	mg/L	0.19	--	--	--	U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis - nonachlor	mg/L	0.19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans - nonachlor	mg/L	0.19	--	--	<0.0002	--	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDD	mg/L	0.00031	0.000031	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	mg/L	0.00022	0.000018	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	mg/L	0.00022	0.000022	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDT	mg/L	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDx	mg/L	--	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
alpha-Chlordane	mg/L	--	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
gamma-Chlordane	mg/L	--	--	--	<0.0002	U	0.0002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Chlordanes	mg/L	--	0.000081	--	<0.00002	--	0.00002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Please refer to notes at end of table.

Table 1
Stormwater Data for Outfall WR-209
Shore Terminals, LLC – Portland Facility
Portland, Oregon

	Units	JSCS SLV ^{4,5}	Cleanup Level PHSS ROD	TEF ⁹	WR-209 Outfall																			
					1/29/2014					8/16/2017					8/16/2017					9/8/2017				
					Total					Total					Dissolved					Total				
					Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ
Volatile Organic Compounds by EPA Method 8260B (continued)																								
Methylene chloride	mg/L	8.9	--	--	<20	U	20	--	--	<1.07	U	1.07	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	mg/L	100	--	--	<1.0	U	1.0	--	--	<0.117	U	0.117	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,4-Dichloro-2-butene	mg/L	7100	--	--	--	--	--	--	--	<0.257	U	0.257	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	mg/L	1300	--	--	<1.0	U	1.0	--	--	<0.13	U	0.13	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Acetate	mg/L	16	--	--	--	--	--	--	--	<0.645	U	0.645	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	mg/L	1.2	--	--	<0.3	U	0.3	--	--	0.141	J	0.0896	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	mg/L	7.3	7.3	--	<1.0	U	1.0	--	--	<0.158	U	0.158	--	--	--	--	--	--	--	--	--	--	--	--
m,p-Xylene	mg/L	1.8	--	--	<2	U	2.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	mg/L	13	--	--	<1.0	U	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylenes (total)	mg/L	200	--	--	--	--	--	--	--	1.3	J	0.316	--	--	--	--	--	--	--	--	--	--	--	--
Methyl tert-butyl ether	mg/L	37	--	--	<1.0	U	1.0	--	--	0.976	--	0.102	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene (PCE)	mg/L	0.12	--	--	<1.0	U	1.0	--	--	<0.199	U	0.199	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	mg/L	9.8	--	--	<1.0	U	1.0	--	--	<0.412	U	0.412	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	mg/L	100	--	--	<1.0	U	1.0	--	--	<0.152	U	0.152	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	mg/L	0.055	--	--	<1.0	U	1.0	--	--	<0.222	U	0.222	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene (TCE)	mg/L	0.17	--	--	<1.0	U	1.0	--	--	<0.153	U	0.153	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	mg/L	0.015	--	--	<1.0	U	1.0	--	--	<0.118	U	0.118	--	--	--	--	--	--	--	--	--	--	--	--
n-Butylbenzene	mg/L	--	--	--	<1.0	U	1.0	--	--	0.752	--	0.143	--	--	--	--	--	--	--	--	--	--	--	--
n-Propylbenzene	mg/L	--	--	--	7.02	--	1.0	--	--	28.8	--	0.162	--	--	--	--	--	--	--	--	--	--	--	--
Ethanol	mg/L	--	--	--	<5.0	U	5.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Semivolatile Organic Compounds by EPA Method 8270B																								
1,2-Dichlorobenzene	mg/L	49	--	--	<1.0	U	1.0	--	--	<0.101	U	0.101	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	mg/L	14	--	--	<1.0	U	1.0	--	--	<0.13	U	0.13	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	mg/L	2.8	--	--	<1.0	U	1.0	--	--	<0.121	U	0.121	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	mg/L	8.2	--	--	<1.0	U	1.0	--	--	<0.355	U	0.355	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	mg/L	0.00029	0.000029	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	mg/L	490	--	--	<1.0	U	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	mg/L	3.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	mg/L	0.86	--	--	<1.0	U	1.0	--	--	0.251	--	0.157	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	mg/L	5.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2'-oxybis(1-chloropropane)	mg/L	0.95	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis-(2-chloroethoxy) methane	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis-(2-chloroethyl) ether	mg/L	0.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl-phenyl ether	mg/L	0.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-bromophenyl-phenyl ether	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	mg/L	0.028	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	mg/L	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalate Esters by EPA Method 8270B																								
Dimethylphthalate	mg/L	3	--	--	<2.0	U	2.0	--	--	--	--	--	--	--	--	--	--	--	--	<0.282	U	0.282	--	--
Diethylphthalate	mg/L	3	--	--	<2.0	U	2.0	--	--	--	--	--	--	--	--	--	--	--	--	<0.283	U	0.283	--	--
Di-n-butylphthalate	mg/L	3	--	--	<2.0	U	2.0	--	--	--	--	--	--	--	--	--	--	--	--	<0.266	U	0.266	--	--
Butylbenzylphthalate	mg/L	3	--	--	<2.0	U	2.0	--	--	--	--	--	--	--	--	--	--	--	--	0.926	J	0.275	--	--
Di-n-octylphthalate	mg/L	3	--	--	<2.0	U	2.0	--	--	--	--	--	--	--	--	--	--	--	--	0.755	J	0.278	--	--
bis(2-Ethylhexyl)phthalate	mg/L	2.2	0.2	--	<2.0	U	2.0	--	--	--	--	--	--	--	--	--	--	--	--	0.943	J	0.709	--	4.7
Polycyclic Aromatic Hydrocarbons by EPA Method 8270SIM																								
Naphthalene ¹	mg/L	0.2	12	--	0.0967	--	0.05	--	--	0.159	J	0.0198	1	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene ¹	mg/L	0.2	--	--	--	--	--	--	--	0.0143	J	0.00902	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene ¹	mg/L	0.2	--	--	<0.05	U	0.05	--	--	<0.012	U	0.012	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene ¹	mg/L	0.2	--	--	0.321	--	0.05	1.6	--	5.86	--	0.01	29.3	--	--	--	--	--	--	--	--	--	--	--
Fluorene ¹	mg/L	0.2	--	--	0.267	--	0.05	1.3	--	3.17	--	0.0085	15.9	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene ¹	mg/L	0.2	--	--	0.392	--	0.05	2	--	4.03	--	0.0082	20	--	--	--	--	--	--	--	--	--	--	--
Anthracene ¹	mg/L	0.2	--	--	<0.05	U	0.05	--	--	0.397	--	0.014	2	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene ²	mg/L	0.2	--	--	0.0922	--	0.05	--	--	1.01	--	0.0157	5	--	--	--	--	--	--	--	--	--	--	--
Pyrene ²	mg/L	0.2	--	--	0.128	--	0.05	--	--	1.52	--	0.0117	8	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene ³	mg/L	0.018	0.0012	0.1	<0.05	--	0.05	--	--	0.0312	J	0.0041	1.7	26	--	--	--	--	--	--	--	--	--	--
Chrysene ^{2,3}	mg/L	0.018	0.0013	0.001	<0.05	U	0.05	--	--	0.0231	J	0.0108	1.3	18	--	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene ^{2,3}	mg/L	0.018	0.0012	0.1	<0.05	U	0.05	--	--	0.00347	J	0.00212	--	3	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene ^{2,3}	mg/L	0.018	0.0013	0.01	<0.05	U	0.05	--	--	<0.0136	J3	0.0136	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene ³	mg/L	0.018	0.00012	1	<0.05	U	0.05	--	--	<0.0116	J3	0.0116	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene ³	mg/L	0.018	0.0012	0.1	<0.05	U	0.05	--	--	<0.0148	J3	0.0148	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene ³	mg/L	0.018	0.00012	1	<0.05	U	0.05	--	--	<0.00396	J3	0.00396	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene ²	mg/L	0.2	--	--	<0.05	U	0.05	--	--	<0.00227	U	0.00227	--	--	--	--	--	--	--	--	--	--	--	--
Total LPAH	mg/L	--	--	--	1.13	A	--	--	--	13.64	A	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HPAH	mg/L	--	--	--	0.220	U,A	--	--	--	2.592	A	--	--	--	--	--	--	--	--	--	--	--	--	--
Total cPAH (BaP eq)	mg/L	--	0.00012	--	0.058	U	--	--	481	0.012	--	--	--	101	--	--	--	--	--	--	--	--	--	--
Total PAHs	mg/L	--	--	--	1.30	U,A	--	--	--	16.247	A	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (by NWTPH-Dx and NWTPH-Gx)																								
TPH Diesel	mg/L	1	--	--	<0.162	U	0.162	--	--	0.244	--	0.1	--	--</										

Table 1
Stormwater Data for Outfall WR-209
Shore Terminals, LLC – Portland Facility
Portland, Oregon

- Notes:
1. The source of each SLV is documented in Table 3.1 of the Portland Harbor Joint Source Control Strategy, which can be viewed at http://www.deq.state.or.us/lq/cu/nwr/PortlandHarbor/docs/JSCSFinalTable03_1.pdf
 2. At Portland Harbor sites, drinking water MCLs and PRGs are also used as screening levels, per the JSCS. These values are applied when they are lower than all other screening values.
 3. SLV = Screening Level Value.
 4. PHSS Cleanup Level = Cleanup level for surface water documented in the Portland Harbor Superfund Site (PHSS) ROD, which can be viewed at <https://semspub.epa.gov/work/10/100036257.pdf>
 5. TEF = Toxicity Equivalency Factor.
 6. TEF is used to evaluate the toxic effects of PAHs relative to benzo(a)pyrene as discussed in Oregon DEQ Human Health Risk Assessment Guidance, which can be viewed at <http://www.oregon.gov/deq/FilterDocs/HumanHealthRiskAssess>
 7. **Bold** = Detected above the method reporting limit (MRL).
 8. < = Not detected at or above the method detection limit (MDL) shown.
 9. U = Not detected at or above the MDL shown.
 10. A = Indicates that the total value shown is the summation based on a limited number of analytes.
 11. -- = Not analyzed, not applicable, or concentration does not exceed the PHSS Cleanup Level or JSCS SLV.
 12. µg/L = Micrograms per liter.
 13. mg/L = Milligrams per liter.
 14. EQ = Exceedance Quotient (calculated as concentration/screening level).
 15. Light Polycyclic Aromatic Hydrocarbon (LPAH).
 16. Heavy Polycyclic Aromatic Hydrocarbon (HPAH).
 17. Carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH).
 18. Summation of PAHs follows the Portland Harbor RI/FS Appendix A Summation Rules. Summation of PAHs was performed using one half of the detection limit for concentration of PAHs below the detection limit to calculate the summation of LPAH, HPAH, cPAH, and Total PAHs. If the number of detected analytes was below the threshold identified in Table A3-4, LPAH, HPAH, and Total PAHs were calculated using the summation of detected analyte concentrations only. If the minimum number of required analytes were detected, LPAH, HPAH, and Total PAH were calculated using the summation of the detected concentrations and one half the detection limit for the non-detected analytes.
 19. DDD = Dichlorodiphenyldichloroethane.
 20. DDE = Dichlorodiphenyldichloroethylene.
 21. DDT = Dichlorodiphenyltrichloroethane.
 22. Total DDD = Sum of the concentrations of DDD isomers.
 23. Total DDE = Sum of the concentrations of DDE isomers.
 24. Total DDT = sum of the concentrations of DDT isomers.
 25. Total DDx = sum of the concentrations of 2,4 and 4,4 isomers of DDD, DDE, and DDT.
 26. The MDL was not reported for samples collected on 9/27/2013 or 1/29/2014, the MRL is reported for each analyte.

Quality Assurance/Quality Control Data Qualifiers.

J = Analyte detected below quantitation limits
J3 = Analyte detected in method blank, detection in sample was less than or equal to five times the detected concentration from the method blank.
E = Concentration exceeded the calibration range of the instrument.
H = Sample was analyzed outside of method holding time.

Table 2
Stormwater Data for Outfall WR-209 Ditch
Shore Terminals, LLC – Portland Facility
Portland, Oregon

	Units	JSCS SLV ^{2,3}	Cleanup Level PHSS ROD	TEF ⁶	WR-209 Ditch Inlet																													
					11/16/2011										11/29/2012					9/27/2013					9/27/2013					1/29/2014				
					Total					Dissolved					Total					Total					Total DUP					Total				
					Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ
Metals by EPA 6000/7000 Series Methods																																		
Aluminum (pH 6.5 - 9.0)	mg/L	50	--	--	13,800	--	9.68	276	--	56.5	--	0.421	1.1	--	843	--	0.421	17	--	987	--	100	20	--	1,230	--	100	25	--	1,090	--	100	22	--
Antimony	mg/L	6	--	--	2.9	--	0.024	--	--	0.737	--	0.021	--	--	0.125	J	0.021	--	--	<0.5	U	0.5	--	--	<0.5	U	0.5	--	--	<0.5	U	0.5	--	--
Arsenic	mg/L	0.045	0.018	--	3.82	--	0.02	85	212	0.161	--	0.032	4	9	0.422	--	0.032	9	23	0.598	--	0.1	13	33	0.745	--	0.1	17	41	0.444	--	0.1	10	25
Arsenic III	mg/L	190	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1	--	--	--	--	0.1	--	--	--	--	0.1	--	--
Cadmium	mg/L	0.094	--	--	0.398	--	0.021	4	--	<0.013	U	0.013	--	--	0.35	--	0.013	4	--	<0.1	U	0.1	--	--	<0.1	U	0.1	--	--	<0.1	--	0.1	--	--
Chromium, total	mg/L	100	100	--	17	--	0.087	--	--	0.212	--	0.013	--	--	1.13	--	0.013	--	--	1.14	--	0.1	--	--	1.33	--	0.1	--	--	1.33	--	0.1	--	--
Chromium, hexavalent	mg/L	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Copper	mg/L	2.7	2.74	--	38	--	0.151	14	14	2.55	--	0.018	--	--	3.05	--	0.018	1.1	1	3.66	--	0.5	1.4	1.3	4.11	--	0.5	1.5	1.5	2.52	--	0.5	--	--
Lead	mg/L	0.54	--	--	38.9	--	0.014	72	--	0.156	--	0.027	--	--	1.9	--	0.027	4	--	1.92	--	0.1	4	--	2.28	--	0.1	4	--	2.44	--	0.1	5	--
Manganese	mg/L	50	--	--	1,080	E	0.069	22	--	14.7	--	0.069	--	--	1.04	--	0.069	--	--	265	--	5.0	5	--	306	--	5.0	6	--	105	--	5.0	2	--
Mercury	mg/L	0.77	--	--	<0.01	U	0.01	--	--	<0.01	U	0.01	--	--	<0.00114	U	0.0114	--	--	<0.1	U	0.1	--	--	<0.1	U	0.1	--	--	<0.1	U	0.1	--	--
Methyl Mercury	mg/L	0.0028	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Nickel	mg/L	16	--	--	11.9	--	0.046	--	--	0.662	--	0.047	--	--	1.93	--	0.047	--	--	1.53	--	0.5	--	--	1.82	--	0.5	--	--	1.08	--	0.5	--	--
Selenium	mg/L	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Silver	mg/L	0.12	--	--	0.105	--	0.005	--	--	<0.005	U	0.005	--	--	<0.005	U	0.005	--	--	<0.1	U	0.1	--	--	<0.1	U	0.1	--	--	<0.1	U	0.1	--	--
Zinc	mg/L	36	36.5	--	284	--	2.2	8	8	17.1	--	0.11	--	--	15.6	--	0.11	--	--	11.7	--	2.0	--	--	13.4	--	2.0	--	--	11.0	--	2.0	--	--
Polychlorinated Biphenyls (PCBs) as Aroclors by EPA Method 8082																																		
Aroclor 1016	mg/L	0.96	--	--	<0.0039	U	0.0039	--	--	<<0.0038	U	0.0038	--	--	<0.00366	U	0.00366	--	--	<0.019	U	0.019	--	--	<0.019	U	0.019	--	--	<0.02	U	0.02	--	--
Aroclor 1221	mg/L	0.034	--	--	<0.0039	U	0.0039	--	--	<0.0038	U	0.0038	--	--	<0.00366	U	0.00366	--	--	<0.019	U	0.019	--	--	<0.019	U	0.019	--	--	<0.02	U	0.02	--	--
Aroclor 1232	mg/L	0.034	--	--	<0.0039	U	0.0039	--	--	<0.0038	U	0.0038	--	--	<0.00366	U	0.00366	--	--	<0.019	U	0.019	--	--	<0.019	U	0.019	--	--	<0.02	U	0.02	--	--
Aroclor 1242	mg/L	0.034	--	--	<0.0039	U	0.0039	--	--	<0.0038	U	0.0038	--	--	<0.00366	U	0.00366	--	--	<0.019	U	0.019	--	--	<0.019	U	0.019	--	--	<0.02	U	0.02	--	--
Aroclor 1248	mg/L	0.034	--	--	<0.0039	U	0.0039	--	--	<0.0038	U	0.0038	--	--	<0.00366	U	0.00366	--	--	<0.019	U	0.019	--	--	<0.019	U	0.019	--	--	<0.02	U	0.02	--	--
Aroclor 1254	mg/L	0.033	--	--	<0.0039	U	0.0039	--	--	<0.0038	U	0.0038	--	--	<0.00366	U	0.00366	--	--	<0.019	U	0.019	--	--	<0.019	U	0.019	--	--	<0.02	U	0.02	--	--
Aroclor 1260	mg/L	0.034	--	--	<0.0039	U	0.0039	--	--	<0.0038	U	0.0038	--	--	<0.00366	U	0.00366	--	--	<0.019	U	0.019	--	--	<0.019	U	0.019	--	--	<0.02	U	0.02	--	--
Aroclor 1262	mg/L	--	--	--	<0.0039	U	0.0039	--	--	<0.0038	U	0.0038	--	--	<0.00366	U	0.00366	--	--	<0.019	U	0.019	--	--	<0.019	U	0.019	--	--	<0.02	U	0.02	--	--
Aroclor 1268	mg/L	--	--	--	<0.0039	U	0.0039	--	--	<0.0038	U	0.0038	--	--	<0.00366	U	0.00366	--	--	<0.019	U	0.019	--	--	<0.019	U	0.019	--	--	<0.02	U	0.02	--	--
Total PCBs	mg/L	0.000064	6.4E-06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Organochlorine Pesticides by EPA Method 8081B w/low MDLs																																		
α - BHC	mg/L	0.0049	--	--	<0.000025	U	0.000025	--	--	<0.000025	U	0.000025	--	--	<0.000025	U	0.000025	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
β - BHC	mg/L	0.017	--	--	<0.000037	U	0.000037	--	--	<0.000037	U	0.000037	--	--	<0.000037	U	0.000037	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
γ - BHC (Lindane)	mg/L	0.052	--	--	<0.000036	U	0.000036	--	--	<0.000036	U	0.000036	--	--	<0.000036	U	0.000036	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
δ - BHC	mg/L	0.037	--	--	<0.000034	U	0.000034	--	--	<0.000034	U	0.000034	--	--	<0.000034	U	0.000034	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
Heptachlor	mg/L	0.000079	--	--	<0.000053	U	0.000053	--	--	<0.000053	U	0.000053	--	--	<0.000053	U	0.000053	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
Heptachlor epoxide	mg/L	0.000039	--	--	<0.000042	U	0.000042	--	--	<0.000042	U	0.000042	--	--	<0.000042	U	0.000042	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
Aldrin	mg/L	0.00005	7.7E-07	--	<0.000006	U	0.000006	--	--	<0.000006	U	0.000006	--	--	<0.0000060	U	0.000006	--	--	<0.00002	U,H	0.00002	--	--	<0.00002	U,H	0.00002	--	--	<0.00002	U	0.00002	--	--
Chlordane	mg/L	0.00081	--	--	<0.0000019	U	0.0000019	--	--	<0.0000019	U	0.0000019	--	--	<0.0000019	U	0.0000019	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
Endosulfan alpha-	mg/L	0.056	--	--	<0.000036	U	0.000036	--	--	<0.000036	U	0.000036	--	--	<0.000036	U	0.000036	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
Endosulfan beta-	mg/L	0.056	--	--	<0.000045	U	0.000045	--	--	<0.000045	U	0.000045	--	--	<0.000045	U	0.000045	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
Endosulfan sulfate	mg/L	89	--	--	<0.000051	U	0.000051	--	--	<0.000051	U	0.000051	--	--	<0.000051	U	0.000051	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U,H	0.0002	--	--	<0.0002	U	0.0002	--	--
Dieldrin	mg/L	0.000054	--	--	<0.000004	U	0.000004																											

Table 2
Stormwater Data for Outfall WR-209 Ditch
Shore Terminals, LLC – Portland Facility
Portland, Oregon

	Units	JSCS SLV ^{2,3}	Cleanup Level PHSS ROD	TEF ⁶	WR-209 Ditch Inlet																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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Stormwater Data for Outfall WR-209 Ditch
Shore Terminals, LLC – Portland Facility
Portland, Oregon

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Table 2
Stormwater Data for Outfall WR-209 Ditch
Shore Terminals, LLC – Portland Facility
Portland, Oregon

	Units	JSCS SLV ^{2,3}	Cleanup Level PHSS ROD	TEF ⁶	WR-209 Ditch Inlet																													
					11/16/2011										11/29/2012					9/27/2013					9/27/2013					1/29/2014				
					Total					Dissolved					Total					Total					Total DUP					Total				
					Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MDL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ	Concentration	Qualifier	MRL	SLV EQ	Cleanup Level EQ
Total Petroleum Hydrocarbons (TPH) by NWTPH-Dx and NWTPH-Gx																																		
TPH Diesel	mg/L	1	--	--	0.167	--	0.0634	--	--	--	--	--	--	--	0.0732	J,J3	0.0606	--	--	0.222	--	0.077	--	--	0.233	--	0.0764	--	--	<0.248	U	0.248	--	--
TPH Heavy Oil	mg/L	1	--	--	0.702	J3	0.0555	--	--	--	--	--	--	--	0.0905	J,J3	0.053	--	--	0.347	--	0.192	--	--	0.385	--	0.191	--	--	<0.619	U	0.619	--	--
TPH-Gx	mg/L	1000	--	--	100	U,J3	19.7	--	--	--	--	--	--	--	<10.8	U	10.8	--	--	<100	U	100	--	--	<100	U	100	--	--	<100	U	100	--	--
Total Suspended Solids by EPA Method 160.2																																		
Total Suspended Solids	mg/L	--	--	--	198	--	1.1	--	--	--	--	--	--	--	15	--	1.1	--	--	53	--	1.1	--	--	21	--	--	--	--	93	--	--	--	--

- Notes:
1. The source of each SLV is documented in Table 3.1 of the Portland Harbor Joint Source Control Strategy, which can be viewed at http://www.deq.state.or.us/lq/cu/nwr/PortlandHarbor/docs/JSCSFinalTable03_1.pc
 2. At Portland Harbor sites, drinking water MCLs and PRGs are also used as screening levels, per the JSCS. These values are applied when they are lower than all other screening values
 3. SLV = Screening Level Value.
 4. PHSS Cleanup Level = Cleanup level for surface water documented in the Portland Harbor Superfund Site (PHSS) ROD, which can be viewed at <https://semspub.epa.gov/work/10/100036257.pd>
 5. TEF = Toxicity Equivalency Factor.
 6. TEF is used to evaluate the toxic effects of PAHs relative to benzo(a)pyrene as discussed in Oregon DEQ Human Health Risk Assessment Guidance, which can be viewed at <http://www.oregon.gov/deq/FilterDocs/HumanHealthRiskAssessmentGuidance.pd>
 7. **Bold** = Detected above the method reporting limit (MRL).
 8. < = Not detected at or above the method detection limit (MDL) shown.
 9. U = Not detected at or above the MDL shown.
 10. A = Indicates that the total value shown is the summation based on a limited number of analytes
 11. -- = Not analyzed, not applicable, or concentration does not exceed the PHSS Cleanup Level or JSCS SLV
 12. µg/L = Micrograms per liter.
 13. mg/L = Milligrams per liter.
 14. EQ = Exceedance Quotient (calculated as concentration/screening level).
 15. Light Polycyclic Aromatic Hydrocarbon (LPAH).
 16. Heavy Polycyclic Aromatic Hydrocarbon (HPAH).
 17. Carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH).
 18. Summation of PAHs follows the Portland Harbor RI/FS Appendix A Summation Rules. Summation of PAHs was performed using one half of the detection limit for concentration of PAHs below the detection limit to calculate the summation of LPAH, HPAH, cPAH, and Total PAHs. If the number of detected analytes was below the threshold identified in Table A3-4, LPAH, HPAH, and Total PAHs were calculated using the summation of detected analyte concentrations only
If the minimum number of required analytes were detected, LPAH, HPAH, and Total PAH were calculated using the summation of the detected concentrations and one half the detection limit for the non-detected analyte:
 19. DDD = Dichlorodiphenyldichloroethane.
 20. DDE = Dichlorodiphenyldichloroethylene.
 21. DDT = Dichlorodiphenyltrichloroethane.
 22. Total DDD = Sum of the concentrations of DDD isomers.
 23. Total DDE = Sum of the concentrations of DDE isomers.
 24. Total DDT = sum of the concentrations of DDT isomers.
 25. Total DDx = sum of the concentrations of 2,4 and 4,4 isomers of DDD, DDE, and DDT.
 26. The MDL was not reported for samples collected on 9/27/2013 or 1/29/2014, the MRL is reported for each analyte

Quality Assurance/Quality Control Data Qualifiers.
J = Analyte detected below quantitation limits
J3 = Analyte detected in method blank, detection in sample was less than or equal to five times the detected concentration from the method blank
E = Concentration exceeded the calibration range of the instrument.
H = Sample was analyzed outside of method holding time.
T = Value is the sum of 6+ detected concentrations.

Table 3
WR-209 (Dry Weather) and KMW02 – Comparison of Total Metals
Shore Terminals - Portland
Portland, Oregon

Well ID	Sample Date	Analytical Results (µg/L)																															
		Aluminum		Antimony		Arsenic		Arsenic III		Cadmium		Total Chromium		Hexavalent Chromium		Copper		Lead		Manganese		Mercury		Methyl Mercury		Nickel		Selenium		Silver		Zinc	
1997 Site ROD Cleanup Goal		--		--		5.0		--		--		--		--		12		3.2		--		--		--		--		--		--		--	
2017 PHSS Cleanup Level		--		--		0.018		--		--		100		--		2.74		--		--		--		--		--		--		--		36.5	
Portland Harbor JSCS SLV		50		6		0.045		190		0.094		100		11		2.7		0.54		50		0.77		0.0028		16		5		0.12		36	
		Conc.	SLV EQ	Conc.	SLV EQ	Conc.	PHSS ROD EQ	Conc.	SLV EQ	Conc.	SLV EQ	Conc.	PHSS ROD EQ	Conc.	SLV EQ	Conc.	PHSS ROD EQ	Conc.	SLV EQ	Conc.	SLV EQ	Conc.	SLV EQ	Conc.	SLV EQ	Conc.	SLV EQ	Conc.	SLV EQ	Conc.	SLV EQ	Conc.	PHSS ROD EQ
KMW02	3/27/2015	--	--	--	--	2.9	161	--	--	--	--	--	--	--	--	<0.21	--	<0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3/17/2016	--	--	--	--	2.66	148	--	--	--	--	--	--	--	--	<1.0	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3/21/2017	--	--	--	--	1.43 J	79	--	--	--	--	--	--	--	--	<5.0	--	<2.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2/9/2018	--	--	--	--	3.04	169	--	--	--	--	--	--	--	--	0.744 J	--	<2.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/19/2018	--	--	<1.0	--	3.59	199	--	--	<0.20	--	<1.0	--	--	--	<1.0	--	<0.20	--	7,910	158	<0.080	--	--	--	1.56	--	<1.0	--	<0.20	--	2.37	--
	3/15/2019	--	--	--	--	2.3	128	--	--	--	--	--	--	--	--	<1.0	--	<0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/9/2019	<50	--	<1.0	--	3.36	187	--	--	<0.20	--	<1.0	--	--	--	<1.0	--	<0.20	--	8,330	167	<0.080	--	--	--	1.45	--	<1.0	--	<0.20	--	2.47	--
	1/29/2020	<50	--	<1.0	--	2.41	134	--	--	<0.20	--	<1.0	--	--	--	<1.0	--	<0.20	--	8,090	162	<0.080	--	--	--	1.28	--	<1.0	--	<0.20	--	3.42	--
WR-209	8/16/2017	87.9	--	<0.754	--	11.5	639	--	--	<0.16	--	<0.54	--	--	--	<0.52	--	<0.24	--	1,040	21	<0.049	--	--	--	1.26	--	<0.38	--	<0.31	--	<2.56	--

- Notes:
- < = Concentration as reported by analytical laboratory is less than the method detection limit.
 - µg/L = Microgram(s) per liter.
 - Metals analyzed by EPA Method 6020.
 - PHSS Cleanup Levels for surface water from U.S. EPA Record of Decision Portland Harbor Superfund Site, Portland, Oregon, January 2017.
 - JSCS SLV = Screening Level Values from Portland Harbor Joint Source Control Strategy (JSCS), December 2005.
 - Bold** cells indicates that the compound was detected above the laboratory method detection limit.
 - Gray highlighted cells indicate values that are equal to or exceeding PHSS Cleanup Level. If a PHSS Cleanup Level was not developed for an analyte, the JSCS SLV is used for comparison.
 - = not analyzed or concentration does not exceed the PHSS Cleanup Level or JSCS SLV.
 - EQ = Exceedance Quotient (calculated as concentration/screening level).

Quality Assurance/Quality Control Data Qualifiers.

B = Reported analyte was present in the associated method blank.

J = Reported result is an estimated value.

J3 = The associated batch QC was outside the established quality control range for precision.

Table 4
WR-209 (Dry Weather) and KMW02 – Comparison of PAHs
Shore Terminals - Portland
Portland, Oregon

Well ID	Sample Date	Analytical Results (µg/L)																																			
		1-Methylnaphthalene		2-Methylnaphthalene		Acenaphthene		Acenaphthylene		Anthracene		Benzo(a)anthracene		Benzo(a)pyrene		Benzo(b)fluoranthene		Benzo(g,h,i)perylene		Benzo(k)fluoranthene		Chrysene		Dibenz(a,h)anthracene		Fluoranthene		Fluorene		Indeno(1,2,3-cd)pyrene		Naphthalene		Phenanthrene		Pyrene	
2017 PHSS Cleanup Level		--		2.1		23		--		0.73		0.0012		0.00012		0.0012		0.4		0.0013		0.0013		0.00012		6.2		3.9		0.0012		12		6.3		10	
Portland Harbor JSCS SLV		--		0.2		0.2		0.2		--		0.018		0.018		0.018		0.2		0.018		0.018		0.018		0.2		0.2		0.018		0.2		0.2		0.2	
		Conc.	SLV EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	SLV EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ	Conc.	PHSS ROD EQ		
KMW02	3/27/2015	<0.0067	--	<0.0072	--	<0.0055	--	<0.0056	--	<0.0053	--	<0.0070	--	<0.0067	--	<0.0065	--	<0.0059	--	<0.0070	--	<0.0064	--	<0.0057	--	<0.012	--	<0.0051	--	<0.0052	--	<0.0085	--	<0.0084	--	<0.013	--
	3/17/2016	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--	<0.10	--
	3/21/2017	<0.25	--	<0.25	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	0.0536 BJ	--	<0.05	--	<0.05	--
	02/09/2018	<0.25	--	<0.25	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	<0.25	--	<0.05	--	<0.05	--
	10/19/2018	<0.019	--	<0.019	--	<0.0381	--	<0.019	--	<0.00952	--	<0.00952	--	<0.0143	--	<0.0143	--	<0.00952	--	<0.0143	--	<0.00952	--	<0.00952	--	<0.019	--	<0.00952	--	<1.00	--	<0.019	--	<0.019	--	<0.019	--
	3/15/2019	<0.0316	--	<0.0316	--	<0.0158	--	<0.0158	--	<0.0158	--	<0.0079	--	<0.0079	--	<0.0079	--	<0.0158	--	<0.0079	--	<0.0079	--	<0.0079	--	<0.0158	--	<0.0158	--	<0.0079	--	<0.0316	--	<0.0316	--	<0.0158	--
	10/9/2019	<0.0189	--	<0.0189	--	<0.00943	--	<0.00943	--	<0.00943	--	<0.00943	--	<0.0142	--	<0.0142	--	<0.00943	--	<0.0142	--	<0.00943	--	<0.00943	--	<0.00943	--	<0.00943	--	<0.00943	--	<0.0189	--	<0.00943	--	<0.00943	--
	1/28/2020	<0.0187	--	<0.0187	--	<0.00935	--	<0.00935	--	<0.00935	--	<0.00935	--	0.0165	137.5	<0.014	--	<0.00935	--	<0.014	--	<0.00935	--	<0.00935	--	<0.00935	--	<0.00935	--	<0.00935	--	<0.0187	--	<0.00935	--	<0.00935	--
WR-209	8/16/2017	--	--	0.0143 J	--	5.86	--	<0.012	--	0.397	--	0.0312J	26	<0.0116 J3	--	0.00347 J	3	<0.00227	--	<0.0136 J3	--	0.0231 J	18	<0.00396 J3	--	1.01	--	3.17	--	<0.0148 J3	--	0.159 J	--	4.03	--	1.52	--

- Notes:
- PAH = Polycyclic aromatic hydrocarbons.
 - < = Concentration as reported by analytical laboratory is less than the method detection limit.
 - = not analyzed or concentration does not exceed the PHSS Cleanup Level or JSCS SLV.
 - ug/L = Microgram(s) per liter.
 - PHSS Cleanup Levels for surface water from U.S. EPA Record of Decision Portland Harbor Superfund Site, Portland, Oregon, January 2017.
 - JSCS SLV = Screening Level Values from Portland Harbor Joint Source Control Strategy (JSCS), December 2005.
 - Bold** cells indicates that the compound was detected above the laboratory method detection limit.
 - Gray highlighted cells indicate values that are equal to or exceeding PHSS Cleanup Level. If a PHSS Cleanup Level was not developed for an analyte, the JSCS SLV is used for comparison.
 - Polycyclic aromatic hydrocarbons analyzed by EPA Method 8270 with selective ion monitoring.
 - EQ = Exceedance Quotient (calculated as concentration/screening level).

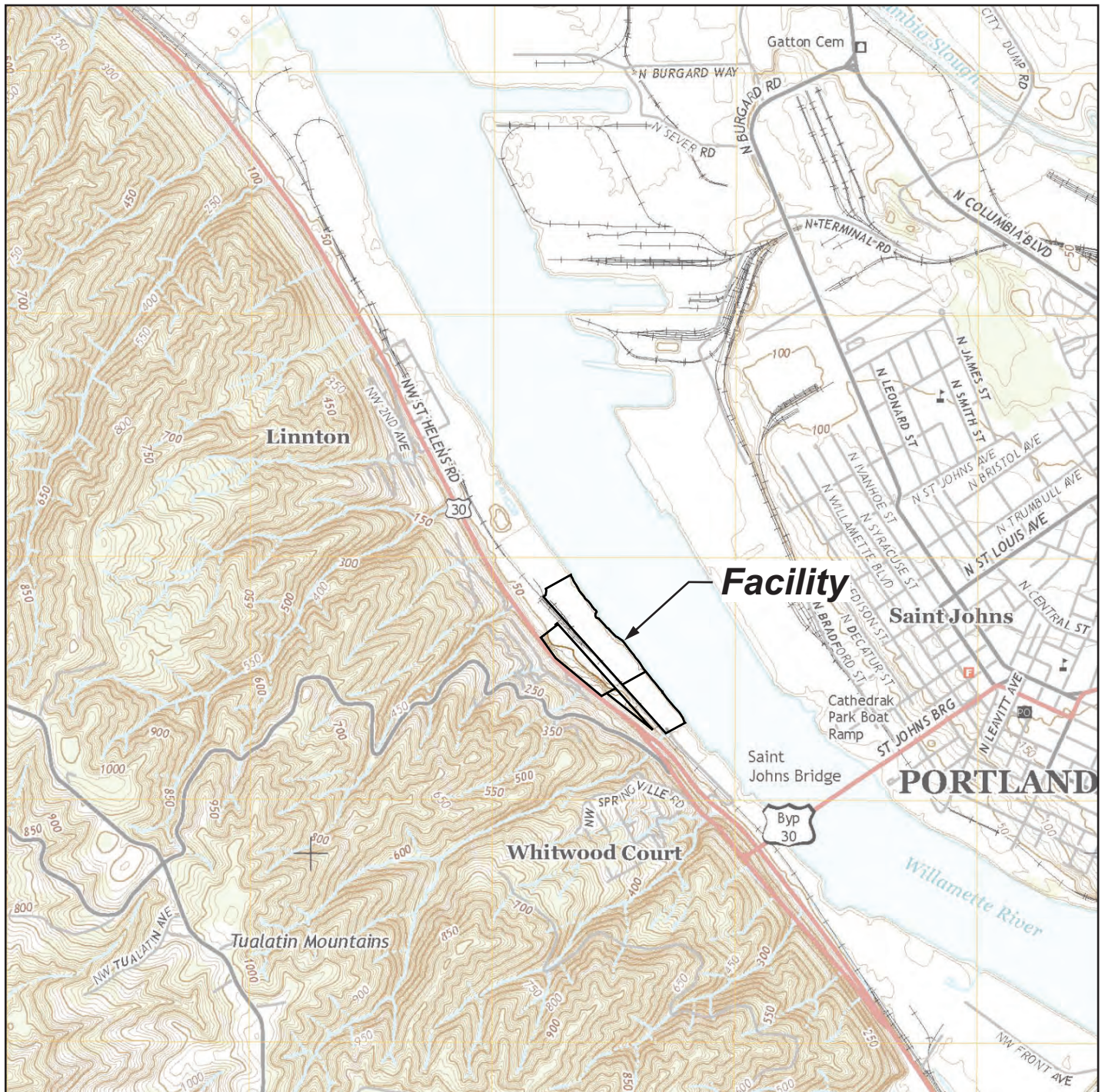
Quality Assurance/Quality Control Data Qualifiers.

B = Reported analyte was present in the associated method blank.

J = Reported result is an estimated value.

J3 = The associated batch QC was outside the established quality control range for precision.

FIGURES



Base map prepared from USGS 7.5-minute quadrangle of Linnton, Oregon, dated 2014, as provided by Topozone.

0 2,000 4,000
Scale in Feet



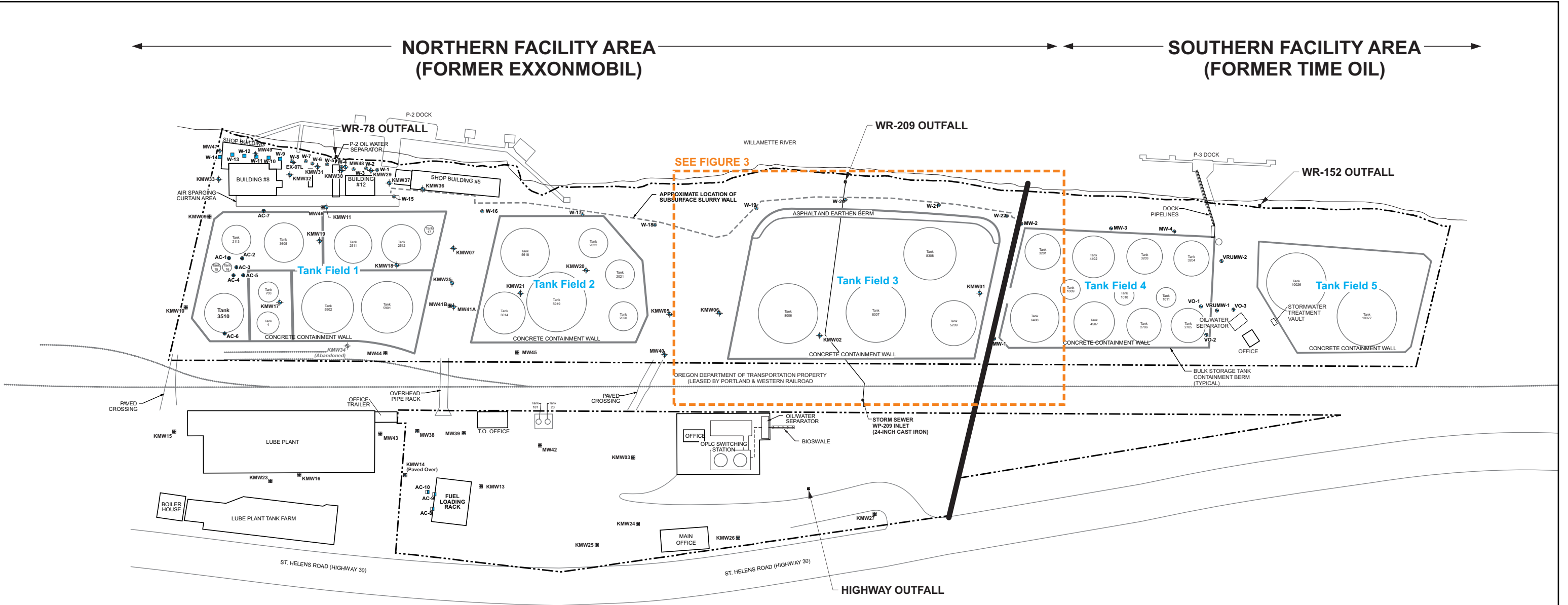
Facility Location Map

Summary of WR-209 Investigations and Sampling
Shore Terminals, LLC Portland Facility
Portland, Oregon



Project Number 0060-003-003
March 2020

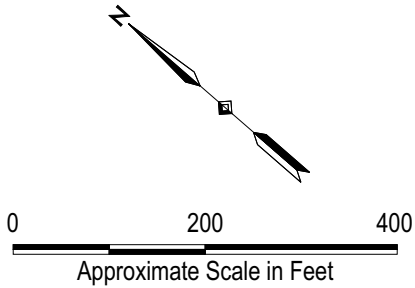
Figure
1



- Legend:**
- MW-1 Monitoring Well Location (Time Oil; Shallow Sand Unit)
 - AC-1 Monitoring Well Location (Shore Terminals; Shallow Sand Unit)
 - AC-8 Monitoring Well Location (Shore Terminals; Deep Sand Unit)
 - KMW11 Monitoring Well Location (ExxonMobil; Shallow Sand Unit)
 - MW41B Monitoring Well Location (ExxonMobil; Deep Sand Unit)
 - W-1 Groundwater Extraction Well Location (ExxonMobil; Currently Used for Monitoring Only)
 - DPW-10 Groundwater Extraction System Well Location (ExxonMobil; Currently Used for Monitoring Only)
 - Property Boundary

NOTE: AS/SVE System and Associated Above Ground Piping Were Removed in June 2018

NOTE: Base map prepared from a Site Map by Acton Mickelson Environmental, Inc., 11-29-2005, a Spill Prevention, Control, and Countermeasure Plan, Figure 2 (Site Plan) by Hart Crowser, Inc., 10-03, and a recent aerial photograph from Google.com.



Site Plan

Summary of WR-209 Investigations and Sampling
Shore Terminals, LLC Portland Facility
Portland, Oregon

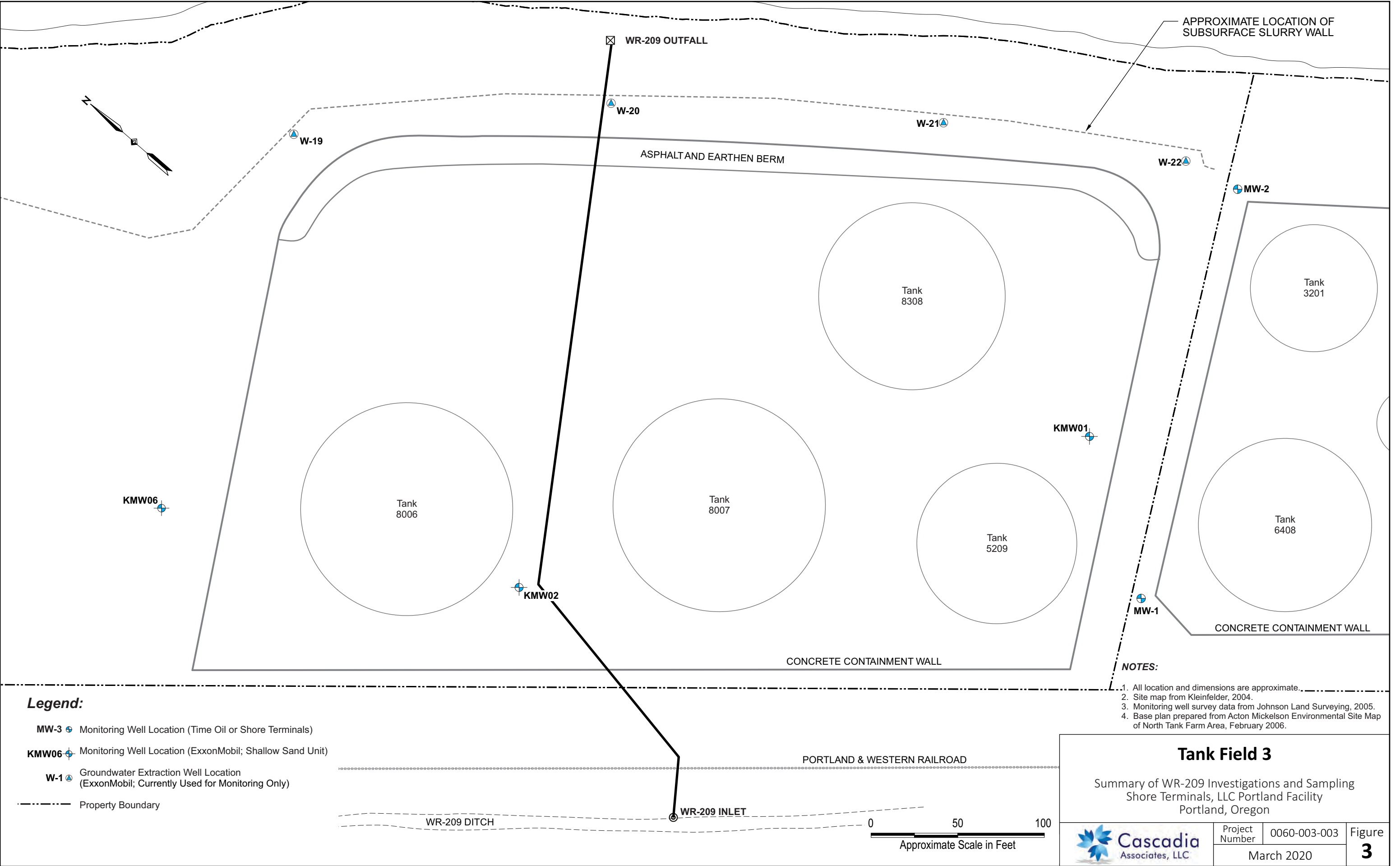


Project Number

0060-003-003

March 2020

Figure 2



APPENDIX A

Tabulation of Historical WR-209/WR-209 Ditch Results (collected by others)

Table A-1
Historical Stormwater Sampling Results – TPH, BTEX, and MTBE
Shore Terminals, LLC Portland Terminal
Portland, Oregon

Monitoring Location	Date Sampled	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE	TPHg	TPHd	TPHo
		Concentrations in ug/L (ppb)					Concentrations in mg/L (ppm)		
WR-209 Outfall	8/8/2002	430	6,000	58	140	100	17	0.78	0.12 J
WR-209 Inlet	5/13/2003	<0.5	<0.7	<0.8	<0.8	<0.5	<0.05	<0.080	<0.10
WR-209 Outfall	5/13/2003	150	74	33	53	100	0.9	0.17	<0.10
WR-209 Inlet	8/14/2003	<0.5	<0.7	<0.8	<0.8	<0.5	<0.05	<0.080	<0.10
WR-209 Outfall	8/14/2003	99	32	41	76	6.0	0.9	0.16	<0.10
WR-209 Inlet	3/24/2006	<1.00	<1.00	<1.00	<3.00	<1.00	<0.100	<0.0962	<0.0962
WR-209 Outfall	3/24/2006	38.2	14.8	3.82	11.7	40.3	0.167	0.235	0.104
WR-209 Inlet	10/29/2008	<1.00	<1.00	<1.00	<3.00	<1.00	<0.100	0.0374 J	0.0453 J
WR-209 Outfall	10/29/2008	0.840 J	0.790 J	<1.0	1.27 J	0.510 J	0.0963 J	0.149	0.0470 J
WR-209 Inlet	4/1/2009	<1.00	<1.00	<1.00	<3.00	<1.00	0.0857 J	0.0352 J	0.227
WR-209 Outfall	4/1/2009	<1.00	0.320 J	<1.00	<3.00	<1.00	<0.100	0.0656 J	0.173

Notes:

1. ug/L (ppb) = micrograms per liter (parts per billion).
2. mg/L (ppm) = milligrams per liter (parts per million).
3. TPHg = Total petroleum hydrocarbons as gasoline by Northwest TPHg.
4. TPHd and TPHo = Total petroleum hydrocarbons by Northwest TPHdx with silica gel treatment. No silica gel cleanup was performed during 2002 analyses.
5. BTEX = Benzene, toluene, ethylbenzene, and xylenes by EPA Method 8260B for all events but 2002. EPA Method 8021B was used for 2002 sampling.
6. J = Detected concentration is below method reporting limit and above method detection limit. Result is estima
7. -- = Not available.
8. **Bolded** values indicate detected concentrations.
9. MTBE = Methyl tert-butyl ether by EPA Method 8260B. Analysis method for 2002 sampling unknown.
10. < = Compound not detected above the laboratory reporting limit shown. For 2002 and 2003 sampling results, not detected above laboratory detection limit shown

Table A-2
Historical Stormwater Sampling Results – PAHs
Shore Terminals, LLC Portland Terminal
Portland, Oregon

Sampling Location	Date Sampled	Acenaphthene ¹	Acenaphthylene ¹	Anthracene ¹	Benzo(a)anthracene ³	Benzo(a)pyrene ³	Benzo(b)fluoranthene ^{2,3}	Benzo(g,h,i)perylene ²	Benzo(k)fluoranthene ^{2,3}	Chrysene ^{2,3}	Dibenz(a,h)anthracene ³	Fluoranthene ²	Fluorene ¹	Indeno(1,2,3-cd)pyrene ³	1-Methylnaphthalene ¹	2-Methylnaphthalene ¹	Naphthalene ¹	Phenanthrene ¹	Pyrene ²	LPAH	HPAH	cPAH	Total PAH
		Concentrations in ug/L (ppb)																					
WR-209 Outfall	8/8/2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.9 J	--	--	8.9	--	--	8.9
WR-209 Inlet	5/13/2003	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.0	--	--	--	--	--	--
WR-209 Outfall	5/13/2003	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.0	--	--	2.0	--	--	2.0
WR-209 Inlet	8/14/2003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	<0.01	--	--	--	--	--
WR-209 Outfall	8/14/2003	2.0	<0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	1.0	<0.01	--	--	2.0	1.0	0.4	6.1	0.6	--	6.7
WR-209 Inlet	3/24/2006	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5.0	--	--	--	--	--	--
WR-209 Outfall	3/24/2006	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5.0	--	--	--	--	--	--
WR-209 Inlet	10/29/2008	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	--	--	--	--
WR-209 Outfall	10/29/2008	0.788	0.0865 J	0.0481 J	<0.0962	<0.0962	<0.0962	<0.0962	<0.0962	<0.0962	<0.0962	0.125	0.635	<0.0962	0.221	<0.0962	<0.0962	0.471	0.250	2.34	--	--	--
WR-209 Inlet	4/1/2009	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	0.100	<0.100	0.10	--	--	--
WR-209 Outfall	4/1/2009	0.274	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	0.0526 J	0.179	<0.105	<0.105	<0.105	<0.105	0.200	0.105	0.65	0.53	--	1.2

Notes:

1. Light Polycyclic Aromatic Hydrocarbon (LPAH).

2. Heavy Polycyclic Aromatic Hydrocarbon (HPAH).

3. Carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH).

4. ug/L (ppb) = micrograms per liter (parts per billion).

5. PAHs = Polycyclic Aromatic Hydrocarbons by EPA Method 8270-SIM.

6. Naphthalene analyzed by EPA Method 8260B for 2003 and 2006 sampling and EPA Method 8021B for the 2002 sampling.

7. J = Detected concentration is below method reporting limit and above method detection limit. Result is estimated.

8. -- = Not analyzed or not established.

9. **Bolded** values indicate detected concentrations.

10. < = Compound not detected above the laboratory reporting limit shown. For 2002 and 2003 sampling results, not detected above laboratory detection limit shown



Table A-3
Historical Stormwater Sampling Results – Metals
Shore Terminals, LLC Portland Terminal
Portland, Oregon

Monitoring Location	Date Sampled	Arsenic		Copper		Lead		Zinc	
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
		Concentrations in µg/L (ppb)							
WR-209 Outfall	8/8/2002	17.3	<5.0	<3.0	<3.0	<1.2	<1.2	5.7 J	<5.0
WR-209 Inlet	5/13/2003	<5.0	<5.0	<3.0	4.3	<1.2	<1.2	4.1 J	<5.0
WR-209 Outfall	5/13/2003	5.5	<5.0	<3.0	<3.0	<1.2	<1.2	<5.0	<5.0
WR-209 Inlet	8/14/2003	<5.0	<5.0	3.1	3.3	<1.2	<1.2	4.4 J	5.3
WR-209 Outfall	8/14/2003	4.6 J	<5.0	3.6	2.5 J	<1.2	1.2	<5.0	<5.0
WR-209 Inlet	3/24/2006	--	--	--	--	--	--	--	--
WR-209 Outfall	3/24/2006	--	--	--	--	--	--	--	--
WR-209 Inlet	10/29/2008	0.470 J	0.490 J	0.740 J	1.36 J	0.350 J	<1.00	5.75	4.28
WR-209 Outfall	10/29/2008	5.14	3.81	2.44 J	<2.0	<1.00	<1.00	1.73 J	2.21 J
WR-209 Inlet	4/1/2009	6.76 J	<50	3.47 J	4.18 J	<50	<50	21.0	10.3 J
WR-209 Outfall	4/1/2009	5.80 J	<50	4.77 J	5.20 J	<50	<50	19.4 J	15.1 J

Notes:

1. ug/L (ppb) = micrograms per liter (parts per billion).
2. Metals analyzed by EPA 6000/7000 Series Methods.
3. J = Detected concentration is below method reporting limit and above method detection limit. Result is estimated.
4. -- = Not available.
5. **Bolded** values indicate detected concentrations.
6. < = Compound not detected above the laboratory reporting limit shown. For 2002 and 2003 sampling results, not detected above laboratory detection limit shown.

ATTACHMENT A

Kleinfelder, 2003. *Storm Sewer Outfall Sampling and
Abandoning Storm Sewer Outfall, Former ExxonMobil Portland
Terminal, 9420 NW St. Helens Road, Portland, Oregon*
April 30, 2003.



April 30, 2003
Project No. 26626

Mr. Brian J. Harrison
ExxonMobil Corporation
Global Remediation
607 ExxonMobil Road
Billings, Montana 59101

**SUBJECT: STORM SEWER OUTFALL SAMPLING and
ABANDONING STORM SEWER OUTFALL
FORMER EXXONMOBIL PORTLAND TERMINAL
9420 NW ST. HELENS ROAD
PORTLAND, OREGON**

Dear Mr. Harrison:

We are providing this letter to inform you of activities related to the storm sewer outfalls at the former ExxonMobil Portland Terminal (Terminal). The identified outfalls and sewer alignments at the Terminal are shown in Figure 1, Industrial Source Control Aerial Photograph, provided by the City of Portland Bureau of Environmental Services (BES) Industrial Stormwater Program. There are five stormwater outfalls at the Terminal along the Willamette River. Photographs of the outfalls are shown in Figure 2. For clarity, outfalls are referred to by the designations assigned by the BES: OF-23, OF-23-Abandoned, WP-78, WP-202, and WP-209. Outfalls OF-23 and OF-23-Abandoned are owned by the City of Portland. WP-78, WP-202, and WP-209 are private or are owned by agencies other than the City of Portland. Note that the sanitary sewer indicated in Figure 1 by a red line passing through the Terminal from northwest to southeast is the Interceptor Sewer installed by the City of Portland in 1969.

BACKGROUND INFORMATION

OF-23-ABANDONED (Abandoned Storm Sewer): Kleinfelder contacted the BES Sewer Engineering Services and spoke with Mr. Tom Caufield, sewer maintenance engineer, to inquire about City records on the storm sewers at the Terminal. OF-23-Abandoned was a 10-inch vitrified clay pipe that ran underneath the Center Tank Farm. The pipe was installed prior to 1936 to drain runoff from the residential hillside southwest of the Terminal to the Willamette

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River. During normal flows, storm runoff would go into the main Interceptor Sewer that runs along the railroad right-of-way; however, during significant rain events excess water would flow into the OF-23-Abandoned pipe and discharge to the Willamette River. The slurry wall at the site was installed in the early 1980s and constructed such that the overflow pipe passed through it. Because of the poor condition of the pipe, the City of Portland abandoned the portion of the pipe under the Center Tank Farm from approximately the railroad line to the Willamette River bank by filling it with grout. Mr. Caufield was involved with some of the sewer work at the Terminal in the late 1980s, and in fact was present at the Terminal in 1989 when the City abandoned OF-23-Abandoned. According to Mr. Caufield, OF-23-Abandoned was video-surveyed in 1985, and the ten-inch vitrified clay pipe was found to be badly cracked and damaged throughout its length. Mobil Oil Corporation and the City of Portland entered into a cost sharing agreement at the time, the City of Portland or their contractors abandoned and replaced the sewer, and Mobil paid a portion of the cost. Mr. Caufield said that the upstream end of the OF-23-Abandoned line, just downstream of the Interceptor Sewer, was pumped with grout until the asphalt above the pipe began to heave upward, and then the grouting was discontinued. It was not clear from the City of Portland records that Kleinfelder reviewed whether grout was pumped into the downstream end of OF-23-Abandoned (at the outfall) or not.

OF-23: When OF-23-Abandoned was abandoned in 1989, it was replaced with OF-23, a 27-inch diameter concrete pipe routed between the Center and South Tank Farms. OF-23 was configured such that under normal conditions combined sewage from the hillside southwest of the Terminal would be diverted to the Interceptor Sewer and not to the OF-23 outfall, but excess flow from storm events would be diverted to the OF-23 outfall. According to Mr. Caufield, in 1991 OF-23 was sealed to divert all flow to the Interceptor Sewer and prevent any flow from reaching the OF-23 outfall.

WP-202: This outfall is the discharge point of a 42-inch diameter, concrete sewer that conveys storm water runoff from the adjacent hillside across the northern portion of the Terminal to the Willamette River. The City of Portland does not claim ownership of the pipe, and Mr. Caufield indicates that ownership of the pipe has been in question since at least the 1980s when he became involved. A small flow volume was observed coming from this pipe on July 16, 2002.

WP-209: WP-209 conveys storm water runoff from the adjacent hillside beneath the South Tank Farm to the WP-209 outfall to the Willamette River. The City of Portland does not claim ownership of this pipe, either. Flow from this outfall was observed on July 16, 2002 (estimated to be less than 1 gallon per minute).

WP-78: WP-78 is the outfall associated with the Terminal storm water collection system that terminates at the API separator outfall. This outfall is now owned and permitted by ST Services.

OUTFALL SAMPLING

Water samples were collected by Kleinfelder on October 17, 2001 from outfall OF-23-Abandoned, and on August 9, 2002 from outfalls WP-202, OF-23 Abandoned, and WP-209. Outfall OF-23 was not sampled during the August 9, 2002 event because there was no flow, and WP-78 was not sampled because it is permitted and sampled by ST Services. The outfall samples were sent to Lancaster Laboratories of Lancaster, Pennsylvania for analysis of benzene, toluene, ethylbenzene, and xylenes; gasoline-range petroleum hydrocarbons (NWTPH-Gx); diesel- and heavy oil-range petroleum hydrocarbons (NWTPH-Dx); and total and dissolved arsenic, copper, lead, and zinc. Sample results are summarized in Tables 1-A and 1-B. The laboratory analytical reports are attached.

PRESSURE GROUTING OUTFALL OF-23-ABANDONED

Based on the sampling results from outfall OF-23-Abandoned, and the fact that it was no longer a functioning sewer, the outfall pipe was grouted in late October 2002 to terminate flow.

PLANNING/PREPARATION: Since the storm pipe outfall is located adjacent to a navigable waterway, authorization from the U.S. Army Corps of Engineers (COE) was required to proceed with the project. Kleinfelder was able to acquire authorization in the form of pre-written Nationwide Permit Number 38 that allows for certain activities associated with the cleanup of waste. Kleinfelder submitted an application for the permit to the COE on behalf of ExxonMobil, and also provided information and received feedback from other stakeholder agencies, including the U.S. Environmental Protection Agency and the Oregon Division of State Lands (DSL). The Voluntary Cleanup Program site project manager for the Oregon Department of Environmental Quality helped to get the DSL approval while waiving their permit.

Additionally, Kleinfelder contacted the United States Coast Guard (USCG). The USCG requested a copy of work plan contained in the COE permit application, which was provided. The USCG stated that they wanted to be informed a day or two before the project start date, and might make a site visit during the project.

The City of Portland Greenway Commission issues permits and has shore and bank landscaping requirements for certain projects and activities within approximately 100 feet of the Willamette River. Because of the nature of project, the Commission waived their requirement for a permit.

ST Services was informed of the plan to plug the pipe. Bill Dungan, the local terminal manager, and Richard Brandes, the ST Services Environmental Director located in Martinez, California, were each provided a copy of the work plan and approved of the scope.

STORM PIPE ABANDONMENT FIELD ACTIVITIES: To accomplish the pipe abandonment project, Kleinfelder subcontracted with Foss Environmental Services Company (Foss), an environmental spill response, geo-construction, and waste management contractor. The abandonment fieldwork was conducted in three phases over three days. The phases included exposing the pipe by hand digging and setting up a waste containment basin and booms; cleaning out the pipe by water-jetting and catching and containing the water and sediment outwash with a vacuum truck; and pressure-grouting the pipe, restoring the stream bank, and demobilizing equipment. During the project, Kleinfelder monitored the river turbidity at the worksite as well as both upstream and downstream of the worksite, as required by the Corps of Engineers Nationwide Permit. The detailed project activities are summarized below.

Day 1 – October 29, 2002

Jim Petersen of Kleinfelder met with the Foss crew that included a project foreman and two laborers, and held a tailgate health and safety meeting. A project-specific job safety analysis had been created to augment the general site health and safety plan. Injury and emergency response contingency plans were described.

The Foss crew set up a containment boom around the work area which consisted of an approximately eight-inch diameter floating boom with an attached curtain that hung below the boom underwater. An oil-absorbent boom was set inside of the containment boom. The USCG inspected the site during the boom installation. The USCG approved of both the boom set-up and the contractors used on the project. The USCG requested prompt notification if there was a significant release resulting from the project that escaped the containment. Prior to leaving, some small crusty, oily spots on the bank near the water about 20 feet downstream of the work area were noted by the USCG.

Workers next began moving riprap and hand digging to expose the outlet of the pipe. After excavating approximately ten feet back from the opening of the wooden structure, it became apparent that the vitrified clay pipe shown on site drawings and identified by the City of Portland as "OF-23 Abandoned," was actually a separate pipe from the wooden structure. The vitrified clay pipe was located approximately two feet above the wooden pipe, and was visibly sealed with grout. A flat area was made at the mouth of the wooden pipe to accommodate a catchment pool.

Day 2 – October 30, 2002

Jim Petersen of Kleinfelder met with the Foss crew and MRP, the water jetting/vacuum truck company, and conducted a tailgate health and safety meeting covering general and project-specific site safety considerations, and focusing particularly on water jetting, high-vacuum, and waste containment issues.

Foss set up a containment pool at the mouth of the pipe, and MRP began jetting sediments out of the wooden pipe with a high pressure jetting hose inserted into the mouth of the pipe. The vacuum truck was used to catch the water and oily sediments as they were washed into the catchment pool. All water and sediments from the jetting operation were captured before they could flow into the river. For approximately two hours the pipe was jetted from its mouth to approximately 65 feet in from the mouth. The 65-foot length was estimated to be up past the uphill side of the slurry wall. Several chunks of bark and wood (up to four inches by ten inches) and a large volume of sediment were washed from the pipe. It was believed that the original volume of pipe sediment had been removed, and the sand that was continuing to enter the pipe was from the surrounding formation, so the jetting was terminated. A small remote, track-mounted camera was put into the pipe to inspect the results of the cleaning operation, however it could not pass beyond 20 feet from the mouth because a piece of debris was lodged in the bottom of the pipe. Foss and MRP attempted unsuccessfully to remove the obstruction. Kleinfelder decided at that point not to do any additional jetting, since the jetting hose could be inserted beyond the distance to the slurry wall, and further jetting would result in the generation of an additional volume of waste material without further benefit toward clearing the pipe.

The work area was secured for the day, and Foss and MRP off-loaded the contents of the vacuum truck into drums. The drums were labeled and staged near the remediation equipment at the Terminal.

Day 3 – October 31, 2002

Jim Petersen of Kleinfelder met with Foss in preparation for the pressure-grouting phase. An MRP vacuum truck operator was on site standing by in case of an unforeseen event during the grouting operation such as a release of oily material. After Kleinfelder conducted a tailgate health and safety meeting, Foss installed a three-inch diameter tremmie pipe 60 feet into the pipe. The tremmie pipe would be left in the abandoned pipe after grouting. After installing the tremmie, a dam, or improvised packer, was built at the mouth of the pipe. The grout pump was placed on the roadway at the top of the riverbank, and the grout hose was connected to the tremmie with approximately 50 feet of hose. Grout was pumped into the pipe. When three cubic yards of grout had been placed in the pipe, and the pumping pressure had built up to 1,800 pounds per square inch, the tremmie pushed back the packer. The packer was quickly replaced,

and the grout pump restarted. Eventually, no more grout could be pumped into the pipe, and the grout pump peaked at approximately 2,400 pounds per square inch of pressure. At this point, water had ceased flowing from the pipe outlet.

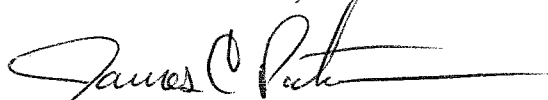
The soil and riprap that had been moved away from the mouth of the pipe were replaced. The catchment basin and containment boom were removed, and the riverbank was restored to approximate its condition before the project.

Post Abandonment

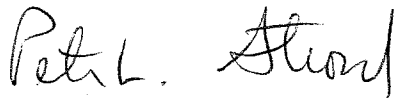
Kleinfelder has observed the storm pipe outlet while at the site for other tasks for the Portland Terminal project, and has not seen water flowing out of the pipe. Seasonal high water occurred in the Willamette River in December, covering the bank above the level of the mouth of the abandoned pipe. We will continue to monitor the abandoned pipe when the seasonal low water conditions return, most likely around the month of July.

Sincerely yours,

KLEINFELDER, INC.



James C. Petersen, P.E.
Project Environmental Engineer



Peter L. Stroud, C.E.G.
Environmental Group Leader

Attachments: Table 1-A. Sewer Outfall Sample Results – Petroleum Hydrocarbons
Table 1-B. Sewer Outfall Sample Results – Metals
Figure 1. Industrial Source Control Aerial Photograph
Figure 2. Sewer Outfall Photographs
Laboratory Analytical Reports

Table 1-A. Sewer Outfall Sample Results – Petroleum Hydrocarbons

Sample Identification	Sample Location	Sample Date	Benzene (µg/L) [1]	Toluene (µg/L) [1]	Ethylbenzene (µg/L) [1]	Total Xylenes (µg/L) [1]	MtBE (µg/L) [1]	Naphthalene (µg/L) [1]	NWTPH-Gx (µg/L) [2]	NWTPH-Dx (diesel) (mg/L) [3]	NWTPH-Dx (heavy oil) (mg/L) [3]
WS-101701	OF-23 Abandoned	October 17, 2001	67	8.3L	5.9	7.7	<20	12	2,700	7.1	<1.9
WP209-080802	WP-209	August 8, 2002	430	6,000	58	140	100	8.9	17,000	0.78	0.12 J
OF23AB-080802	OF-23 Abandoned	August 8, 2002	28	2.1	2.4	2.7 J	10	<5.0	1,700	6.8	0.83
WP202-080802	WP-202	August 8, 2002	<0.20	<0.20	<0.20	<0.60	<0.30	<1.0	<50	<0.084	<0.11
Cleanup Goal*			40	NS	NS	NS	NS	347	1,000	1.0	1.0

1. BTEX, MTBE, Nap. by 8021

2. TPH by NWTPH-Gx (water)

3. TPH by NWTPH-Dx (water)

*Groundwater cleanup goal specified in June 1997 Record of Decision

mg/L milligrams per liter

µg/L micrograms per liter

J Laboratory estimated value

Concentrations printed in bold type where groundwater cleanup goal exceeded

NS Cleanup goal not specified in Record of Decision

Table 1-B. Sewer Outfall Sample Results – Metals

Sample Identification	Sample Location	Sample Date	Total Arsenic (mg/L) [1]	Total Copper (mg/L) [2]	Total Lead (mg/L) [3]	Total Zinc (mg/L) [2]	Dissolved Arsenic (mg/L) [1]	Dissolved Copper (mg/L) [2]	Dissolved Lead (mg/L) [3]	Dissolved Zinc (mg/L) [2]
WS-101701	OF-23 Abandoned	October 17, 2001	0.0222	<0.0024	<0.0088	<0.0032	<0.0053	<0.0024	<0.0088	<0.0032
WP209-080802	WP-209	August 8, 2002	0.0173	<0.0030	<0.0012	0.0057 J	<0.0050	<0.0030	<0.0012	<0.0050
OF23AB-080802	OF-23 Abandoned	August 8, 2002	0.0196	<0.0030	<0.0012	<0.0050	<0.0050	<0.0030	<0.0012	0.0090 J
WP202-080802	WP-202	August 8, 2002	<0.0050	<0.0030	<0.0012	0.0414	<0.0050	<0.0030	<0.0012	0.0269
Cleanup Goal*			0.005	0.012	0.0022	NS	NS	NS	NS	NS

1. SW-846 7060A

2. SW-846 7421

3. SW-846 6010B

*Groundwater cleanup goal specified in the June 1997 Record of Decision

mg/L milligrams per liter

J Laboratory estimated value

Concentrations printed in bold type where groundwater cleanup goal exceeded

NS Cleanup goal not specified in Record of Decision



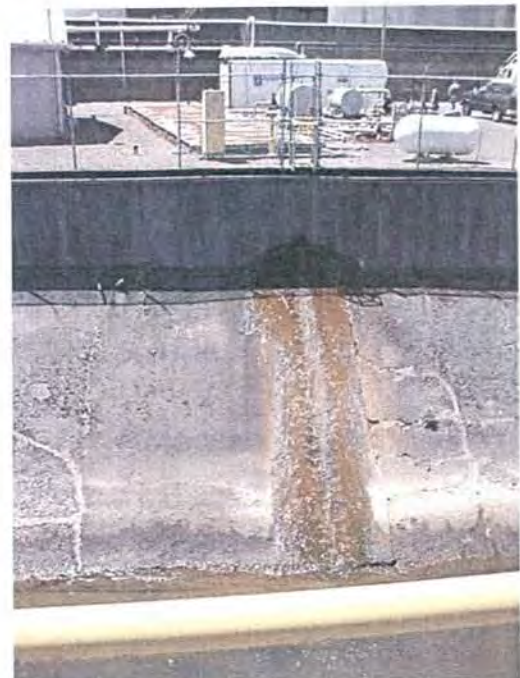
WP-209



OF-23



OF-23 Abandoned



WP-78



WP-202



- LEGEND**
- Storm Sewer
 - Sanitary Sewer
 - Combined Sewer
 - ▲ OF 23 City of Portland Outfall
 - WP-209 Private Outfall

Photo/Map Source: City of Portland Bureau of Environmental Services,
Industrial Stormwater Program



L:\2003\Projects\26626\Outfalls\501120ofF1.cdr 07/02 JKG

INDUSTRIAL SOURCE CONTROL AERIAL PHOTOGRAPH
FORMER EXXONMOBIL PORTLAND TERMINAL
PORTLAND, OREGON

Project # 60-501120

FIGURE 1

CASE NARRATIVE

Prepared For:

Brian Harrison
ExxonMobil
607 ExxonMobil Road
Billings, MT 59101

Prepared By:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 818543. Samples arrived at the laboratory on Saturday, August 10, 2002.

METHODOLOGY

The specific methodologies used in obtaining the enclosed analytical results are indicated on the laboratory chronicles.

COMMENTS

Due to the nature of the sample matrix of sample OF23AB-080802 from LOC# 36-001, the surrogate standard recovery is above the range of specifications for the NWTPH-Dx analysis.



Lancaster Laboratories

Where quality is a science.

ANALYTICAL RESULTS

Prepared for:

ExxonMobil

607 ExxonMobil Road
Billings, MT 59101
310-212-1858

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 818543. Samples arrived at the laboratory on Saturday, August 10, 2002. The PO# for this group is 4501839968 and the release number is 00010.

Client Description

WP209-080802 Water Sample
WP209-080802 Filtered Water Sample
OF23AB-080802 Water Sample
OF23AB-080802 Filtered Water Sample
WP202-080802 Water Sample
WP202-080802 Filtered Water Sample

Lancaster Labs Number

3876582
3876583
3876584
3876585
3876586
3876587

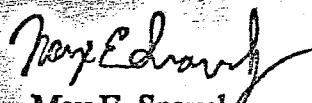
1 COPY TO

Kleinfelder

Attn: Jim Petersen

Questions? Contact your Client Services Representative
Teresa M Lis at (717) 656-2300.

Respectfully Submitted,


Max E. Snavelly
Sr. Chemist



Lancaster Laboratories Sample No. WW 3876582

Collected: 08/08/2002 14:30 by JP

Account Number: 09728

Submitted: 08/10/2002 10:00

ExxonMobil

Reported: 08/23/2002 at 11:12

Discard: 09/23/2002

WP209-080802 Water Sample

607 ExxonMobil Road
Billings, MT 59101

LOC# 36-001 WBS# 08

MOBIL: 9420 NW St. Helens Rd.- Portland, OR

WP209

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
01045	Arsenic (GF)	Code 065 7440-38-2	0.0173	0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D. #	0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.	0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	0.0057 J	0.0050	mg/l	1
08216	BTEx, MTBE, Nap. (8021) Code 011					
00776	Benzene	71-43-2	430.	1.0	ug/l	5
00777	Toluene	108-88-3	6,000.	4.0	ug/l	20
00778	Ethylbenzene	100-41-4	58.	1.0	ug/l	5
00779	Total Xylenes	1330-20-7	140.	3.0	ug/l	5
00780	Methyl tert-Butyl Ether	1634-04-4	100.	1.5	ug/l	5
00781	Naphthalene	91-20-3	8.9 J	5.0	ug/l	5
Due to dilution of the sample made necessary by the high level of toluene, normal reporting limits were not attained.						
08271	TPH by NWTPH-Dx (waters)					
02095	Diesel Range Organics	n.a.	0.78	0.080	mg/l	1
02096	Heavy Range Organics	n.a.	0.12 J	0.10	mg/l	1
Site-specific QC samples were not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.						
08274	TPH by NWTPH-Gx waters					
01648	TPH by NWTPH-Gx waters	n.a.	17.	0.24	mg/l	5

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
01045	Arsenic (GF)	Code SW-846 7060A	1	08/14/2002 10:22	Jessica L Boyd	1
01055	Lead (GF)	Code SW-846 7421	1	08/13/2002 09:35	Jessica L Boyd	1
01753	Copper	Code SW-846 6010B	1	08/14/2002 11:25	Joanne M Gates	1



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PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681



Lancaster Laboratories Sample No. WW 3876582

Collected: 08/08/2002 14:30 by JP

Account Number: 09728

Submitted: 08/10/2002 10:00

ExxonMobil

Reported: 08/23/2002 at 11:12

Discard: 09/23/2002

607 ExxonMobil Road

WP209-080802 Water Sample

Billings, MT 59101

LOC# 36-001 WBS# 08

MOBIL: 9420 NW St. Helens Rd.- Portland, OR

WP209

01772	Zinc	Code	SW-846 6010B	1	08/14/2002 11:25	Joanne M Gates	1
	060						
08216	BTEX, MTBE, Nap. (8021) Code	SW-846 8021B	1	08/13/2002 19:00	Melissa D Mann	20	
	011						
08216	BTEX, MTBE, Nap. (8021) Code	SW-846 8021B	1	08/13/2002 20:15	Melissa D Mann	5	
	011						
08271	TPH by NWTPH-Dx (waters)	NWTPH-Dx, ECY 97-602 (modified)	1	08/14/2002 21:37	Devin M Lahr	1	
08274	TPH by NWTPH-Gx waters	TPH by NWTPH-Gx - 8015B Mod.	1	08/13/2002 20:15	Melissa D Mann	5	
01146	GC VOA Water Prep	SW-846 5030B	1	08/13/2002 19:00	Melissa D Mann	n.a.	
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	08/12/2002 19:30	James L Mertz	1	
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	1	08/12/2002 21:30	Annamaria Stipkovits	1	
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	08/13/2002 08:30	Liana C Jones	1	
07003	Extraction - DRO (Waters)	NWTPH-Dx, ECY 97-602, 6/97	1	08/13/2002 17:45	JoElla L Rice	1	



Page 1 of 1

Lancaster Laboratories Sample No. WW 3876583

Collected: 08/08/2002 14:30 by JP

Account Number: 09728

Submitted: 08/10/2002 10:00

ExxonMobil

Reported: 08/23/2002 at 11:13

Discard: 09/23/2002

WP209-080802 Filtered Water Sample

LOC# 36-001 WBS# 08

MOBIL: 9420 NW St. Helens Rd.- Portland, OR

607 ExxonMobil Road
Billings, MT 59101

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D. #		0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.		0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	N.D.		0.0050	mg/l	1

This sample was filtered in the lab for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis		Analyst	Dilution Factor
				Date and Time			
01045	Arsenic (GF) 065	Code SW-846 7060A	1	08/14/2002 10:42		Jessica L Boyd	1
01055	Lead (GF) 064	Code SW-846 7421	1	08/13/2002 09:40		Jessica L Boyd	1
01753	Copper 060	Code SW-846 6010B	1	08/14/2002 11:40		Joanne M Gates	1
01772	Zinc 060	Code SW-846 6010B	1	08/14/2002 11:40		Joanne M Gates	1
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	08/12/2002 19:30		James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	1	08/12/2002 21:30		Annamaria Stipkovits	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	08/13/2002 08:30		Liana C Jones	1





Lancaster Laboratories Sample No. WW 3876584

Collected: 08/08/2002 15:00 by JP

Account Number: 09728

Submitted: 08/10/2002 10:00

ExxonMobil

Reported: 08/23/2002 at 11:13

Discard: 09/23/2002

607 ExxonMobil Road

OF23AB-080802 Water Sample

Billings, MT 59101

LOC# 36-001 WBS# 08

MOBIL: 9420 NW St. Helens Rd.- Portland, OR

OF23A

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	0.0196		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D. #		0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.		0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	N.D.		0.0050	mg/l	1
08216	BTEX, MTBE, Nap. (8021) Code 011						
00776	Benzene	71-43-2	28.		0.20	ug/l	1
00777	Toluene	108-88-3	2.1		0.20	ug/l	1
00778	Ethylbenzene	100-41-4	2.4		0.20	ug/l	1
00779	Total Xylenes	1330-20-7	2.7 J		0.60	ug/l	1
00780	Methyl tert-Butyl Ether	1634-04-4	10.		0.30	ug/l	1
00781	Naphthalene	91-20-3	N.D. #		5.0	ug/l	1
	Due to the presence of an interferent near its retention time, the normal reporting limit was not attained for naphthalene. The presence or concentration of this compound cannot be determined due to the presence of this interferent.						
08271	TPH by NWTPH-Dx (waters)						
02095	Diesel Range Organics	n.a.	6.8		0.38	mg/l	5
02096	Heavy Range Organics	n.a.	0.83		0.10	mg/l	1
	Due to the nature of the sample matrix, the surrogate standard recovery is above the range of specifications.						
08274	TPH by NWTPH-Gx waters						
01648	TPH by NWTPH-Gx waters	n.a.	1.7		0.050	mg/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Code	Method	Analysis		Analyst	Dilution Factor
				Trial#	Date and Time		
01045	Arsenic (GF)	Code	SW-846 7060A	1	08/14/2002 10:53	Jessica L Boyd	1
01055	Lead (GF)	Code	SW-846 7421	1	08/13/2002 09:45	Jessica L Boyd	1



Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681



Lancaster Laboratories Sample No. WW 3876584

Collected: 08/08/2002 15:00 by JP

Account Number: 09728

Submitted: 08/10/2002 10:00

ExxonMobil

Reported: 08/23/2002 at 11:13

Discard: 09/23/2002

OF23AB-080802 Water Sample

LOC# 36-001 WBS# 08

MOBIL: 9420 NW St. Helens Rd.- Portland, OR

607 ExxonMobil Road
Billings, MT 59101

OF23A							
01753	Copper	Code	SW-846 6010B	1	08/14/2002 11:45	Joanne M Gates	1
	060						
01772	Zinc	Code	SW-846 6010B	1	08/14/2002 11:45	Joanne M Gates	1
	060						
08216	BTEX, MTBE, Nap. (8021)	Code	SW-846 8021B	1	08/13/2002 16:02	Melissa D Mann	1
	011						
08271	TPH by NWTPH-Dx (waters)		NWTPH-Dx, ECY 97-602 (modified)	1	08/20/2002 22:53	Devin M Lahr	1
08271	TPH by NWTPH-Dx (waters)		NWTPH-Dx, ECY 97-602 (modified)	1	08/21/2002 18:00	Devin M Lahr	5
08274	TPH by NWTPH-Gx waters		TPH by NWTPH-Gx - 8015B Mod.	1	08/13/2002 16:02	Melissa D Mann	1
01146	GC VOA Water Prep		SW-846 5030B	1	08/13/2002 16:02	Melissa D Mann	n.a.
01848	WW SW846 ICP Digest (tot rec)		SW-846 3005A	1	08/12/2002 19:30	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot		SW-846 3020A	1	08/12/2002 21:30	Annamaria Stipkovits	1
06254	WW/TL As/Se-GFAA Digest		SW-846 7060A	1	08/13/2002 08:30	Liana C Jones	1
07003	Extraction - DRO (Waters)		NWTPH-Dx, ECY 97-602, 6/97	2	08/19/2002 17:45	JoElla L Rice	1



Lancaster Laboratories Sample No. WW 3876585

Collected: 08/08/2002 15:00 by JP

Account Number: 09728

Submitted: 08/10/2002 10:00

ExxonMobil

Reported: 08/23/2002 at 11:14

Discard: 09/23/2002

607 ExxonMobil Road

Billings, MT 59101

OF23AB-080802 Filtered Water Sample

LOC# 36-001 WBS# 08

MOBIL: 9420 NW St. Helens Rd.- Portland, OR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D. #		0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.		0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	0.0090 J		0.0050	mg/l	1

This sample was filtered in the lab for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Method	Analysis		Analyst	Dilution Factor
			Trial#	Date and Time		
01045	Arsenic (GF) 065	Code SW-846 7060A	1	08/14/2002 11:03	Jessica L Boyd	1
01055	Lead (GF) 064	Code SW-846 7421	1	08/14/2002 11:25	Jessica L Boyd	1
01753	Copper 060	Code SW-846 6010B	1	08/14/2002 11:50	Joanne M Gates	1
01772	Zinc 060	Code SW-846 6010B	1	08/14/2002 11:50	Joanne M Gates	1
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	08/12/2002 19:30	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	1	08/12/2002 21:30	Annamaria Stipkovits	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	08/13/2002 08:30	Liana C Jones	1



Lancaster Laboratories Sample No. WW 3876586

Collected: 08/08/2002 15:30 by JP

Account Number: 09728

Submitted: 08/10/2002 10:00

ExxonMobil

Reported: 08/23/2002 at 11:14

607 ExxonMobil Road

Discard: 09/23/2002

Billings, MT 59101

WP202-080802 Water Sample

LOC# 36-001 WBS# 08

MOBIL: 9420 NW St. Helens Rd.- Portland, OR

WP202

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D. #		0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.		0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	0.0414		0.0050	mg/l	1
08216	BTEX, MTBE, Nap. (8021) Code 011						
00776	Benzene	71-43-2	N.D.	0.20		ug/l	1
00777	Toluene	108-88-3	N.D.	0.20		ug/l	1
00778	Ethylbenzene	100-41-4	N.D.	0.20		ug/l	1
00779	Total Xylenes	1330-20-7	N.D.	0.60		ug/l	1
00780	Methyl tert-Butyl Ether	1634-04-4	N.D.	0.30		ug/l	1
00781	Naphthalene	91-20-3	N.D.	1.0		ug/l	1
08271	TPH by NWTPH-Dx (waters)						
02095	Diesel Range Organics	n.a.	N.D. #	0.084		mg/l	1
02096	Heavy Range Organics	n.a.	N.D. #	0.11		mg/l	1
	Site-specific QC samples were not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.						
08274	TPH by NWTPH-Gx waters						
01648	TPH by NWTPH-Gx waters	n.a.	N.D.	0.050		mg/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Method	Analysis		Analyst	Dilution Factor
			Trial#	Date and Time		
01045	Arsenic (GF)	Code SW-846 7060A	1	08/14/2002 11:13	Jessica L Boyd	1
01055	Lead (GF)	Code SW-846 7421	1	08/13/2002 09:55	Jessica L Boyd	1
01753	Copper	Code SW-846 6010B	1	08/14/2002 11:54	Joanne M Gates	1
01772	Zinc	Code SW-846 6010B	1	08/14/2002 11:54	Joanne M Gates	1
08216	BTEX, MTBE, Nap. (8021) Code 011	SW-846 8021B	1	08/13/2002 15:27	Melissa D Mann	1





Lancaster Laboratories Sample No. WW 3876586

Collected: 08/08/2002 15:30 by JP

Account Number: 09728

Submitted: 08/10/2002 10:00

ExxonMobil

Reported: 08/23/2002 at 11:14

607 ExxonMobil Road
Billings, MT 59101

Discard: 09/23/2002

WP202-080802 Water Sample

LOC# 36-001 WBS# 08

MOBIL: 9420 NW St. Helens Rd.- Portland, OR

WP202

08271	TPH by NWTPH-Dx (waters)	NWTPH-Dx, ECY 97-602 (modified)	1	08/14/2002 22:02	Devin M Lahr	1
08274	TPH by NWTPH-Gx waters	TPH by NWTPH-Gx - 8015B Mod.	1	08/13/2002 15:27	Melissa D Mann	1
01146	GC VOA Water Prep	SW-846 5030B	1	08/13/2002 15:27	Melissa D Mann	n.a.
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	08/12/2002 19:30	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	1	08/12/2002 21:30	Annamaria Stipkovits	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	08/13/2002 08:30	Liana C Jones	1
07003	Extraction - DRO (Waters)	NWTPH-Dx, ECY 97-602, 6/97	1	08/13/2002 17:45	JoElla L Rice	1



Page 1 of 1

Lancaster Laboratories Sample No. WW 3876587

Collected: 08/08/2002 15:30 by JP

Account Number: 09728

Submitted: 08/10/2002 10:00

ExxonMobil

Reported: 08/23/2002 at 11:14

607 ExxonMobil Road
Billings, MT 59101

Discard: 09/23/2002

WP202-080802 Filtered Water Sample

LOC# 36-001 WBS# 08

MOBIL: 9420 NW St. Helens Rd.- Portland, OR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method	Units	Dilution Factor
				Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.	0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D. #	0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.	0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	0.0269	0.0050	mg/l	1

This sample was filtered in the lab for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Code	Method	Analysis		Analyst	Dilution Factor
				Trial#	Date and Time		
01045	Arsenic (GF)	Code	SW-846 7060A	1	08/14/2002 11:23	Jessica L Boyd	1
01055	Lead (GF)	Code	SW-846 7421	1	08/13/2002 10:09	Jessica L Boyd	1
01753	Copper	Code	SW-846 6010B	1	08/14/2002 11:59	Joanne M Gates	1
01772	Zinc	Code	SW-846 6010B	1	08/14/2002 11:59	Joanne M Gates	1
01848	WW SW846 ICP Digest (tot rec)		SW-846 3005A	1	08/12/2002 19:30	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot		SW-846 3020A	1	08/12/2002 21:30	Annamaria Stipkovits	1
06254	WW/TL As/Se-GFAA Digest		SW-846 7060A	1	08/13/2002 08:30	Liana C Jones	1



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Quality Control Summary

Page 1 of 2

Client Name: ExxonMobil
Reported: 08/23/02 at 11:14 AM

Group Number: 818543

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 022241848006	Sample number(s): 3876582-3876587							
Copper Code 060	N.D.	0.003	mg/l	105		92-108		
Zinc Code 060	N.D.	0.005	mg/l	109		94-112		
Batch number: 022245704002	Sample number(s): 3876582-3876587							
Lead (GF) Code 064	N.D.	.0012	mg/l	104		80-117		
Batch number: 022250004A	Sample number(s): 3876582,3876586							
Diesel Range Organics	N.D.	.08	mg/l	90	93	55-126	3	20
Heavy Range Organics	N.D.	.1	mg/l					
Batch number: 022256254001	Sample number(s): 3876582-3876587							
Arsenic (GF) Code 065	N.D.	.005	mg/l	103		83-116		
Batch number: 02225A56A	Sample number(s): 3876582,3876584,3876586							
Benzene	N.D.	.2	ug/l	105	101	80-118	3	30
Toluene	N.D.	.2	ug/l	103	100	82-119	3	30
Ethylbenzene	N.D.	.2	ug/l	104	101	81-119	3	30
Total Xylenes	N.D.	.6	ug/l	105	102	82-120	2	30
Methyl tert-Butyl Ether	N.D.	.3	ug/l	104	104	79-127	0	30
Naphthalene	N.D.	1.	ug/l	96	95	44-139	1	30
TPH by NWTPH-Gx waters	N.D.	.048	mg/l	94		74-116		
Batch number: 022310009A	Sample number(s): 3876584							
Diesel Range Organics	N.D.	.08	mg/l	88	94	55-126	7	20
Heavy Range Organics	N.D.	.1	mg/l					

Sample Matrix Quality Control

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	BKG MAX	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 022241848006	Sample number(s): 3876582-3876587							
Copper Code 060	107	107	82-120	0	20	N.D.	0 (1)	20
Zinc Code 060	106	108	75-125	1	20	N.D.	0 (1)	20
Batch number: 022245704002	Sample number(s): 3876582-3876587							
Lead (GF) Code 064	101	104	80-120	2	20	0.0101	0.0112	10 (1)
Batch number: 022256254001	Sample number(s): 3876582-3876587							
Arsenic (GF) Code 065	62*	81	80-120	17	20	0.0164	0.0233	35* (1)
Batch number: 02225A56A	Sample number(s): 3876582,3876584,3876586							
Benzene	106	109	83-130	2	30			
Toluene	106	108	87-129	2	30			
Ethylbenzene	107	109	86-133	2	30			
Total Xylenes	108	110	86-132	2	30			
Methyl tert-Butyl Ether	102	104	66-140	2	30			
Naphthalene	97	100	39-150	3	30			
TPH by NWTPH-Gx waters	103	106	74-132	1	30			

Surrogate Quality Control

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.



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Quality Control Summary

Page 2 of 2

Client Name: ExxonMobil
 Reported: 08/23/02 at 11:14 AM

Group Number: 818543

Surrogate Quality Control

Analysis Name: TPH by NWTPH-Dx (waters)
 Batch number: 022250004A
 Orthoterphenyl

3876582	95
3876586	80
Blank	77
LCS	93
LCSD	96

Limits: 50-150

Analysis Name: BTEX, MTBE, Naphthalene (8021)
 Batch number: 02225A56A

	Trifluorotoluene-P	Trifluorotoluene-F
3876582	102	96
3876584	107	111
3876586	93	92
Blank	92	88
LCS	94	94
LCSD	94	
MS	92	121
MSD	94	118

Limits: 71-130 57-146

Analysis Name: TPH by NWTPH-Dx (waters)
 Batch number: 022310009A
 Orthoterphenyl

3876584	209*
Blank	78
LCS	93
LCSD	97

Limits: 50-150

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.



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ANALYTICAL RESULTS

Prepared for:

ExxonMobil
607 ExxonMobil Road
Billings MT 59101

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 782728. Samples arrived at the laboratory on Thursday, October 18, 2001. The PO# for this group is 4501003947-0509 and the release number is 00010.

Client Description

WS-101701 Grab Water Sample
WS-101701 Filtered Grab Water Sample

Lancaster Labs Number

3709488
3709489

METHODOLOGY

The specific methodologies used in obtaining the enclosed analytical results are indicated on the laboratory chronicles.

1 COPY TO

Kleinfelder, Inc.

Attn: Jim Petersen

Questions? Contact your Client Services Representative
Teresa M. Lis at (717) 656-2300.

Respectfully Submitted,

Victoria M. Martell
Chemist



Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681



Lancaster Laboratories Sample No. WW 3709488

Collected: 10/17/2001 12:00 by JP

Account Number: 09728

Submitted: 10/18/2001 09:15

Reported: 11/19/2001 at 15:18

Discard: 12/20/2001

WS-101701 Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 60501119

MOBIL: 9420 NW St. Helens Rd.; Portland, OR

ExxonMobil

607 ExxonMobil Road

Billings MT 59101

WS17-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
01753	Copper	7440-50-8	N.D.	0.0024	mg/l	1
01772	Zinc	7440-66-6	N.D.	0.0032	mg/l	1
07035	Arsenic TR	7440-38-2	0.0222	0.0053	mg/l	1
07055	Lead TR	7439-92-1	N.D.	0.0088	mg/l	1
08211	BTEX, MTBE, Naphthalene (8020)					
00776	Benzene	71-43-2	67.	0.20	ug/l	1
00777	Toluene	108-88-3	8.3	0.20	ug/l	1
00778	Ethylbenzene	100-41-4	5.9	0.20	ug/l	1
00779	Total Xylenes	1330-20-7	7.7	0.60	ug/l	1
00780	Methyl tert-Butyl Ether	1634-04-4	N.D.	20.	ug/l	1
00781	Naphthalene	91-20-3	12.	1.0	ug/l	1

A site-specific MSD sample was not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.

Due to the presence of an interferent near its retention time, the normal reporting limit was not attained for MTBE. The presence or concentration of this compound cannot be determined due to the presence of this interferent.

08271 TPH by NWTPH-Dx (waters)

02095	Diesel Range Organics	n.a.	7.1	0.75	mg/l	10
02096	Heavy Range Organics	n.a.	N.D.	1.9	mg/l	10

Accurate surrogate recoveries could not be determined due to the dilution required for analysis of the sample.

08274 Gx by 8015B Modified - water

01648	Gx by 8015B Modified - water	n.a.	2.7	0.048	mg/l	1

Site-specific MS/MSD samples were not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.



Lancaster Laboratories Sample No. WW 3709488

Collected: 10/17/2001 12:00 by JP

Account Number: 09728

Submitted: 10/18/2001 09:15

Reported: 11/19/2001 at 15:18

Discard: 12/20/2001

WS-101701 Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 60501119

MOBIL: 9420 NW St. Helens Rd.; Portland, OR

ExxonMobil

607 ExxonMobil Road

Billings MT 59101

WS17-

Laboratory Chronicle

CAT No.	Analysis Name	Method	Analysis		Analyst	Dilution Factor
			Trial#	Date and Time		
01753	Copper	SW-846 6010B	1	10/26/2001 11:32	Jayme Curet	1
01772	Zinc	SW-846 6010B	1	10/26/2001 11:32	Jayme Curet	1
07035	Arsenic TR	SW-846 6010B	1	10/26/2001 11:32	Jayme Curet	1
07055	Lead TR	SW-846 6010B	1	10/26/2001 11:32	Jayme Curet	1
08211	BTEX, MTBE, Naphthalene (8020)	SW-846 8020A	1	10/19/2001 12:16	John B. Kiser	1
08271	TPH by NWTPH-Dx (waters)	NWTPH-Dx, ECY 97- 602(modified)	1	10/24/2001 19:34	Devin M. Lahr	10
08274	Gx by 8015B Modified - water	Gx by SW-846 8015B Modified	1	10/19/2001 12:16	John B. Kiser	1
01146	GC VOA Water Prep	SW-846 5030B	1	10/19/2001 12:16	John B. Kiser	n.a.
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	10/25/2001 11:00	Christine M. Conlin	1
07003	Extraction - DRO (Waters)	NWTPH-Dx, ECY 97-602, 6/97	1	10/22/2001 17:00	Elia R. Botrous	1



Lancaster Laboratories Sample No. WW 3709489

Collected: 10/17/2001 12:00 by JP

Account Number: 09728

Submitted: 10/18/2001 09:15

Reported: 11/19/2001 at 15:18

Discard: 12/20/2001

WS-101701 Filtered Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 60501119

MOBIL: 9420 NW St. Helens Rd.; Portland, OR

ExxonMobil

607 ExxonMobil Road

Billings MT 59101

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method	Units	Dilution Factor
				Detection Limit		
01753	Copper	7440-50-8	N.D.	0.0024	mg/l	1
01772	Zinc	7440-66-6	N.D.	0.0032	mg/l	1
07035	Arsenic TR	7440-38-2	N.D.	0.0053	mg/l	1
07055	Lead TR	7439-92-1	N.D.	0.0088	mg/l	1

This sample was filtered in the lab for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
01753	Copper	SW-846 6010B	1	10/26/2001 11:37	Jayne Curet	1
01772	Zinc	SW-846 6010B	1	10/26/2001 11:37	Jayne Curet	1
07035	Arsenic TR	SW-846 6010B	1	10/26/2001 11:37	Jayne Curet	1
07055	Lead TR	SW-846 6010B	1	10/26/2001 11:37	Jayne Curet	1
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	10/25/2001 11:00	Christine M. Conlin	1



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Page 1 of 2

Quality Control Summary

Client Name: ExxonMobil

Group Number: 782728

Reported: 11/19/01 at 03:18 PM

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 01291A02	Sample number(s): 3709488							
Benzene	N.D.	.2	ug/l	104	108	80-118	4	30
Toluene	N.D.	.2	ug/l	103	105	82-119	2	30
Ethylbenzene	N.D.	.2	ug/l	103	105	81-119	3	30
Total Xylenes	N.D.	.6	ug/l	105	107	82-120	2	30
Methyl tert-Butyl Ether	N.D.	.3	ug/l	107	114	79-127	6	30
Naphthalene	N.D.	1.	ug/l	89	106	68-121	18	30
Gx by 8015B Modified - water	N.D.	.048	mg/l	98	93	76-119	6	30
Batch number: 012950012A	Sample number(s): 3709488							
Diesel Range Organics	N.D.	.08	mg/l	84		55-126		
Heavy Range Organics	N.D.	.2	mg/l					
Batch number: 012981848003	Sample number(s): 3709488-3709489							
Copper	N.D.	.0024	mg/l	101		92-108		
Zinc	N.D.	.0032	mg/l	103		94-112		
Arsenic TR	N.D.	.0053	mg/l	102		90-110		
Lead TR	N.D.	.0088	mg/l	101		94-110		

Sample Matrix Quality Control

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	BKG MAX	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 01291A02	Sample number(s): 3709488							
Benzene	115		66-140					
Toluene	113		72-138					
Ethylbenzene	111		71-138					
Total Xylenes	113		69-140					
Methyl tert-Butyl Ether	115		60-145					
Naphthalene	98		49-137					
Batch number: 012950012A	Sample number(s): 3709488							
Diesel Range Organics					7.1	7.4	5 (1)	20
Heavy Range Organics					N.D.	N.D.	200* (1)	20
Batch number: 012981848003	Sample number(s): 3709488-3709489							
Copper	102	102	75-125	1	20	N.D.	N.D.	0 (1)
Zinc	99	98	75-125	1	20	0.0203 J	0.0158 J	25* (1)
Arsenic TR	101	100	82-122	0	20	N.D.	N.D.	0 (1)
Lead TR	100	100	75-125	0	20	N.D.	N.D.	0 (1)

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.



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Page 2 of 2

Quality Control Summary

Client Name: ExxonMobil

Group Number: 782728

Reported: 11/19/01 at 03:18 PM

Surrogate Quality Control

Analysis Name: BTEX, MTBE, Naphthalene (8020)

Batch number: 01291A02

	Trifluorotoluene-P	Trifluorotoluene-F
3709488	103	97
Blank	101	90
LCS	99	97
LCSD	102	100
MS	102	

Limits:	72-134	65-137

Analysis Name: TPH by NWTPH-Dx (waters)

Batch number: 012950012A

Orthoterphenyl

3709488	241*
Blank	93
LCS	101
PD	459*

Limits:	50-150

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.



Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681



Where Region Analysis Requests Chain or Custody

For Lancaster Laboratories use only
Sample #: 970.9488-99

Acct. # 4728

Please print:

SCRDs

Mobil Consultant/Office: Klemfelter - Portland, OR Consultant Pj. Mgr: Jim Peterson Pj. #: 60501119 Consultant Phone #: 503-644-9447 Fax #: 503-6431905 Location Code #: 36-001 WBS #: 46 Site Address: 2920 Alw St. Helens, Id., Port-Had State: OR Sampler: Jim Peterson Mobil Engineer: Brian Harrison		Matrix: ☒ Soil ☐ Water ☐ Dredge ☐ Sediment ☐ Tissue ☐ NDEs ☐ Other		Analyses Requested: ☒ Total Pb, As, Cu, Zn ☒ Dissolved Pb, As, Cu, Zn ☒ Lead 7420 ☐ 7421 ☐ Title 22 Metals ☐ TPHAZ ☒ NMTPH GR ☒ DX ☐ TPB 8015 MOD GRO ☐ DRO ☒ BTEX 8020 ☒ 8021 CH + MIBS		Preservative Codes: H = HCl T = Thiosulfate N = HNO ₃ B = NaOH S = H ₂ SO ₄ O = Other	
Sample Identification: WS-101701 Date Collected: 10/17/01 Time Collected: 1300		Total Number of Containers: 9		Remarks: 2x Dissolved As, Pb, Cu, Zn sample has not been filtered or preserved. Please filter ASAP		Turnaround Time Requested (TAT) (please circle): ☒ MOBIL STD. TAT ☐ 72 hour ☐ 48 hour ☐ other _____ day	
Data Package Options (please circle if requested): QC Summary ☐ G/LP ☐ Other ☐ SDG Complete? Yes ☐ No Type I (Tier I) ☐ Type III (NJ Red. Del.) ☐ Disk ☐ Site-specific QC required? Yes ☐ No (if yes, indicate QC sample and submit triplicate volume.) Type IV (CLIP) ☐ Type VI (Raw Data) ☐ Internal Chain of Custody required? Yes ☐ No WIP ☐		Relinquished by: Jim Peterson Date: 10/17/01 Time: 14:15 Relinquished by: _____ Date: _____ Time: _____ Relinquished by: _____ Date: _____ Time: _____		Received by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____		Custody Seal Intact? Yes ☒ No ☐ N/A	
Temperature Upon Receipt: _____ °C		Relinquished by: UPS ☒ FedEx ☐ Other _____					

ATTACHMENT B

Kleinfelder, 2004. *Storm Sewer WP-209 Sampling,
Former ExxonMobil Portland Terminal,
9420 NW St. Helens Road, Portland, Oregon
May 17, 2004*



KLEINFELDER

An employee owned company

May 17, 2004
Project No. 26626

Mr. Brian J. Harrison
ExxonMobil Corporation
Global Remediation
607 ExxonMobil Road
Billings, Montana 59101

**SUBJECT: STORM SEWER WP-209 SAMPLING
FORMER EXXONMOBIL PORTLAND TERMINAL
9420 NW ST. HELENS ROAD
PORTLAND, OREGON**

Dear Mr. Harrison:

Kleinfelder, Inc, is pleased to submit the following letter report summarizing sampling and inspection of storm sewer WP-209 located at the former Exxon/Mobile Portland Terminal site. The purpose of this investigation was to characterize the flow from this storm water drain, trace its placement and identify the source area(s) contributing to flow.

WP-209 is a 24-inch diameter concrete pipe that originates on the west side of the railroad tracks approximately 400 feet west of its outfall at the Willamette River. Flow into WP-209 originates from the steep slopes west of the railroad tracks and from surface water flow to the south approximately 200 feet and to the north approximately 300 feet on the west side of the railroad tracks (Figure 1). Flow that originates from the steep slopes to the west is collected in an apparent French drain feature consisting of a one-foot diameter plastic pipe that terminates at the railroad tracks (Figure 2). Ownership of this storm sewer has not been determined.

Surface water samples were collected and flow rates measured from WP-209 at the point of outfall (Willamette River) and at its origin on May 13, 2003 and August 14, 2003. Kleinfelder further conducted a video inspection of the pipe on July 3, 2003. A fall monitoring event was inconclusive due to high water in the Willamette River covering WP-209 at the outfall and further flooding at its point of origin. The following letter report discusses the results of these field activities and presents a conceptual model of the possible source area(s) for flow through WP-209.

WP-209 Sampling

WP-209 is believed to convey storm water runoff originating from the adjacent hillside to the west. This water continues east underground through WP-209 beneath the railroad tracks and the South Tank Farm to its (WP-209s) outfall at the Willamette River. Flow through this pipe was measured near the railroad tracks (point of origin) and at the point of outfall at the Willamette River. Field parameters, including temperature, dissolved oxygen, electric conductivity and pH, were also monitored at this time. Grab water samples were collected from both points of measurement and sent to Lancaster Laboratories of Lancaster, Pennsylvania for analysis of the metals arsenic, lead, copper and zinc (total and dissolved) as well as the organics analysis for diesel, heavy oil and gasoline range hydrocarbons and MTBE, benzene, toluene, ethylbenzene, naphthalene and xylene (Tables 1a and 1b).

Flow measurements at the point of origin were observed at 0.4 gpm on May 13, 2003 and 4.9 gpm on August 14, 2004. Flow from WP-209 at the point of outfall was observed at 1.4 gpm on May 13, 2003 and at 5.5 gpm on August 14, 2004. On both sampling events it was apparent that the flow increased from the point of origin to the outfall.

Analysis of the water samples collected on May 13, 2003 indicated non-detects for all metals and organics at the point of origin. The sample collected at the outfall indicated elevated concentrations of gasoline range hydrocarbons MTBE, benzene, toluene, ethylbenzene, naphthalene and xylene (Tables 1a and 1b).

Analysis of the water samples collected on August 14, 2003 indicated slightly elevated arsenic concentration and non-detects for all other metals and organics at the point of origin. The sample collected at the outfall indicated elevated concentrations of gasoline range hydrocarbons MTBE, benzene, toluene, ethylbenzene, naphthalene and xylene (Tables 1a and 1b)

The increase in flow from the point of origin to the outfall indicates sources contributing to the overall flow that were not observed in the field. The increase in the concentration of petroleum constituents suggest that water is entering the WP-209 from a source other than those observed up gradient from the outfall and down gradient from the point of origin. This additional source could be an additional storm water tie in at some point along this run, groundwater seepage into the storm water drain through this run or both mechanisms.

WP-209 Video Taping

In an effort to further understand and characterize WP-209, Kleinfelder contracted Cowlitz Clean Sweep (CCS) of Longview, Washington on July 3, 2003 to run a video camera through the pipe from the outfall to point of origin at the railroad tracks. The inspection started at the outfall and advanced into the pipe to 58.8 feet where it encountered wood debris preventing the camera from

advancing any further. Radial cracks displaying infiltration of groundwater were observed at 42.8 feet.

Following the attempt to inspect the pipe from the outfall, CCS then attempted a run through the pipe from the point of origin. This attempt was discontinued due to debris encountered at 29.4 feet.

Conclusions

Kleinfelder evaluated WP-209 to characterize flow and identify source areas contributing to the flow. Based on analysis of water samples collected both at its origin and outfall to the Willamette River it is apparent that water quality deteriorates through its reach beneath the south tank farm. Further it was noted in the field that conductivity increased from the point of origin to the outfall. Obvious iron staining at the outfall indicated ferrous iron (Fe^{2+}) was precipitating as ferric iron (Fe^{3+}) that was not observed at the point of origin. It is suspected that this water quality issue is a result of another tie into the drain or the infiltration of impacted groundwater. The videotaping of WP-209, while only partially entering the drainpipe, displayed radial cracks and the ingress of groundwater. Evaluation of groundwater elevations (W-19, W-20, W-21, W-22, KMW-01 and KMW-02) from quarterly monitoring data suggests that WP-209 is at least partially submerged throughout the year.

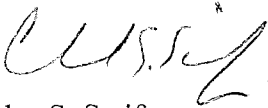
Recommendations

Kleinfelder recommends that WP-209 be cleaned out entirely to facilitate another attempt at video taping this storm drain. Following this inspection a decision could be made to either line WP-209 to prevent potential groundwater infiltration or abandon the drain in the same manner as *OF-23 Abandoned* was handled. In addition, an elevation survey of WP-209 would verify WP-209 elevations with relationship to measured groundwater elevations.

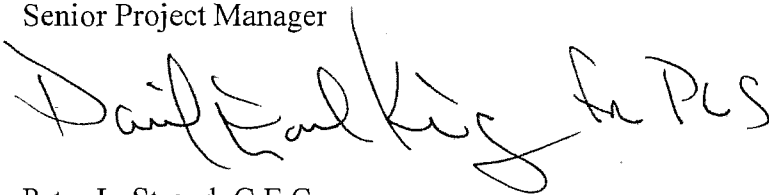
CLOSING

Should you require additional information or have any questions regarding this summary, please contact Charles Swift or Peter Stroud at 503-644-9447 at your convenience.

Respectfully submitted,
KLEINFELDER, INC.



Charles S. Swift
Senior Project Manager



Peter L. Stroud, C.E.G.
Environmental Group Leader

Attachments: Table 1-A. Storm Sewer WP-209 Sample Results – Petroleum Hydrocarbons
Table 1-B. Storm Sewer WP-209 Sample Results – Metals
Figure 1. Industrial Source Control Aerial Photograph
Figure 2. Photographs of WP-209
Laboratory Analytical Reports

cc: Mr. Bill Dungan, ST Services Shore Terminals, LLC
Mr. Richard Brandes, ST Services Shore Terminals, LLC
Ms. Heidi Blischke, Oregon Department of Environmental Quality

Table 1-A. Storm Sewer WP-209 Sample Results – Petroleum Hydrocarbons

Sample Identification	Sample Location	Sample Date	Benzene (µg/L) [1]	Toluene (µg/L) [1]	Ethyl- benzene (µg/L) [1]	Total Xylenes (µg/L) [1]	MtBE (µg/L) [1]	Naph- thalene (µg/L) [1]	NWTPH- Gx (µg/L) [2]	NWTPH- Dx (diesel) (mg/L) [3]	NWTPH- Dx (heavy oil) (mg/L) [3]
SW-WP209-051303	Storm pipe WP-209: near railroad, 400-feet from outfall	May 13, 2003	ND <0.5	ND <0.7	ND <0.8	ND <0.8	ND <0.5	ND <1.	ND <50	ND <0.080	ND <0.10
OF-WP209-051303	Storm pipe WP-209 Outfall at River	May 13, 2003	150	74	33	53	100	2	900	0.17	ND <0.10
WP209-RR	Storm pipe WP-209: near railroad, 400-feet from outfall	August 14, 2003	ND <0.5	ND <0.7	ND <0.8	ND <0.8	ND <0.5	ND <1.	ND <50	ND <0.080	ND <0.10
WP209-OF	Storm pipe WP-209 Outfall at River	August 14, 2003	99	32	41	76	6	2	900	0.16	ND
Cleanup Goal*			40	NS	NS	NS	NS	347	1,000	1.0	1.0

1. May 13, 2003 samples by 8260B; August 8, 2002 sample by 8021

2. TPH by NWTPH-Gx (water)

3. TPH by NWTPH-Dx (water)

*Groundwater cleanup goal specified in June 1997 Record of Decision

mg/L milligrams per liter

µg/L micrograms per liter

J Laboratory estimated value

Concentrations printed in bold type where groundwater cleanup goal exceeded

NS Cleanup goal not specified in Record of Decision

L:\2004\PROJECTS\26626\WP-209\POR4R175.DOC

MAY 17, 2004

Table 1-B. Storm Sewer WP-209 Sample Results – Metals

Sample Identification	Sample Location	Sample Date	Total Arsenic (mg/L) [1]	Total Copper (mg/L) [2]	Total Lead (mg/L) [3]	Total Zinc (mg/L) [2]	Dissolved Arsenic (mg/L) [1]	Dissolved Copper (mg/L) [2]	Dissolved Lead (mg/L) [3]	Dissolved Zinc (mg/L) [2]
SW-WP209-051303	Storm pipe WP-209: near railroad, 400-feet from outfall	May 13, 2003	ND <0.0050	ND <0.0030	ND <0.0012	0.0041 J	ND <0.0050	0.0043 J	ND <0.0012	ND <0.0050
OF-WP209-051303	Storm pipe WP-209 Outfall at River	May 13, 2003	0.0055	ND <0.0030	ND <0.0012	ND <0.0050	ND <0.0050	ND <0.0030	ND <0.0012	ND <0.0050
WP209-RR	Storm pipe WP-209: near railroad, 400-feet from outfall	August 14, 2003	ND <0.0050	0.0033	ND <0.0012	0.0053	ND <0.0050	0.0031	ND <0.0012	0.0044J
WP209-OF	Storm pipe WP-209 Outfall at River	August 14, 2003	0.0046J	0.0036	ND <0.0012	ND <0.0050	ND <0.0050	0.0025J	0.0012	ND <0.0050
Cleanup Goal*			0.005	0.012	0.0022	NS	NS	NS	NS	NS

1. SW-846 7060A

2. SW-846 7421

3. SW-846 6010B

*Groundwater cleanup goal specified in the June 1997 Record of Decision

mg/L milligrams per liter

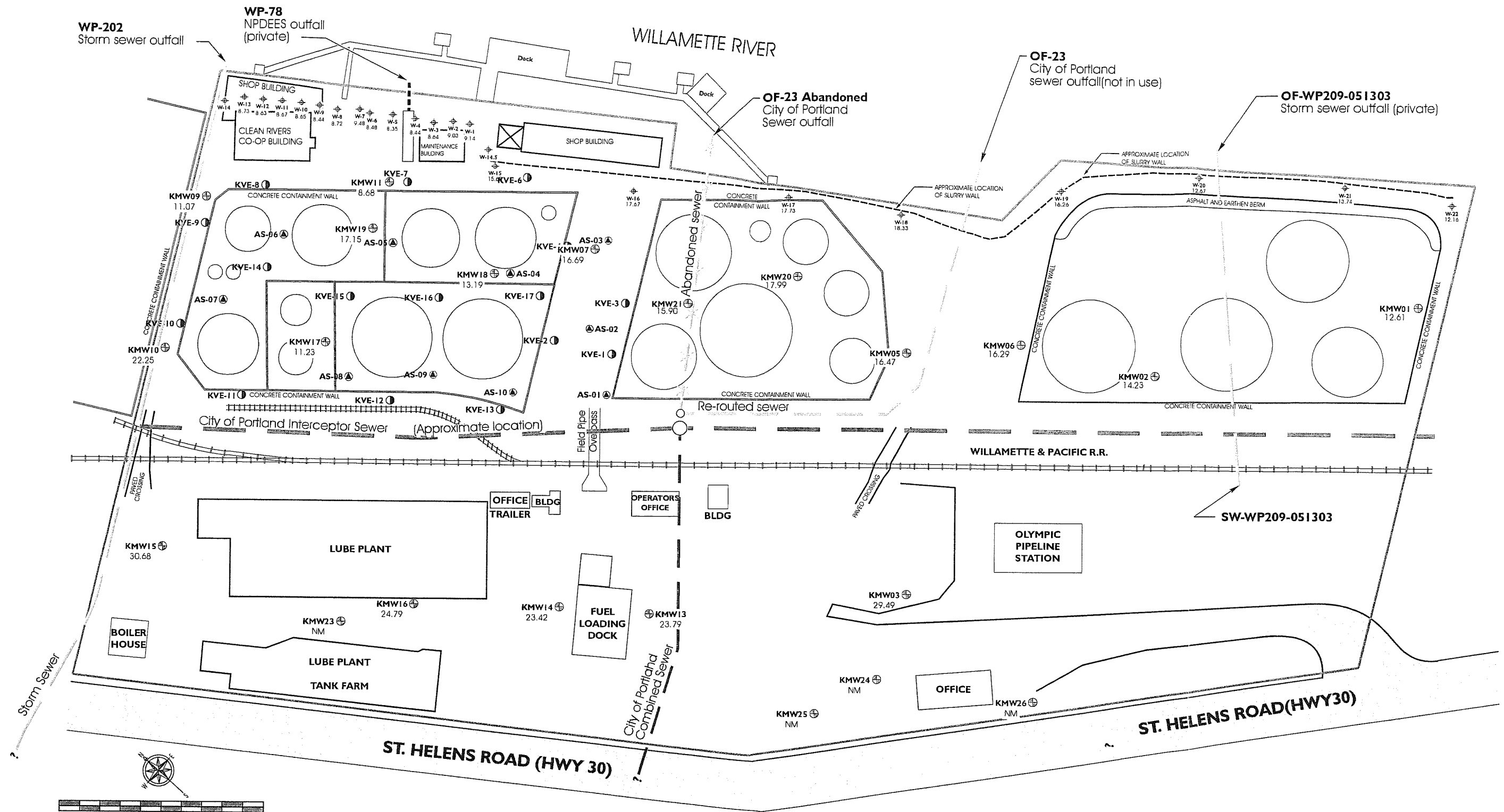
J Laboratory estimated value

Concentrations printed in bold type where groundwater cleanup goal exceeded

NS Cleanup goal not specified in Record of Decision

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MAY 17, 2004



LEGEND

- KMW15** ⊕ Monitoring Well
30.68 Groundwater elevation (in feet above mean sea level)
- W-22** ⊕ Eductor/slurry wall well
- Slurry Wall



KLEINFELDER

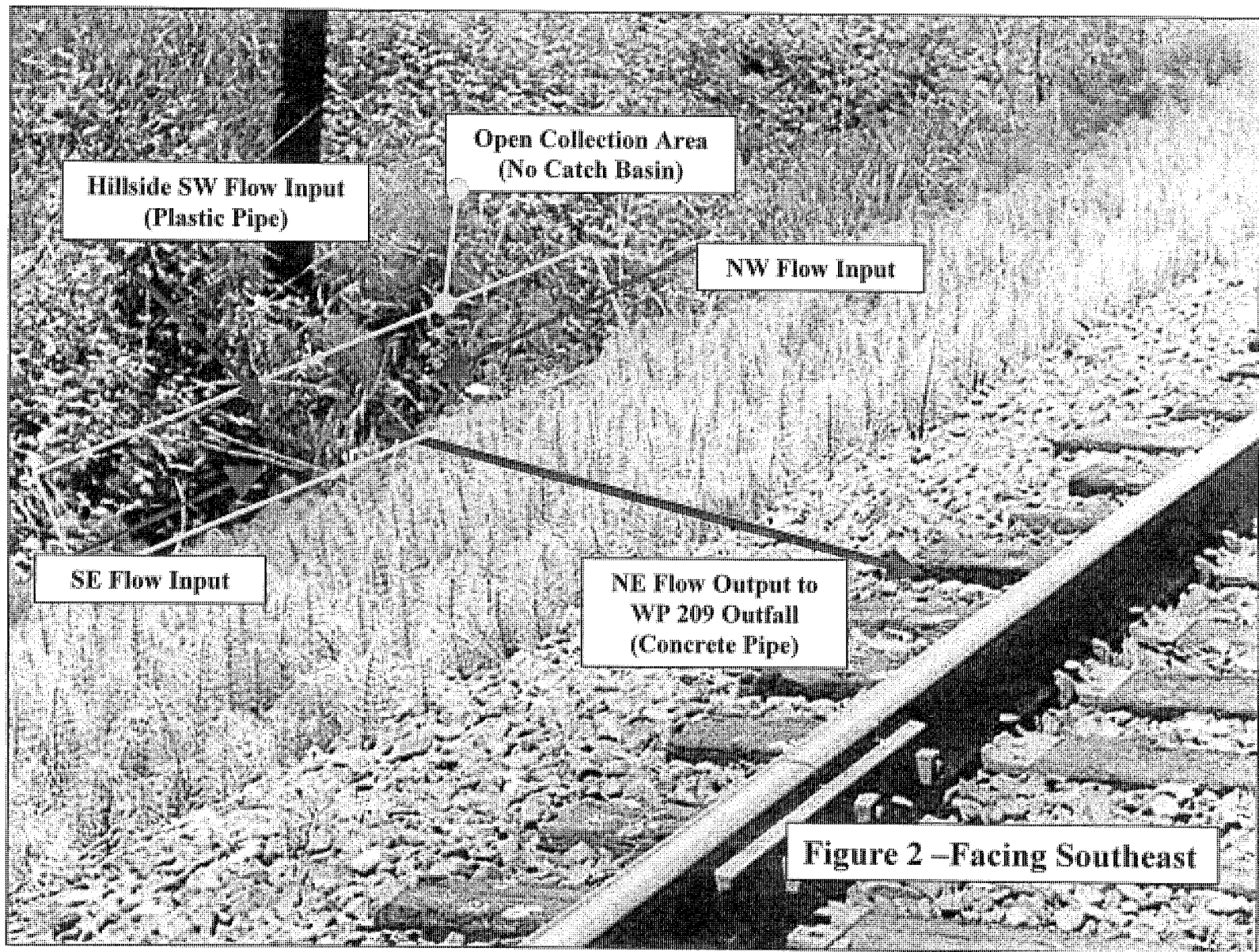
Copyright 2004

L:\2004\Projects\26626 05/04 TLK

STORM WATER DRAIN LOCATIONS - WP-209
FORMER EXXONMOBIL PORTLAND TERMINAL
PORTLAND, OREGON

Project # 26626-06T

FIGURE 1





ANALYTICAL RESULTS

Prepared for:

ExxonMobil
607 ExxonMobil Road

Billings MT 59101

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 851881. Samples arrived at the laboratory on Wednesday, May 14, 2003. The PO# for this group is 4501839968 and the release number is 00010.

<u>Client Description</u>	<u>Lancaster Labs Number</u>
SW-WP209-051303 Grab Water Sample	4043935
SW-WP209-051303 Filtered Grab Water Sample	4043936
OF-WP209-051303 Grab Water Sample	4043937
OF-WP209-051303 Filtered Grab Water Sample	4043938
Trip Blank Water Sample	4043939

1 COPY TO

Kleinfelder

Attn: Jim Petersen

Questions? Contact your Client Services Representative
Danette S Blystone at (717) 656-2300.

Respectfully Submitted,

A handwritten signature in dark ink, appearing to read "Steven A. Skiles".
Steven A. Skiles
Sr. Chemist



Lancaster Laboratories Sample No. WW 4043935

Collected: 05/13/2003 11:25 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

Billings MT 59101

SW-WP209-051303 Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

SW209

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.		0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.		0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	0.0041 J		0.0050	mg/l	1
08271	TPH by NWTPH-Dx (waters)						
02095	Diesel Range Organics	n.a.	N.D.		0.080	mg/l	1
02096	Heavy Range Organics	n.a.	N.D.		0.10	mg/l	1
	Site-specific QC samples were not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.						
08273	TPH by NWTPH-Gx waters						
01645	TPH by NWTPH-Gx waters	n.a.	N.D.		0.05	mg/l	1
02300	UST Waters by 8260B Code 017						
02010	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	ug/l	1
05401	Benzene	71-43-2	N.D.		0.5	ug/l	1
05407	Toluene	108-88-3	N.D.		0.7	ug/l	1
05415	Ethylbenzene	100-41-4	N.D.		0.8	ug/l	1
05439	Naphthalene	91-20-3	N.D.		1.	ug/l	1
06310	Xylene (Total)	1330-20-7	N.D.		0.8	ug/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis		Analyst	Dilution Factor
				Date and Time			
01045	Arsenic (GF)	Code SW-846 7060A	1	05/19/2003 09:32		Jessica L Boyd	1
01055	Lead (GF)	Code SW-846 7421	1	05/22/2003 15:27		Jennifer L Moyer	1
01753	Copper	Code SW-846 6010B	3	05/20/2003 07:05		Joanne M Gates	1
01772	Zinc	Code SW-846 6010B	1	05/20/2003 19:35		Shannon L Strausser	1
08271	TPH by NWTPH-Dx (waters)	NWTPH-Dx, ECY 97-602 (modified)	1	05/16/2003 12:11		Devin M Hetrick	1





Lancaster Laboratories Sample No. WW 4043935

Collected: 05/13/2003 11:25 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

SW-WP209-051303 Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

SW209

08273	TPH by NWTPH-Gx waters	TPH BY NWTPH-Gx - 8015B Mod.	1	05/14/2003 22:22	Martha L Seidel	1
02300	UST Waters by 8260B Code 017	SW-846 8260B	1	05/17/2003 02:06	Seth J Good	1
01146	GC VOA Water Prep	SW-846 5030B	1	05/14/2003 22:22	Martha L Seidel	n.a.
01163	GC/MS VOA Water Prep	SW-846 5030B	1	05/17/2003 02:06	Seth J Good	n.a.
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	05/15/2003 20:20	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	2	05/20/2003 21:20	James L Mertz	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	05/16/2003 11:05	Christine Conlin	1
07003	Extraction - DRO (Waters)	NWTPH-DX, ECY 97-602, 6/97	1	05/15/2003 11:00	Jennytza L Marciano	1



Lancaster Laboratories Sample No. WW 4043936

Collected: 05/13/2003 11:25 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

Billings MT 59101

SW-WP209-051303 Filtered Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method	Units	Dilution Factor
				Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.	0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.	0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	0.0043	0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	N.D.	0.0050	mg/l	1

This sample was filtered in the lab for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Code	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
01045	Arsenic (GF)	Code	SW-846 7060A	1	05/19/2003 09:37	Jessica L Boyd	1
	065						
01055	Lead (GF)	Code	SW-846 7421	1	05/22/2003 15:37	Jennifer L Moyer	1
	064						
01753	Copper	Code	SW-846 6010B	3	05/20/2003 07:10	Joanne M Gates	1
	060						
01772	Zinc	Code	SW-846 6010B	1	05/20/2003 19:41	Shannon L Strausser	1
	060						
01848	WW SW846 ICP Digest (tot		SW-846 3005A	1	05/15/2003 20:20	James L Mertz	1
	rec)						
05704	WW/TL SW 846 GFAA Digest		SW-846 3020A	2	05/20/2003 21:20	James L Mertz	1
	tot						
06254	WW/TL As/Se-GFAA Digest		SW-846 7060A	1	05/16/2003 11:05	Christine Conlin	1



Lancaster Laboratories Sample No. WW 4043937

Collected: 05/13/2003 11:50 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

OF-WP209-051303 Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

OF209

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	0.0055		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.		0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.		0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	N.D.		0.0050	mg/l	1
08271	TPH by NWTPH-Dx (waters)						
02095	Diesel Range Organics	n.a.	0.17		0.080	mg/l	1
02096	Heavy Range Organics	n.a.	N.D.		0.10	mg/l	1
	Site-specific QC samples were not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.						
08273	TPH by NWTPH-Gx waters						
01645	TPH by NWTPH-Gx waters	n.a.	0.9		0.05	mg/l	1
02300	UST Waters by 8260B Code 017						
02010	Methyl Tertiary Butyl Ether	1634-04-4	100.		0.5	ug/l	1
05401	Benzene	71-43-2	150.		0.5	ug/l	1
05407	Toluene	108-88-3	74.		0.7	ug/l	1
05415	Ethylbenzene	100-41-4	33.		0.8	ug/l	1
05439	Naphthalene	91-20-3	2.		1.	ug/l	1
06310	Xylene (Total)	1330-20-7	53.		0.8	ug/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis		Analyst	Dilution Factor
				Date and Time			
01045	Arsenic (GF)	Code SW-846 7060A	1	05/19/2003 09:42		Jessica L Boyd	1
01055	Lead (GF)	Code SW-846 7421	1	05/22/2003 15:48		Jennifer L Moyer	1
01753	Copper	Code SW-846 6010B	3	05/20/2003 07:16		Joanne M Gates	1
01772	Zinc	Code SW-846 6010B	1	05/20/2003 19:46		Shannon L Strausser	1
8271	TPH by NWTPH-Dx (waters)	NWTPH-Dx, ECY 97-602(modified)	1	05/16/2003 12:36		Devin M Hetrick	1





Lancaster Laboratories Sample No. WW 4043937

Collected: 05/13/2003 11:50 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

Billings MT 59101

OF-WP209-051303 Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

OF209

08273	TPH by NWTPH-Gx waters	TPH BY NWTPH-Gx - 8015B Mod.	1	05/14/2003 22:55	Martha L Seidel	1
02300	UST Waters by 8260B Code 017	SW-846 8260B	1	05/17/2003 03:26	Seth J Good	1
01146	GC VOA Water Prep	SW-846 5030B	1	05/14/2003 22:55	Martha L Seidel	n.a.
01163	GC/MS VOA Water Prep	SW-846 5030B	1	05/17/2003 03:26	Seth J Good	n.a.
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	05/15/2003 20:20	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	2	05/20/2003 21:20	James L Mertz	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	05/16/2003 11:05	Christine Conlin	1
07003	Extraction - DRO (Waters)	NWTPH-Dx, ECY 97-602, 6/97	1	05/15/2003 11:00	Jennytza L Marcano	1



Lancaster Laboratories Sample No. WW 4043938

Collected: 05/13/2003 11:50 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

Billings MT 59101

OF-WP209-051303 Filtered Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.		0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.		0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	N.D.		0.0050	mg/l	1

This sample was filtered in the lab for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Code	Method	Analysis		Analyst	Dilution Factor
				Trial#	Date and Time		
01045	Arsenic (GF)	Code 065	SW-846 7060A	1	05/19/2003 09:47	Jessica L Boyd	1
01055	Lead (GF)	Code 064	SW-846 7421	1	05/22/2003 15:59	Jennifer L Moyer	1
01753	Copper	Code 060	SW-846 6010B	3	05/20/2003 07:21	Joanne M Gates	1
01772	Zinc	Code 060	SW-846 6010B	1	05/20/2003 20:03	Shannon L Strausser	1
01848	WW SW846 ICP Digest (tot rec)		SW-846 3005A	1	05/15/2003 20:20	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot		SW-846 3020A	2	05/20/2003 21:20	James L Mertz	1
06254	WW/TL As/Se-GFAA Digest		SW-846 7060A	1	05/16/2003 11:05	Christine Conlin	1



Lancaster Laboratories Sample No. WW 4043939

Collected: n.a.

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

Billings MT 59101

Trip Blank Water Sample

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

TB209

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
08273	TPH by NWTPH-Gx waters					
01645	TPH by NWTPH-Gx waters	n.a.	N.D.	0.05	mg/l	1
02300	UST Waters by 8260B Code 017					
02010	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	ug/l	1
05401	Benzene	71-43-2	N.D.	0.5	ug/l	1
05407	Toluene	108-88-3	N.D.	0.7	ug/l	1
05415	Ethylbenzene	100-41-4	N.D.	0.8	ug/l	1
05439	Naphthalene	91-20-3	N.D.	1.	ug/l	1
06310	Xylene (Total)	1330-20-7	N.D.	0.8	ug/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
08273	TPH by NWTPH-Gx waters	TPH BY NWTPH-Gx - 8015B Mod.	1	05/14/2003 21:49	Martha L Seidel	1
02300	UST Waters by 8260B Code 017	SW-846 8260B	1	05/17/2003 03:52	Seth J Good	1
01146	GC VOA Water Prep	SW-846 5030B	1	05/14/2003 21:49	Martha L Seidel	n.a.
01163	GC/MS VOA Water Prep	SW-846 5030B	1	05/17/2003 03:52	Seth J Good	n.a.





Quality Control Summary

Client Name: ExxonMobil

Group Number: 851881

Reported: 05/23/03 at 04:18 PM

Laboratory Compliance Quality Control

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank MDL</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Batch number: 03133A55A TPH by NWTPH-Gx waters	Sample number(s): 4043935,4043937,4043939 N.D.	0.05	mg/l	93	94	70-130	1	30
Batch number: 031350005A Diesel Range Organics Heavy Range Organics	Sample number(s): 4043935,4043937 N.D.	0.080 0.10	mg/l mg/l	69	65	55-126	6	20
Batch number: 031351848005 Copper Zinc	Sample number(s): 4043935-4043938 N.D.	0.003 0.005	mg/l mg/l	104 103		92-110 94-112		
Batch number: 031366254003 Arsenic (GF)	Sample number(s): 4043935-4043938 N.D.	.005	mg/l	98		80-120		
Batch number: 031405704002 Lead (GF)	Sample number(s): 4043935-4043938 N.D.	0.0012	mg/l	97		80-120		
Batch number: T031361AA Methyl Tertiary Butyl Ether Benzene Toluene Ethylbenzene Naphthalene Xylene (Total)	Sample number(s): 4043935,4043937,4043939 N.D.	0.5 0.5 0.7 0.8 1. 0.8	ug/l ug/l ug/l ug/l ug/l ug/l	94 97 97 96 92 96		77-127 85-117 85-115 82-119 64-121 84-120		

Sample Matrix Quality Control

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD</u>	<u>BKG MAX</u>	<u>DUP CONC</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
Batch number: 03133A55A TPH by NWTPH-Gx waters	Sample number(s): 4043935,4043937,4043939 106	103	70-130	2	30			
Batch number: 031351848005 Copper Zinc	Sample number(s): 4043935-4043938 103	103	82-120	1	20	N.D.	N.D.	0 (1) 20
Batch number: 031366254003 Arsenic (GF)	Sample number(s): 4043935-4043938 107	108	80-120	1	20	0.0023 J	0.0040 J	54* (1) 20
Batch number: 031405704002 Lead (GF)	Sample number(s): 4043935-4043938 61*	80	80-120	22*	20	0.0031	0.0042	29* (1) 20
Batch number: T031361AA Methyl Tertiary Butyl Ether Benzene Toluene Ethylbenzene Naphthalene Xylene (Total)	Sample number(s): 4043935,4043937,4043939 95	94	69-134	0	30			
	99	101	83-128	2	30			
	98	102	83-127	4	30			
	100	101	82-134	1	30			
	88	90	59-124	2	30			
	97	99	82-130	3	30			

*- Outside of specification

- 1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.



Lancaster Laboratories, Inc.

2425 New Holland Pike

PO Box 12425

Lancaster, PA 17605-2425

717 655-3300 FAX 717 655-3504

0010 0 0/00/03



Quality Control Summary

Client Name: ExxonMobil
Reported: 05/23/03 at 04:18 PM

Group Number: 851881

Surrogate Quality Control

Analysis Name: TPH by NWTPH-Gx waters
Batch number: 03133A55A
Trifluorotoluene-F

4043935	104
4043937	107
4043939	102
Blank	108
LCS	102
LCSD	103
MS	101
MSD	101

Limits: 57-146

Analysis Name: TPH by NWTPH-Dx (waters)
Batch number: 031350005A
Orthoterphenyl

4043935	87
4043937	96
Blank	91
LCS	105
LCSD	100

Limits: 50-150

Analysis Name: UST-Unleaded Waters by 8260B
Batch number: T031361AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
4043935	90	92	91	89
4043937	91	94	92	92
4043939	93	95	92	91
Blank	90	90	94	88
LCS	87	94	96	93
MS	90	96	95	91
MSD	91	94	98	95
Limits:	81-120	82-112	85-112	83-113

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.



 Lancaster Laboratories
Where quality is a science.

Acct. #: 9728

Sample #: 4043935-39

Please print.

G#85188

SCR#: 111/933

Mobil Consultant/Office: Kleinfelder / Portland OR

Consultant Prj. Mgr: Jim Petersen

Consultant Phone #: 266 26

Location Code #: 36001

Site Address: 7420 NW St Helens Rd, Portland

Sampler: Jim Petersen

Mobil Engineer: Brian Harrison

Phone: (503) 644 9447

Fax #: (503) 643-1905

WBS #:

State: OR

Matrix

Soil

Water

Oil

Air

Potable

NPDES

Total Number of Containers

BTX 8020

8021

MTBE

TPH 8015 MOD

GRO

DRO

NWTPH

Gx

TPHAZ

Title 22 Metals

Lead 7420

BTX+N+M+E

8260

NWTPH-Gx

As Cu Pb Zn - Total

As Cu Pb Zn - Diss

Analyses Requested

List total number of containers in the box under each analysis:

Preservative Codes

H = HCl

N = HNO3

S = H2SO4

T = Thiosulfate

B = NaOH

O = Other

Sample Identification

Date Collected

Time Collected

Grab

Composite

SW-WP 209-051303

5/13/03

1125

X

X

9

OF-WP 209-051303

5/13/03

1150

X

X

9

Remarks

* Note - Diss. Metal Samples NOT Filtered: Filter ASAP

Turnaround Time Requested (TAT) (please circle):

MOBIL STD. TAT

72 hour

48 hour

24 hour

other 5 day

Data Package Options (please circle if requested)

QC Summary

Type I (Tier I)

Type III (NJ Red. Del.)

Type IV (CLP)

Type VI (Raw Data)

WIP

GLP

Other

Disk

SDG Complete?

Yes

No

Site-specific QC required?

Yes

No

Internal Chain of Custody required?

Yes

No

Relinquished by:

Date

Time

Received by:

Date

Time

Relinquished by:

Date

Time

Received by:

Date

Time

Relinquished by:

Date

Time

Received by:

Date

Time

Relinquished by Commercial Carrier:

UPS

FedEx

Other

Temperature Upon R

2.5 °C

Received by:

Custody Seals Intact?

Yes

No

N/A



Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

ANALYTICAL RESULTS

Prepared for:

ExxonMobil
607 ExxonMobil Road

Billings MT 59101

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 863542. Samples arrived at the laboratory on Saturday, August 16, 2003. The PO# for this group is 4501839968 and the release number is 00010.

Client Description

WP209-RR Grab Water Sample
WP209-RR Filtered Grab Water Sample
WP209-OF Grab Water Sample
WP209-OF Filtered Grab Water Sample

Lancaster Labs Number

4103643
4103644
4103645
4103646

1 COPY TO

Kleinfelder

Attn: Jim Petersen

Questions? Contact your Client Services Representative
Danette S Blystone at (717) 656-2300.

Respectfully Submitted,

Victoria M. Martell
Chemist



2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. WW 4103643

Collected: 08/14/2003 14:00 by JP

Account Number: 09728

Submitted: 08/16/2003 10:00

ExxonMobil

Reported: 08/27/2003 at 14:52

607 ExxonMobil Road

Discard: 09/27/2003

WP209-RR Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08

9420 NW St. Helens Rd - Portland, OR

209RR

CAT			As Received	As Received		Dilution	
No.	Analysis Name	CAS Number	Result	Method	Units	Factor	
01045	Arsenic (GF)	Code 065	7440-38-2	N.D.	0.0050	mg/l	1
01055	Lead (GF)	Code 064	7439-92-1	N.D.	0.0012	mg/l	1
07053	Copper	Code 060	7440-50-8	0.0031	0.0030	mg/l	1
07072	Zinc	Code 060	7440-66-6	0.0044 J	0.0050	mg/l	1
08271	TPH by NWTPH-Dx (waters)						
02095	Diesel Range Organics	n.a.	N.D.	0.080	mg/l	1	
02096	Heavy Range Organics	n.a.	N.D.	0.10	mg/l	1	
	Sufficient sample volume was not available to perform a MS/MSD for this analysis. Therefore, a LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.						
08273	TPH by NWTPH-Gx waters						
01645	TPH by NWTPH-Gx waters	n.a.	N.D.	0.05	mg/l	1	
	A site-specific MSD sample was not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.						
08357	Selected SVOAs by 8270 SIM						
08362	Naphthalene	91-20-3	N.D.	0.01	ug/l	1	
08365	Acenaphthylene	208-96-8	N.D.	0.01	ug/l	1	
08366	Acenaphthene	83-32-9	N.D.	0.01	ug/l	1	
08368	Fluorene	86-73-7	N.D.	0.01	ug/l	1	
08369	Phenanthrene	85-01-8	N.D.	0.01	ug/l	1	
08370	Anthracene	120-12-7	N.D.	0.01	ug/l	1	
08372	Fluoranthene	206-44-0	N.D.	0.01	ug/l	1	
08373	Pyrene	129-00-0	N.D.	0.01	ug/l	1	
08374	Benzo(a)anthracene	56-55-3	N.D.	0.01	ug/l	1	
08375	Chrysene	218-01-9	N.D.	0.01	ug/l	1	
08376	Benzo(b)fluoranthene	205-99-2	N.D.	0.01	ug/l	1	
08377	Benzo(k)fluoranthene	207-08-9	N.D.	0.01	ug/l	1	
08378	Benzo(a)pyrene	50-32-8	N.D.	0.01	ug/l	1	
08379	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.01	ug/l	1	
08380	Dibenz(a,h)anthracene	53-70-3	N.D.	0.01	ug/l	1	
08381	Benzo(g,h,i)perylene	191-24-2	N.D.	0.01	ug/l	1	
	Sufficient sample volume was not available to perform a MS/MSD for this analysis. Therefore, a LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.						



Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Page 2 of 3

Lancaster Laboratories Sample No. WW 4103643

Collected: 08/14/2003 14:00 by JP

Account Number: 09728

Submitted: 08/16/2003 10:00

ExxonMobil

Reported: 08/27/2003 at 14:52

607 ExxonMobil Road

Discard: 09/27/2003

WP209-RR Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08

9420 NW St. Helens Rd - Portland, OR

209RR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
The recoveries of benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and dibenz(a,h)anthracene were above QC limits in the LCS/LCSD. Since the recoveries were high and these targets were not detected in the sample, no further action was taken.						
05382	EPA SW846/8260-water Code 027					
05401	Benzene	71-43-2	N.D.	0.5	ug/l	1
05402	1,2-Dichloroethane	107-06-2	N.D.	1.	ug/l	1
05407	Toluene	108-88-3	N.D.	0.7	ug/l	1
05412	1,2-Dibromoethane	106-93-4	N.D.	1.	ug/l	1
05383	EPA SW846/8260 (water) cont					
05415	Ethylbenzene	100-41-4	N.D.	0.8	ug/l	1
05416	m+p-Xylene	1330-20-7	N.D.	0.8	ug/l	1
05417	o-Xylene	95-47-6	N.D.	0.8	ug/l	1
05420	Isopropylbenzene	98-82-8	N.D.	1.	ug/l	1
05424	n-Propylbenzene	103-65-1	N.D.	1.	ug/l	1
05426	1,3,5-Trimethylbenzene	108-67-8	N.D.	1.	ug/l	1
05429	1,2,4-Trimethylbenzene	95-63-6	N.D.	1.	ug/l	1
05439	Naphthalene	91-20-3	N.D.	1.	ug/l	1
08202	EPA SW 846/8260 - Water					
02010	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	ug/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
01045	Arsenic (GF) Code 065	SW-846 7060A	1	08/26/2003 05:14	Melissa-Ann S McAlpine	1
01055	Lead (GF) Code 064	SW-846 7421	1	08/21/2003 21:41	Jessica L Boyd	1
07053	Copper Code 060	SW-846 6010B	1	08/19/2003 05:56	Donna R Sackett	1
07072	Zinc Code 060	SW-846 6010B	1	08/19/2003 05:56	Donna R Sackett	1
08271	TPH by NWTPH-Dx (waters)	NWTPH-Dx, ECY 97-602 (modified)	1	08/26/2003 15:13	Devin M Hetrick	1



Analysis Report

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Page 3 of 3

Lancaster Laboratories Sample No. WW 4103643

Collected: 08/14/2003 14:00 by JP

Account Number: 09728

Submitted: 08/16/2003 10:00

ExxonMobil

Reported: 08/27/2003 at 14:52

607 ExxonMobil Road

Discard: 09/27/2003

WP209-RR Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08

9420 NW St. Helens Rd - Portland, OR

209RR

08273	TPH by NWTPH-Gx waters	TPH BY NWTPH-Gx - 8015B Mod.	1	08/22/2003 08:57	Martha L Seidel	1
08357	Selected SVOAs by 8270 SIM	SW-846 8270C (SIM)	1	08/21/2003 00:09	Linda M Hartenstine	1
05382	EPA SW846/8260-water Code 027	SW-846 8260B	1	08/19/2003 22:33	Marc S Neal	1
05383	EPA SW846/8260 (water) cont	SW-846 8260B	1	08/19/2003 22:33	Marc S Neal	1
08202	EPA SW 846/8260 - Water	SW-846 8260B	1	08/19/2003 22:33	Marc S Neal	1
00813	BNA Water Extraction	SW-846 3510C	1	08/19/2003 17:00	Elia R Botrous	1
01146	GC VOA Water Prep	SW-846 5030B	1	08/22/2003 08:57	Martha L Seidel	n.a.
01163	GC/MS VOA Water Prep	SW-846 5030B	1	08/19/2003 22:33	Marc S Neal	n.a.
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	08/18/2003 20:10	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	1	08/19/2003 20:15	James L Mertz	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	08/25/2003 20:00	James L Mertz	1
07003	Extraction - DRO (Waters)	NWTPH-Dx, ECY 97-602, 6/97	2	08/20/2003 23:00	Felix C Arroyo	1



Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Page 1 of 1

Lancaster Laboratories Sample No. WW 4103644

Collected: 08/14/2003 14:00 by JP

Account Number: 09728

Submitted: 08/16/2003 10:00

ExxonMobil

Reported: 08/27/2003 at 14:53

607 ExxonMobil Road

Discard: 09/27/2003

WP209-RR Filtered Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08

9420 NW St. Helens Rd - Portland, OR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.		0.0012	mg/l	1
07053	Copper	Code 060 7440-50-8	0.0033		0.0030	mg/l	1
07072	Zinc	Code 060 7440-66-6	0.0053		0.0050	mg/l	1

This sample was field filtered for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Method	Analysis		Analyst	Dilution Factor
			Trial#	Date and Time		
01045	Arsenic (GF) 065	Code SW-846 7060A	1	08/26/2003 05:19	Melissa-Ann S McAlpine	1
01055	Lead (GF) 064	Code SW-846 7421	1	08/21/2003 21:51	Jessica L Boyd	1
07053	Copper 060	Code SW-846 6010B	1	08/19/2003 06:11	Donna R Sackett	1
07072	Zinc 060	Code SW-846 6010B	1	08/19/2003 06:11	Donna R Sackett	1
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	08/18/2003 20:10	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	1	08/19/2003 20:15	James L Mertz	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	08/25/2003 20:00	James L Mertz	1



Page 1 of 3

Account Number: 09728

ExxonMobil
607 ExxonMobil Road

Billings MT 59101

9420 NW St. Helens Rd - Portland, OR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
01045	Arsenic (GF)	Code 065 7440-38-2	0.0046 J	0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.	0.0012	mg/l	1
07053	Copper	Code 060 7440-50-8	0.0036	0.0030	mg/l	1
07072	Zinc	Code 060 7440-66-6	N.D.	0.0050	mg/l	1
08271	TPH by NWTPH-Dx (waters)					
02095	Diesel Range Organics	n.a.	0.16	0.082	mg/l	1
02096	Heavy Range Organics	n.a.	N.D.	0.10	mg/l	1
	Sufficient sample volume was not available to perform a MS/MSD for this analysis. Therefore, a LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.					
08273	TPH by NWTPH-Gx waters					
01645	TPH by NWTPH-Gx waters	n.a.	0.9	0.05	mg/l	1
	A site-specific MSD sample was not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.					
08357	Selected SV0As by 8270 SIM					
08362	Naphthalene	91-20-3	2.	0.01	ug/l	1
08365	Acenaphthylene	208-96-8	N.D.	0.01	ug/l	1
08366	Acenaphthene	83-32-9	2.	0.01	ug/l	1
08368	Fluorene	86-73-7	1.	0.01	ug/l	1
08369	Phenanthrene	85-01-8	1.	0.01	ug/l	1
08370	Anthracene	120-12-7	0.1	0.01	ug/l	1
08372	Fluoranthene	206-44-0	0.2	0.01	ug/l	1
08373	Pyrene	129-00-0	0.4	0.01	ug/l	1
08374	Benzo(a)anthracene	56-55-3	N.D.	0.01	ug/l	1
08375	Chrysene	218-01-9	N.D.	0.01	ug/l	1
08376	Benzo(b)fluoranthene	205-99-2	N.D.	0.01	ug/l	1
08377	Benzo(k)fluoranthene	207-08-9	N.D.	0.01	ug/l	1
08378	Benzo(a)pyrene	50-32-8	N.D.	0.01	ug/l	1
08379	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.01	ug/l	1
08380	Dibenz(a,h)anthracene	53-70-3	N.D.	0.01	ug/l	1
08381	Benzo(g,h,i)perylene	191-24-2	N.D.	0.01	ug/l	1

Sufficient sample volume was not available to perform a MS/MSD for this analysis. Therefore, a LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.



Analysis Report

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Page 2 of 3

Lancaster Laboratories Sample No. WW 4103645

Collected: 08/14/2003 15:15 by JP

Account Number: 09728

Submitted: 08/16/2003 10:00
Reported: 08/27/2003 at 14:53
Discard: 09/27/2003
WP209-OF Grab Water Sample
LOC# 36-001 WBS# 08
9420 NW St. Helens Rd - Portland, OR

ExxonMobil
607 ExxonMobil Road
Billings MT 59101

2090F

			As Received	Method		
CAT			As Received	Method		Dilution
No.	Analysis Name	CAS Number	Result	Detection Limit	Units	Factor
The recoveries of benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and dibenz(a,h)anthracene were above QC limits in the LCS/LCSD. Since the recoveries were high and these targets were not detected in the sample, no further action was taken.						
05382	EPA SW846/8260-water Code 027					
05401	Benzene	71-43-2	99.	0.5	ug/l	1
05402	1,2-Dichloroethane	107-06-2	N.D.	1.	ug/l	1
05407	Toluene	108-88-3	32.	0.7	ug/l	1
05412	1,2-Dibromoethane	106-93-4	N.D.	1.	ug/l	1
05383	EPA SW846/8260 (water) cont					
05415	Ethylbenzene	100-41-4	41.	0.8	ug/l	1
05416	m+p-Xylene	1330-20-7	66.	0.8	ug/l	1
05417	o-Xylene	95-47-6	10.	0.8	ug/l	1
05420	Isopropylbenzene	98-82-8	4.	1.	ug/l	1
05424	n-Propylbenzene	103-65-1	7.	1.	ug/l	1
05426	1,3,5-Trimethylbenzene	108-67-8	7.	1.	ug/l	1
05429	1,2,4-Trimethylbenzene	95-63-6	36.	1.	ug/l	1
05439	Naphthalene	91-20-3	2.	1.	ug/l	1
08202	EPA SW 846/8260 - Water					
02010	Methyl Tertiary Butyl Ether	1634-04-4	6.	0.5	ug/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis	Analyst	Dilution Factor
				Date and Time		
01045	Arsenic (GF) 065	Code SW-846 7060A	1	08/26/2003 05:33	Melissa-Ann S McAlpine	1
01055	Lead (GF) 064	Code SW-846 7421	1	08/21/2003 22:10	Jessica L Boyd	1
07053	Copper 060	Code SW-846 6010B	1	08/19/2003 06:16	Donna R Sackett	1
07072	Zinc 060	Code SW-846 6010B	1	08/19/2003 06:16	Donna R Sackett	1
08271	TPH by NWTPH-Dx (waters)	NWTPH-Dx, ECY 97-602(modified)	1	08/26/2003 15:38	Devin M Hetrick	1



Analysis Report

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Page 3 of 3

Lancaster Laboratories Sample No. WW 4103645

Collected: 08/14/2003 15:15 by JP

Account Number: 09728

Submitted: 08/16/2003 10:00

ExxonMobil

Reported: 08/27/2003 at 14:53

607 ExxonMobil Road

Discard: 09/27/2003

WP209-OF Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08

9420 NW St. Helens Rd - Portland, OR

2090F

08273	TPH by NWTPH-Gx waters	TPH BY NWTPH-Gx - 8015B Mod.	1	08/22/2003 09:30	Martha L Seidel	1
08357	Selected SVOAs by 8270 SIM	SW-846 8270C (SIM)	1	08/21/2003 00:49	Linda M Hartenstine	1
05382	EPA SW846/8260-water Code 027	SW-846 8260B	1	08/19/2003 22:59	Marc S Neal	1
05383	EPA SW846/8260 (water) cont	SW-846 8260B	1	08/19/2003 22:59	Marc S Neal	1
08202	EPA SW 846/8260 - Water	SW-846 8260B	1	08/19/2003 22:59	Marc S Neal	1
00813	BNA Water Extraction	SW-846 3510C	1	08/19/2003 17:00	Elia R Botrous	1
01146	GC VOA Water Prep	SW-846 5030B	1	08/22/2003 09:30	Martha L Seidel	n.a.
01163	GC/MS VOA Water Prep	SW-846 5030B	1	08/19/2003 22:59	Marc S Neal	n.a.
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	08/18/2003 20:10	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	1	08/19/2003 20:15	James L Mertz	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	08/25/2003 20:00	James L Mertz	1
07003	Extraction - DRO (Waters)	NWTPH-Dx, ECY 97-602, 6/97	2	08/20/2003 23:00	Felix C Arroyo	1



Analysis Report

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Page 1 of 1

Lancaster Laboratories Sample No. WW 4103646

Collected: 08/14/2003 15:15 by JP

Account Number: 09728

Submitted: 08/16/2003 10:00

ExxonMobil

Reported: 08/27/2003 at 14:53

607 ExxonMobil Road

Discard: 09/27/2003

WP209-OF Filtered Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08

9420 NW St. Helens Rd - Portland, OR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method	Units	Dilution Factor
				Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.	0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	0.0012	0.0012	mg/l	1
07053	Copper	Code 060 7440-50-8	0.0025 J	0.0030	mg/l	1
07072	Zinc	Code 060 7440-66-6	N.D.	0.0050	mg/l	1

This sample was field filtered for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
01045	Arsenic (GF)	Code SW-846 7060A	1	08/26/2003 05:38	Melissa-Ann S	1
	065				McAlpine	
01055	Lead (GF)	Code SW-846 7421	1	08/21/2003 22:20	Jessica L Boyd	1
	064					
07053	Copper	Code SW-846 6010B	1	08/19/2003 06:21	Donna R Sackett	1
	060					
07072	Zinc	Code SW-846 6010B	1	08/19/2003 06:21	Donna R Sackett	1
	060					
01848	WW SW846 ICP Digest (tot	SW-846 3005A	1	08/18/2003 20:10	James L Mertz	1
	rec)					
05704	WW/TL SW 846 GFAA Digest	SW-846 3020A	1	08/19/2003 20:15	James L Mertz	1
	tot					
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	08/25/2003 20:00	James L Mertz	1

Quality Control Summary

Client Name: ExxonMobil

Group Number: 863542

Reported: 08/27/03 at 02:53 PM

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 032301848002	Sample number(s): 4103643-4103646							
Copper Code 060	N.D.	.003	mg/l	102		92-110		
Zinc Code 060	N.D.	.005	mg/l	101		94-112		
Batch number: 03230WAG026	Sample number(s): 4103643, 4103645							
Naphthalene	N.D.	.01	ug/l	120	118	61-134	2	30
Acenaphthylene	N.D.	.01	ug/l	114	112	59-127	2	30
Acenaphthene	N.D.	.01	ug/l	119	118	60-127	1	30
Fluorene	N.D.	.01	ug/l	126	127	66-134	1	30
Phenanthrene	N.D.	.01	ug/l	118	119	64-129	1	30
Anthracene	N.D.	.01	ug/l	111	113	63-126	2	30
Fluoranthene	N.D.	.01	ug/l	128	130	66-143	2	30
Pyrene	N.D.	.01	ug/l	127	130	54-148	2	30
Benzo(a)anthracene	N.D.	.01	ug/l	121	126	60-134	4	30
Chrysene	N.D.	.01	ug/l	133	134	63-139	1	30
Benzo(b)fluoranthene	N.D.	.01	ug/l	145*	144*	63-140	0	30
Benzo(k)fluoranthene	N.D.	.01	ug/l	128	128	61-142	0	30
Benzo(a)pyrene	N.D.	.01	ug/l	118	123	60-138	4	30
Indeno(1,2,3-cd)pyrene	N.D.	.01	ug/l	138*	140*	66-131	2	30
Dibenz(a,h)anthracene	N.D.	.01	ug/l	127*	127*	59-125	0	30
Benzo(g,h,i)perylene	N.D.	.01	ug/l	132	132	66-134	1	30
Batch number: 032315704002	Sample number(s): 4103643-4103646							
Lead (GF) Code 064	N.D.	0.0012	mg/l	108		80-120		
Batch number: 032320009A	Sample number(s): 4103643, 4103645							
Diesel Range Organics	N.D.	.08	mg/l	56	63	55-126	11	20
Heavy Range Organics	N.D.	.1	mg/l					
Batch number: 03233A51A	Sample number(s): 4103643, 4103645							
TPH by NWTPH-Gx waters	N.D.	0.05	mg/l	95	100	70-130	6	30
Batch number: 032376254003	Sample number(s): 4103643-4103646							
Arsenic (GF) Code 065	N.D.	.005	mg/l	86		80-120		
Batch number: N032311AA	Sample number(s): 4103643, 4103645							
Methyl Tertiary Butyl Ether	N.D.	.5	ug/l	100		77-127		
Benzene	N.D.	.5	ug/l	98		85-117		
1,2-Dichloroethane	N.D.	1.	ug/l	103		77-132		
Toluene	N.D.	.7	ug/l	98		85-115		
1,2-Dibromoethane	N.D.	1.	ug/l	98		81-114		
Ethylbenzene	N.D.	.8	ug/l	99		82-119		
m+p-Xylene	N.D.	.8	ug/l	101		84-120		
c-Xylene	N.D.	.8	ug/l	102		84-120		
Isopropylbenzene	N.D.	1.	ug/l	99		80-120		
n-Propylbenzene	N.D.	1.	ug/l	95		78-119		
1,3,5-Trimethylbenzene	N.D.	1.	ug/l	96		78-122		
1,2,4-Trimethylbenzene	N.D.	1.	ug/l	97		79-123		
Naphthalene	N.D.	1.	ug/l	83		64-121		

Sample Matrix Quality Control

MS	MSD	MS/MSD	RPD	BKG	DUP	DUP	Dup RPD

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.



Analysis Report

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Page 2 of 3

Quality Control Summary

Client Name: ExxonMobil

Group Number: 863542

Reported: 08/27/03 at 02:53 PM

Analysis Name	%REC	%REC	Limits	RPD	MAX	Conc	Conc	RPD	Max
Batch number: 032301848002	Sample number(s): 4103643-4103646								
Copper Code 060	108	106	82-120	2	20	N.D.	N.D.	0 (1)	20
Zinc Code 060	98	96	80-120	2	20	0.0853	0.0819	4 (1)	20
Batch number: 032315704002	Sample number(s): 4103643-4103646								
Lead (GF) Code 064	94	94	80-120	0	20	N.D.	N.D.	0 (1)	20
Batch number: 03233A51A	Sample number(s): 4103643, 4103645								
TPH by NWTPH-Gx waters	112		70-130						
Batch number: 032376254003	Sample number(s): 4103643-4103646								
Arsenic (GF) Code 065	(2)	(2)	80-120	1	20	0.517	0.527	2	20
Batch number: N032311AA	Sample number(s): 4103643, 4103645								
Methyl Tertiary Butyl Ether	107	104	69-134	3	30				
Benzene	105	105	83-128	0	30				
1,2-Dichloroethane	103	101	73-136	3	30				
Toluene	101	105	83-127	2	30				
1,2-Dibromoethane	103	105	78-120	2	30				
Ethylbenzene	99	98	82-134	1	30				
m+p-Xylene	96	98	82-130	1	30				
o-Xylene	99	100	82-130	1	30				
Isopropylbenzene	105	105	81-130	1	30				
n-Propylbenzene	101	106	78-131	4	30				
1,3,5-Trimethylbenzene	98	101	74-130	2	30				
1,2,4-Trimethylbenzene	94	96	75-132	1	30				
Naphthalene	61	62	59-124	2	30				

Surrogate Quality Control

Analysis Name: Selected SVOAs by 8270 SIM

Batch number: 03230WAG026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
4103643	126	125	133
4103645	150	123	129
Blank	121	122	123
LCS	121	121	125
LCSD	118	122	128
Limits:	49-157	41-134	51-137

Analysis Name: TPH by NWTPH-Dx (waters)

Batch number: 032320009A

	Orthoterphenyl
4103643	59
4103645	93
Blank	71
LCS	86
LCSD	75
Limits:	50-150

Analysis Name: TPH by NWTPH-Gx waters

Batch number: 03233A51A

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.

Quality Control Summary

Client Name: ExxonMobil
Reported: 08/27/03 at 02:53 PM

Group Number: 863542

Surrogate Quality Control

Trifluorotoluene-F

4103643	119
4103645	120
Blank	110
LCS	106
LCSD	107
MS	119

Limits: 57-146

Analysis Name: EPA SW846/8260 (water)
Batch number: N032311AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
4103643	87	92	92	87
4103645	87	89	91	89
Blank	92	91	91	85
LCS	91	89	92	91
MS	89	91	95	92
MSD	87	95	95	92
Limits:	81-120	82-112	85-112	83-113

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

N.D.	none detected	BMQL	Below Minimum Quantitation Level
TNTC	Too Numerous To Count	MPN	Most Probable Number
IU	International Units	CP Units	cobalt-chloroplatinate units
umhos/cm	micromhos/cm	NTU	nephelometric turbidity units
C	degrees Celsius	F	degrees Fahrenheit
meq	milliequivalents	lb.	pound(s)
g	gram(s)	kg	kilogram(s)
ug	microgram(s)	mg	milligram(s)
ml	milliliter(s)	l	liter(s)
m3	cubic meter(s)	ul	microliter(s)
<	less than - The number following the sign is the <u>limit of quantitation</u> , the smallest amount of analyte which can be reliably determined using this specific test.		
>	greater than		
J	estimated value – The result falls within the Method Detection Limit (MDL) and Limit of Quantitation (LOQ).		
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.		
ppb	parts per billion		
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a possible aldol-condensation product	B	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	E	Estimated due to interference
C	Pesticide result confirmed by GC/MS	M	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	N	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	S	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	U	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	W	Post digestion spike out of control limits
U	Compound was not detected	*	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	+	Correlation coefficient for MSA <0.995

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

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Where quality is a science.

Acct. #:

Sample #:

SCR#:

Please print.

[illegible]



Analysis Report

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ANALYTICAL RESULTS

Prepared for:

ExxonMobil
607 ExxonMobil Road

Billings MT 59101

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 851881. Samples arrived at the laboratory on Wednesday, May 14, 2003. The PO# for this group is 4501839968 and the release number is 00010.

<u>Client Description</u>	<u>Lancaster Labs Number</u>
SW-WP209-051303 Grab Water Sample	4043935
SW-WP209-051303 Filtered Grab Water Sample	4043936
OF-WP209-051303 Grab Water Sample	4043937
OF-WP209-051303 Filtered Grab Water Sample	4043938
Trip Blank Water Sample	4043939

1 COPY TO Kleinfelder

Attn: Jim Petersen

Questions? Contact your Client Services Representative
Danette S Blystone at (717) 656-2300.

Respectfully Submitted,

Steven Skiles
Senior Chemist



Analysis Report

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Page 1 of 2

Lancaster Laboratories Sample No. WW 4043935

Collected: 05/13/2003 11:25 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

Billings MT 59101

SW-WP209-051303 Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

SW209

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.		0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.		0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	0.0041 J		0.0050	mg/l	1
08271	TPH by NWTPH-Dx (waters)						
02095	Diesel Range Organics	n.a.	N.D.		0.080	mg/l	1
02096	Heavy Range Organics	n.a.	N.D.		0.10	mg/l	1
	Site-specific QC samples were not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.						
08273	TPH by NWTPH-Gx waters						
01645	TPH by NWTPH-Gx waters	n.a.	N.D.		0.05	mg/l	1
02300	UST Waters by 8260B Code 017						
02010	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	ug/l	1
05401	Benzene	71-43-2	N.D.		0.5	ug/l	1
05407	Toluene	108-88-3	N.D.		0.7	ug/l	1
05415	Ethylbenzene	100-41-4	N.D.		0.8	ug/l	1
05439	Naphthalene	91-20-3	N.D.		1.	ug/l	1
06310	Xylene (Total)	1330-20-7	N.D.		0.8	ug/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis		Analyst	Dilution Factor
				Date and Time			
01045	Arsenic (GF)	Code SW-846 7060A	1	05/19/2003 09:32		Jessica L Boyd	1
01055	Lead (GF)	Code SW-846 7421	1	05/22/2003 15:27		Jennifer L Moyer	1
01753	Copper	Code SW-846 6010B	3	05/20/2003 07:05		Joanne M Gates	1
01772	Zinc	Code SW-846 6010B	1	05/20/2003 19:35		Shannon L Strausser	1
08271	TPH by NWTPH-Dx (waters)	NWTPH-Dx, ECY 97-602(modified)	1	05/16/2003 12:11		Devin M Hetrick	1
08273	TPH by NWTPH-Gx waters	TPH BY NWTPH-Gx - 8015B Mod.	1	05/14/2003 22:22		Martha L Seidel	1



Analysis Report

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Page 2 of 2

Lancaster Laboratories Sample No. WW 4043935

Collected: 05/13/2003 11:25 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

SW-WP209-051303 Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

SW209

02300	UST Waters by 8260B Code	SW-846 8260B	1	05/17/2003 02:06	Seth J Good	1
	017					
01146	GC VOA Water Prep	SW-846 5030B	1	05/14/2003 22:22	Martha L Seidel	n.a.
01163	GC/MS VOA Water Prep	SW-846 5030B	1	05/17/2003 02:06	Seth J Good	n.a.
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	05/15/2003 20:20	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	2	05/20/2003 21:20	James L Mertz	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	05/16/2003 11:05	Christine Conlin	1
07003	Extraction - DRO (Waters)	NWTPH-Dx, ECY 97-602, 6/97	1	05/15/2003 11:00	Jennytza L Marcano	1



Analysis Report

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Page 1 of 1

Lancaster Laboratories Sample No. WW 4043936

Collected: 05/13/2003 11:25 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

SW-WP209-051303 Filtered Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method	Units	Dilution Factor
				Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.	0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.	0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	0.0043	0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	N.D.	0.0050	mg/l	1

This sample was filtered in the lab for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis	Analyst	Dilution Factor
				Date and Time		
01045	Arsenic (GF) 065	Code SW-846 7060A	1	05/19/2003 09:37	Jessica L Boyd	1
01055	Lead (GF) 064	Code SW-846 7421	1	05/22/2003 15:37	Jennifer L Moyer	1
01753	Copper 060	Code SW-846 6010B	3	05/20/2003 07:10	Joanne M Gates	1
01772	Zinc 060	Code SW-846 6010B	1	05/20/2003 19:41	Shannon L Strausser	1
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	05/15/2003 20:20	James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	2	05/20/2003 21:20	James L Mertz	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	05/16/2003 11:05	Christine Conlin	1



Analysis Report

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Page 1 of 2

Lancaster Laboratories Sample No. WW 4043937

Collected: 05/13/2003 11:50 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

Billings MT 59101

OF-WP209-051303 Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

OF209

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	0.0055		0.0050	mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.		0.0012	mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.		0.0030	mg/l	1
01772	Zinc	Code 060 7440-66-6	N.D.		0.0050	mg/l	1
08271	TPH by NWTPH-Dx (waters)						
02095	Diesel Range Organics	n.a.	0.17		0.080	mg/l	1
02096	Heavy Range Organics	n.a.	N.D.		0.10	mg/l	1
	Site-specific QC samples were not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.						
08273	TPH by NWTPH-Gx waters						
01645	TPH by NWTPH-Gx waters	n.a.	0.9		0.05	mg/l	1
02300	UST Waters by 8260B Code 017						
02010	Methyl Tertiary Butyl Ether	1634-04-4	100.		0.5	ug/l	1
05401	Benzene	71-43-2	150.		0.5	ug/l	1
05407	Toluene	108-88-3	74.		0.7	ug/l	1
05415	Ethylbenzene	100-41-4	33.		0.8	ug/l	1
05439	Naphthalene	91-20-3	2.		1.	ug/l	1
06310	Xylene (Total)	1330-20-7	53.		0.8	ug/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Code	Method	Analysis		Analyst	Dilution Factor
				Trial#	Date and Time		
01045	Arsenic (GF)	Code	SW-846 7060A	1	05/19/2003 09:42	Jessica L Boyd	1
	065						
01055	Lead (GF)	Code	SW-846 7421	1	05/22/2003 15:48	Jennifer L Moyer	1
	064						
01753	Copper	Code	SW-846 6010B	3	05/20/2003 07:16	Joanne M Gates	1
	060						
01772	Zinc	Code	SW-846 6010B	1	05/20/2003 19:46	Shannon L Strausser	1
	060						
08271	TPH by NWTPH-Dx (waters)		NWTPH-Dx, ECY 97-602(modified)	1	05/16/2003 12:36	Devin M Hetrick	1
08273	TPH by NWTPH-Gx waters		TPH BY NWTPH-Gx - 8015B Mod.	1	05/14/2003 22:55	Martha L Seidel	1



Analysis Report

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Page 2 of 2

Lancaster Laboratories Sample No. WW 4043937

Collected: 05/13/2003 11:50 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

OF-WP209-051303 Grab Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

OF209

02300	UST Waters by 8260B Code	SW-846 8260B	1	05/17/2003 03:26	Seth J Good	1
	017					
01146	GC VOA Water Prep	SW-846 5030B	1	05/14/2003 22:55	Martha L Seidel	n.a.
01163	GC/MS VOA Water Prep	SW-846 5030B	1	05/17/2003 03:26	Seth J Good	n.a.
01848	WW SW846 ICP Digest (tot	SW-846 3005A	1	05/15/2003 20:20	James L Mertz	1
	rec)					
05704	WW/TL SW 846 GFAA Digest	SW-846 3020A	2	05/20/2003 21:20	James L Mertz	1
	tot					
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	05/16/2003 11:05	Christine Conlin	1
07003	Extraction - DRO (Waters)	NWTPH-Dx, ECY 97-602,	1	05/15/2003 11:00	Jennytza L Marcano	1
		6/97				



Analysis Report

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Page 1 of 1

Lancaster Laboratories Sample No. WW 4043938

Collected: 05/13/2003 11:50 by JP

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

Billings MT 59101

OF-WP209-051303 Filtered Grab Water Sample

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

CAT No.	Analysis Name	CAS Number	As Received Result	As Received		Units	Dilution Factor
				Method	Detection Limit		
01045	Arsenic (GF)	Code 065 7440-38-2	N.D.	0.0050		mg/l	1
01055	Lead (GF)	Code 064 7439-92-1	N.D.	0.0012		mg/l	1
01753	Copper	Code 060 7440-50-8	N.D.	0.0030		mg/l	1
01772	Zinc	Code 060 7440-66-6	N.D.	0.0050		mg/l	1

This sample was filtered in the lab for dissolved metals.

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis		Analyst	Dilution Factor
				Date and Time			
01045	Arsenic (GF) 065	Code SW-846 7060A	1	05/19/2003 09:47		Jessica L Boyd	1
01055	Lead (GF) 064	Code SW-846 7421	1	05/22/2003 15:59		Jennifer L Moyer	1
01753	Copper 060	Code SW-846 6010B	3	05/20/2003 07:21		Joanne M Gates	1
01772	Zinc 060	Code SW-846 6010B	1	05/20/2003 20:03		Shannon L Strausser	1
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	05/15/2003 20:20		James L Mertz	1
05704	WW/TL SW 846 GFAA Digest tot	SW-846 3020A	2	05/20/2003 21:20		James L Mertz	1
06254	WW/TL As/Se-GFAA Digest	SW-846 7060A	1	05/16/2003 11:05		Christine Conlin	1



Analysis Report

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Page 1 of 1

Lancaster Laboratories Sample No. WW 4043939

Collected: n.a.

Account Number: 09728

Submitted: 05/14/2003 10:40

ExxonMobil

Reported: 05/23/2003 at 16:17

607 ExxonMobil Road

Discard: 06/23/2003

Trip Blank Water Sample

Billings MT 59101

LOC# 36-001 WBS# 08 Prj.# 26626

MOBIL: 9420 NW St. Helens Rd. - Portland, OR

TB209

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method	Units	Dilution Factor
				Detection Limit		
08273	TPH by NWTPH-Gx waters					
01645	TPH by NWTPH-Gx waters	n.a.	N.D.	0.05	mg/l	1
02300	UST Waters by 8260B Code 017					
02010	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	ug/l	1
05401	Benzene	71-43-2	N.D.	0.5	ug/l	1
05407	Toluene	108-88-3	N.D.	0.7	ug/l	1
05415	Ethylbenzene	100-41-4	N.D.	0.8	ug/l	1
05439	Naphthalene	91-20-3	N.D.	1.	ug/l	1
06310	Xylene (Total)	1330-20-7	N.D.	0.8	ug/l	1

Laboratory Chronicle

CAT No.	Analysis Name	Method	Analysis		Analyst	Dilution Factor
			Trial#	Date and Time		
08273	TPH by NWTPH-Gx waters	TPH BY NWTPH-Gx - 8015B Mod.	1	05/14/2003 21:49	Martha L Seidel	1
02300	UST Waters by 8260B Code 017	SW-846 8260B	1	05/17/2003 03:52	Seth J Good	1
01146	GC VOA Water Prep	SW-846 5030B	1	05/14/2003 21:49	Martha L Seidel	n.a.
01163	GC/MS VOA Water Prep	SW-846 5030B	1	05/17/2003 03:52	Seth J Good	n.a.

Quality Control Summary

Client Name: ExxonMobil

Group Number: 851881

Reported: 05/23/03 at 04:18 PM

Laboratory Compliance Quality Control

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank MDL</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Batch number: 03133A55A TPH by NWTPH-Gx waters	Sample number(s): 4043935,4043937,4043939 N.D.	0.05	mg/l	93	94	70-130	1	30
Batch number: 031350005A Diesel Range Organics Heavy Range Organics	Sample number(s): 4043935,4043937 N.D. N.D.	0.080 0.10	mg/l mg/l	69	65	55-126	6	20
Batch number: 031351848005 Copper Zinc	Sample number(s): 4043935-4043938 N.D. 0.0103	0.003 0.005	mg/l mg/l	104 103		92-110 94-112		
Batch number: 031366254003 Arsenic (GF)	Sample number(s): 4043935-4043938 N.D.	.005	mg/l	98		80-120		
Batch number: 031405704002 Lead (GF)	Sample number(s): 4043935-4043938 N.D.	0.0012	mg/l	97		80-120		
Batch number: T031361AA Methyl Tertiary Butyl Ether Benzene Toluene Ethylbenzene Naphthalene Xylene (Total)	Sample number(s): 4043935,4043937,4043939 N.D. N.D. N.D. N.D. N.D. N.D.	0.5 0.5 0.7 0.8 1. 0.8	ug/l ug/l ug/l ug/l ug/l ug/l	94 97 97 96 92 96		77-127 85-117 85-115 82-119 64-121 84-120		

Sample Matrix Quality Control

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD</u>	<u>BKG MAX</u>	<u>DUP Conc</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
Batch number: 03133A55A TPH by NWTPH-Gx waters	Sample number(s): 4043935,4043937,4043939 106	103	70-130	2	30			
Batch number: 031351848005 Copper Zinc	Sample number(s): 4043935-4043938 103 101	103 102	82-120 80-120	1 0	20 20	N.D. N.D.	N.D. N.D.	0 (1) 0 (1)
Batch number: 031366254003 Arsenic (GF)	Sample number(s): 4043935-4043938 107	108	80-120	1	20	0.0023 J	0.0040 J	54* (1)
Batch number: 031405704002 Lead (GF)	Sample number(s): 4043935-4043938 61*	80	80-120	22*	20	0.0031	0.0042	29* (1)
Batch number: T031361AA Methyl Tertiary Butyl Ether Benzene Toluene Ethylbenzene Naphthalene Xylene (Total)	Sample number(s): 4043935,4043937,4043939 95 99 98 100 88 97	94 101 102 101 90 99	69-134 83-128 83-127 82-134 59-124 82-130	0 2 4 1 2 3	30 30 30 30 30 30			

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.

Quality Control Summary

Client Name: ExxonMobil
Reported: 05/23/03 at 04:18 PM

Group Number: 851881

Surrogate Quality Control

Analysis Name: TPH by NWTPH-Gx waters
Batch number: 03133A55A
Trifluorotoluene-F

4043935	104
4043937	107
4043939	102
Blank	108
LCS	102
LCSD	103
MS	101
MSD	101

Limits: 57-146

Analysis Name: TPH by NWTPH-Dx (waters)
Batch number: 031350005A
Orthoterphenyl

4043935	87
4043937	96
Blank	91
LCS	105
LCSD	100

Limits: 50-150

Analysis Name: UST-Unleaded Waters by 8260B
Batch number: T031361AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
4043935	90	92	91	89
4043937	91	94	92	92
4043939	93	95	92	91
Blank	90	90	94	88
LCS	87	94	96	93
MS	90	96	95	91
MSD	91	94	98	95

Limits: 81-120 82-112 85-112 83-113

*- Outside of specification

- (1) The result for one or both determinations was less than five times the LOQ.
- (2) The background result was more than four times the spike added.

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

N.D.	none detected	BMQL	Below Minimum Quantitation Level
TNTC	Too Numerous To Count	MPN	Most Probable Number
IU	International Units	CP Units	cobalt-chloroplatinate units
umhos/cm	micromhos/cm	NTU	nephelometric turbidity units
C	degrees Celsius	F	degrees Fahrenheit
meq	milliequivalents	lb.	pound(s)
g	gram(s)	kg	kilogram(s)
ug	microgram(s)	mg	milligram(s)
ml	milliliter(s)	l	liter(s)
m3	cubic meter(s)	ul	microliter(s)
<	less than - The number following the sign is the <u>limit of quantitation</u> , the smallest amount of analyte which can be reliably determined using this specific test.		
>	greater than		
J	estimated value - The result falls within the Method Detection Limit (MDL) and Limit of Quantitation (LOQ).		
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.		
ppb	parts per billion		
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a possible aldol-condensation product	B	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	E	Estimated due to interference
C	Pesticide result confirmed by GC/MS	M	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	N	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	S	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	U	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	W	Post digestion spike out of control limits
U	Compound was not detected	*	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	+	Correlation coefficient for MSA <0.995

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

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ATTACHMENT C

*Acton Mickelson Environmental, Inc (AME, 2007). Report on
Additional Investigation of Storm Sewer WP-209, Former Mobil
Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon
February 15, 2007*

**ACTON •
MICKELSON •
ENVIRONMENTAL, INC.**

Consulting Scientists, Engineers, and Geologists

February 15, 2007

Mr. Tom Gainer, P.E.
Oregon Department of Environmental Quality
Northwest Region
2020 SW 4th Avenue, Suite 400
Portland, Oregon 97201

Via Overnight Mail

13041.09/7

**Subject: *Report on Additional Investigation of Storm Sewer WP-209*
 Former Mobil Portland Terminal
 *9420 NW St. Helens Road, Portland, Oregon***

Dear Mr. Gainer:

This *Report on Additional Investigation of Storm Sewer WP-209* (report) was prepared for ExxonMobil Refining and Supply Company, Global Remediation (ExxonMobil) to describe investigation results at the former Mobil Terminal at 9420 NW St. Helens Road in Portland, Oregon (site, **Figure 1**). ExxonMobil conducts ground water monitoring and remediation at the site under Voluntary Cleanup Agreement No. ECVC-NWR-01015 between ExxonMobil and the State of Oregon, Department of Environmental Quality (DEQ). To follow up on previous reports describing petroleum constituents in discharge flow to the Willamette River from the storm sewer identified as WP-209, ExxonMobil conducted additional investigation of sewer pathways and flow sources and potential sources of petroleum constituents reported in storm sewer WP-209 discharge. This investigation followed the scope of work described in *Work Plan for Additional Investigation of Storm Sewer WP-209* (work plan; Acton • Mickelson • Environmental, Inc. [AME] 2005), approved by DEQ in correspondence dated December 21, 2005.

BACKGROUND

The site is an active petroleum terminal that has operated since approximately 1928. It occupies approximately 29 acres on the western bank of the Willamette River. ExxonMobil and its predecessors owned and operated the site until December 2001 when the product storage and transfer facilities, including the loading rack area, were sold to ST Services, Shore Terminals LLC, and later to Valero, LP. ExxonMobil maintains ownership of a lubricant manufacturing facility in the northwest portion of the site. Olympic Pipe Line Company (Olympic) owns and operates a pipeline station in the southern portion of the site approximately 500 feet southeast of the loading rack area.

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The sewer outfall identified in previous investigations as storm sewer WP-209 (Kleinfelder 2003 and 2004) discharges to the Willamette River immediately northeast of the south tank farm (**Figure 1**). City of Portland (City) maps as reported by Kleinfelder show storm sewer WP-209 as a 48-inch concrete line running southwest to northeast from a manhole in Highway 30, under the south tank farm, and into the Willamette River. Contrary to City information, the storm sewer WP-209 outfall at the Willamette River is an approximate 24-inch-diameter concrete pipe.

Water discharging from storm sewer WP-209 was sampled in August 2002 and May 2003 and analyzed for petroleum constituents and methyl tertiary butyl ether (MTBE). Total petroleum hydrocarbons as gasoline (TPHg), benzene, and MTBE were reported in the August 2002 samples at concentrations of 17,000, 430, and 100 micrograms per liter ($\mu\text{g/L}$), respectively. May 2003 sampling results for TPHg, benzene, and MTBE were 900, 150, and 100 $\mu\text{g/L}$, respectively (Kleinfelder 2003 and 2004).

During the May 2003 sampling event, an unidentified, open sewer line was noted southeast of storm sewer WP-209 and southwest of the south tank farm, with pooled surface water flowing into the open sewer (**Figure 1**). On the assumption the open sewer line represented an inlet to storm sewer WP-209, a sample of pooled surface water was obtained. Analytical results for the pooled surface water sample were non-detect for petroleum constituents and MTBE. Attempts to trace the sewer lines by video camera in May 2003 were unsuccessful due to blockages in the sewer piping, with camera entry attempted at both the unidentified sewer line opening and the storm sewer WP-209 outfall (Kleinfelder 2004). With the discovery of the unidentified sewer line, the May 2003 investigation brought into question the origin and configuration of storm sewer WP-209.

Interviews with employees at the terminal revealed that the State of Oregon, Department of Transportation (ODOT) performed sewer line modification work to the southeast of the Olympic pipeline station in the late 1990s. Communications with Mr. Larry Olsen of ODOT confirm ODOT involvement in the late 1990s and likely ODOT ownership of the modified sewer line. Mr. Olsen was unable to provide any maps or other documentation regarding the origin and routing of this sewer or information regarding the work performed by ODOT. Available information is not conclusive as to whether ODOT modified storm sewer WP-209 or another sewer line in the vicinity of the Olympic pipeline station.

Besides surface water sources, ground water possibly enters storm sewer WP-209 through cracks or breaks in the lines. However, in contrast to analytical results for the storm sewer WP-209 discharge indicating predominantly gasoline constituents, ground water sampling results for monitoring wells W-19 and W-20 indicate predominantly diesel impacts for these two monitoring wells, which are closest to the WP-209 outfall (**Figure 1**). Furthermore, analytical results for ground water samples from monitoring well KMW02, which is located inside the south tank farm and is the nearest monitoring well to the inferred route of storm sewer WP-209 (**Figure 1**), are historically less than reporting limits for petroleum constituents and MTBE (AME 2006).

INVESTIGATION OBJECTIVES

This investigation had the following objectives:

- Investigate the origin, routing, and configuration of storm sewer(s) that constitute or tie into storm sewer WP-209
- Assess possible sources for petroleum constituents and MTBE reported in the storm sewer WP-209 discharge by obtaining and analyzing water samples from inside the storm sewer upgradient of the south tank farm

SCOPE OF WORK

Work for this investigation included the following tasks:

- Obtained a permit from ODOT for temporary lane closure of Highway 30 and access to storm sewer WP-209
- Implemented traffic control for lane closure on Highway 30 immediately upslope (southwest) of the terminal to open a manhole believed to access storm sewer WP-209
- Lowered a Pearpoint-labeled and listed P494 pan-n-tilt color camera on tractor wheels through the manhole in Highway 30, and directed the mobile camera down the sewer line northeasterly toward the railroad tracks and south tank farm (**Figure 1**)
- Obtained a water sample from inside storm sewer WP-209 at the manhole in Highway 30.
- Obtained a sample of water flowing into the opening for the unidentified sewer (**Figure 1**)
- Obtained a water sample from storm sewer WP-209 at the outfall to the Willamette River
- Analyzed storm sewer water samples for the following constituents:
 - Gasoline range organics (GRO), diesel, and motor oil by Northwest Total Petroleum Hydrocarbon Methods NWTPH-Gx and NWTPH-Dx. (Note that GRO, diesel, and motor oil have been historically reported using the acronyms TPHg, TPHd, and TPHo, and the TPHg, TPHd, and TPHo acronyms will be used in this report text for historical consistency)
 - Benzene, toluene, ethylbenzene, and xylenes (BTEX), MTBE, and naphthalene by United States Environmental Protection Agency Method 8260B
- Prepared this report to summarize findings

RESULTS

After obtaining the required lane closure permit from ODOT, AME and its subcontractor Applied Professional Services, Inc. mobilized to perform lane closure and sewer access on March 24, 2006. The manhole in Highway 30 was opened and the camera lowered into the manhole and directed toward the northeast. After traveling approximately 160 feet northeast through the 48-inch-diameter concrete sewer, the camera showed that the end of the sewer line emerges from and discharges to the vegetative covered slope immediately northeast of the entrance driveway (Highway Outfall, **Figure 2**). Effluent water from the Highway Outfall was observed to flow east-northeast through a swale toward the opening for the unidentified sewer line as illustrated on **Figure 2**. A sample was obtained of water flowing through the manhole location (Sample ID "Upper Sewer"), the manhole was secured, and the traffic lane was reopened.

AME observed that the unidentified sewer line is an approximate 48-inch-diameter galvanized steel culvert, not a 24-inch-diameter concrete pipe as reported by Kleinfelder. The approximate 48-inch-diameter unidentified galvanized steel sewer runs under the raised bed for the railroad tracks in the direction of the center aboveground storage tank in the south tank farm (**Figure 2**). To continue investigation of sewer pathways, the camera was directed into the opening for the unidentified sewer line but malfunctioned almost immediately, thus ending camera use in the investigation. Tracing of the unidentified steel sewer was attempted with conductible utility-locating equipment, but the pipe signal was lost approximately 50 feet from the sewer opening. A sample was obtained of water flowing into the opening of the unidentified sewer line (Sample ID "Mid-Inlet").

To complete sampling for the investigation, the outfall identified as storm sewer WP-209 was accessed by boat and a sample was obtained of the discharge flow (Sample ID "Lower Outfall").

Analytical results for the "Upper Sewer," "Mid-Inlet," and "Lower Outfall" samples are shown in **Table 1**. For the "Upper Sewer" sample obtained from the manhole in Highway 30, analytical results were less than reporting limits for all analytes except TPHo reported at 142 µg/L. For the "Mid-Inlet" sample obtained at the opening to the unidentified sewer line, all analytes were less than reporting limits. For the "Lower Outfall" sample obtained from the outfall historically identified as storm sewer WP-209, results for TPHg, TPHd, and TPHo were 167, 235, and 104 µg/L, respectively; BTEX were reported at concentrations ranging from 3.82 µg/L ethylbenzene to 38.2 µg/L benzene, and MTBE was reported at a concentration of 40.3 µg/L. Naphthalene was not detected in the "Lower Outfall" sample. Laboratory reports for these samples are in Enclosure A.

DISCUSSION

Sewer Configuration

City sewer maps and previous reports by Kleinfelder do not accurately portray storm sewer WP-209. Whether or not the discrepancy is the result of sewer work by ODOT is uncertain. Also uncertain is the origin of water observed discharging to the Willamette River from the outfall historically identified as storm sewer WP-209, and whether ODOT work changed or altered the source flow(s) to this sewer outfall. The current understanding of the configuration of the sewer(s) investigated is illustrated on **Figure 2**.

Sampling Results

Analytical results for the "Upper Sewer" sample obtained from the Highway 30 manhole indicate oil-range hydrocarbons are present in storm sewer water flowing onto the site. The reported concentration of TPHo in the Highway 30 manhole sample is less than the current ground water cleanup goal.

Analytical results for the "Lower Outfall" sample were similar to previous analytical results for samples of water discharging from storm sewer WP-209 in that the fuel constituents detected are primarily gasoline related. In comparison, fuel constituents historically reported in ground water samples from monitoring wells W-19 and W-20 are predominantly diesel related. First half 2006 ground water sampling results for monitoring wells W-19 and W-20 are shown in **Table 1**, and laboratory reports for these samples are included in Enclosure A.

Monitoring well MW40, installed downgradient of the Olympic pipeline station in June 2005, had reported detections of gasoline constituents for the first time during the first half 2006 with TPHg up to 405 µg/L and benzene up to 148 µg/L. First half 2006 ground water sampling results for monitoring well MW40 are included in **Table 1**, and the laboratory results for these samples are included in Enclosure A. These latest monitoring well MW40 sampling results are similar to historical results for the storm sewer WP-209 outfall, with gasoline components predominant in the reported distribution of fuel constituents. The resemblance between the distribution of fuel constituents reported for samples from monitoring well MW40 and the storm sewer WP-209 outfall is illustrated on **Figures 3** and **4**. Compared to the distribution of fuel constituents shown for samples from monitoring wells W-19 and W-20, the monitoring well MW40 and storm sewer WP-209 outfall samples are characterized by greater concentrations of benzene, toluene, xylenes, and TPHg, and lesser concentrations of TPHd and TPHo.

Reported fuel constituents in the monitoring well MW40 ground water samples are attributed to the Olympic pipeline station. The resemblance of fuel constituents between samples from monitoring well MW40 and the storm sewer WP-209 outfall is consistent with the observed direction of the piping at the outfall heading back toward the general vicinity of the Olympic pipeline station (**Figure 2**).

CONCLUSIONS AND RECOMMENDATIONS

The primary conclusions drawn from the investigation are as follows:

- The origin of the 24-inch concrete storm sewer discharging to the Willamette River (historically identified as storm sewer WP-209) has not been determined.
- Laboratory analytical data indicate water discharging from storm sewer WP-209 is impacted by gasoline constituents that are attributed to Olympic pipeline operations.

Based on the above conclusions, the following recommendations are presented:

- DEQ should engage Olympic in continued assessment of storm sewer WP-209.
- Further assessment of storm sewer WP-209 should be completed by Olympic.

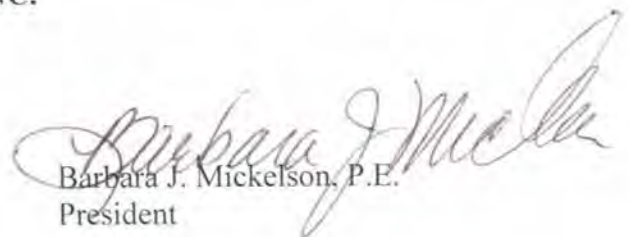
Please call Mr. Brian Harrison of ExxonMobil at (406) 657-5296 if you have any questions regarding this report.

Very truly yours,

ACTON • MICKELSON • ENVIRONMENTAL, INC.



James C. Twiford, P.E.
Senior Project Manager



Barbara J. Mickelson, P.E.
President

Enclosures

cc: Mr. Brian Harrison, ExxonMobil
Ms. Anita Lovely, Lovely Consulting, Inc.
Mr. Bill Dungan, Valero LP
Mr. Joe Aldridge, Valero, LP
Ms. Amanda Spencer, Ash Creek Associates

JCT:tem

REFERENCES

- AME. 2005. *2005 Work Plan for Additional Investigation of Storm Sewer WP-209, Former Mobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon.* December.
- _____. 2006. *2005 Annual Ground Water Monitoring and Remediation Report, Former Mobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon.* February.
- Kleinfelder. 2003. *Storm Sewer Outfall Sampling and Abandoning Storm Sewer Outfall, Former ExxonMobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon.* April.
- Kleinfelder. 2004. *Storm Sewer WP-209 Sampling, Former ExxonMobil Portland Terminal, 9420 NW St. Helens Road, Portland, Oregon.* May.

TABLE 1

SELECTED SEWER AND MONITORING WELL SAMPLE RESULTS

Sample ID	Sample Date	TPHg	TPHd	TPHo	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene
Upper Sewer (Highway 30 Manhole)	3/24/2006	<100.0	<100.0	142.0	<1.0	<1.0	<1.0	<3.0	<1.0	<5.0
Mid-Inlet (Sewer Line 1 Opening)	3/24/2006	<100.0	<96.2	<96.2	<1.0	<1.0	<1.0	<3.0	<1.0	<5.0
Lower Outfall (WP-209 Outfall)	3/24/2006	167.0	235.0	104.0	38.2	14.8	3.82	11.7	40.3	<5.0
W-19	3/23/2006	<100.0	1,550.0	275.0	<1.0	<1.0	<1.0	<3.0	<1.0	<5.0
W-19	5/10/2006	<100.0	2,250.0	241.0	<1.0	<1.0	<1.0	<3.0	<1.0	<5.0
W-20	3/23/2006	<100.0	203.0	135.0	<1.0	<1.0	<1.0	<3.0	<1.0	<5.0
W-20	5/10/2006	<100.0	188.0	151.0	<1.0	<1.0	<1.0	<3.0	<1.0	<5.0
MW40	3/21/2006	405.0	102.0	<98.0	148.0	<1.0	<1.0	9.8	<1.0	5.7
MW40	5/10/2006	246.0	105.0	<100.0	68.9	2.7	<1.0	<3.0	<1.0	<5.0

Notes

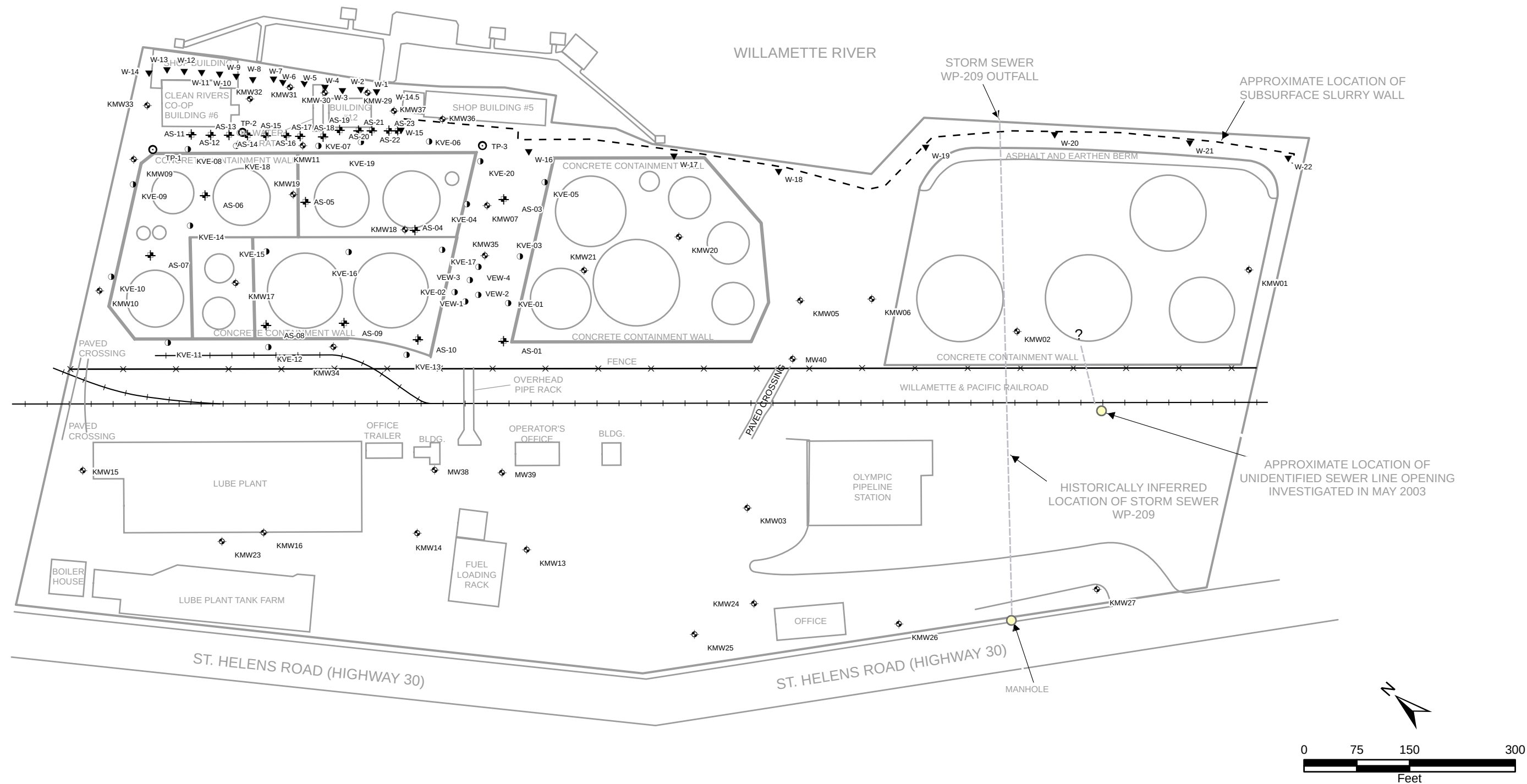
All concentrations are in micrograms per liter.

MTBE = methyl tertiary butyl ether

TPHd = total petroleum hydrocarbons as diesel

TPHg = total petroleum hydrocarbons as gasoline

TPHo = total petroleum hydrocarbons as motor oil



LEGEND

KMW11	MONITORING WELL LOCATION AND DESIGNATION
AS-05	AIR SPARGING WELL LOCATION AND DESIGNATION
KVE-01	VAPOR EXTRACTION WELL LOCATION AND DESIGNATION
W-11	GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)
TP-1	TEMPORARY VAPOR MONITORING WELL LOCATION AND DESIGNATION

NOTES

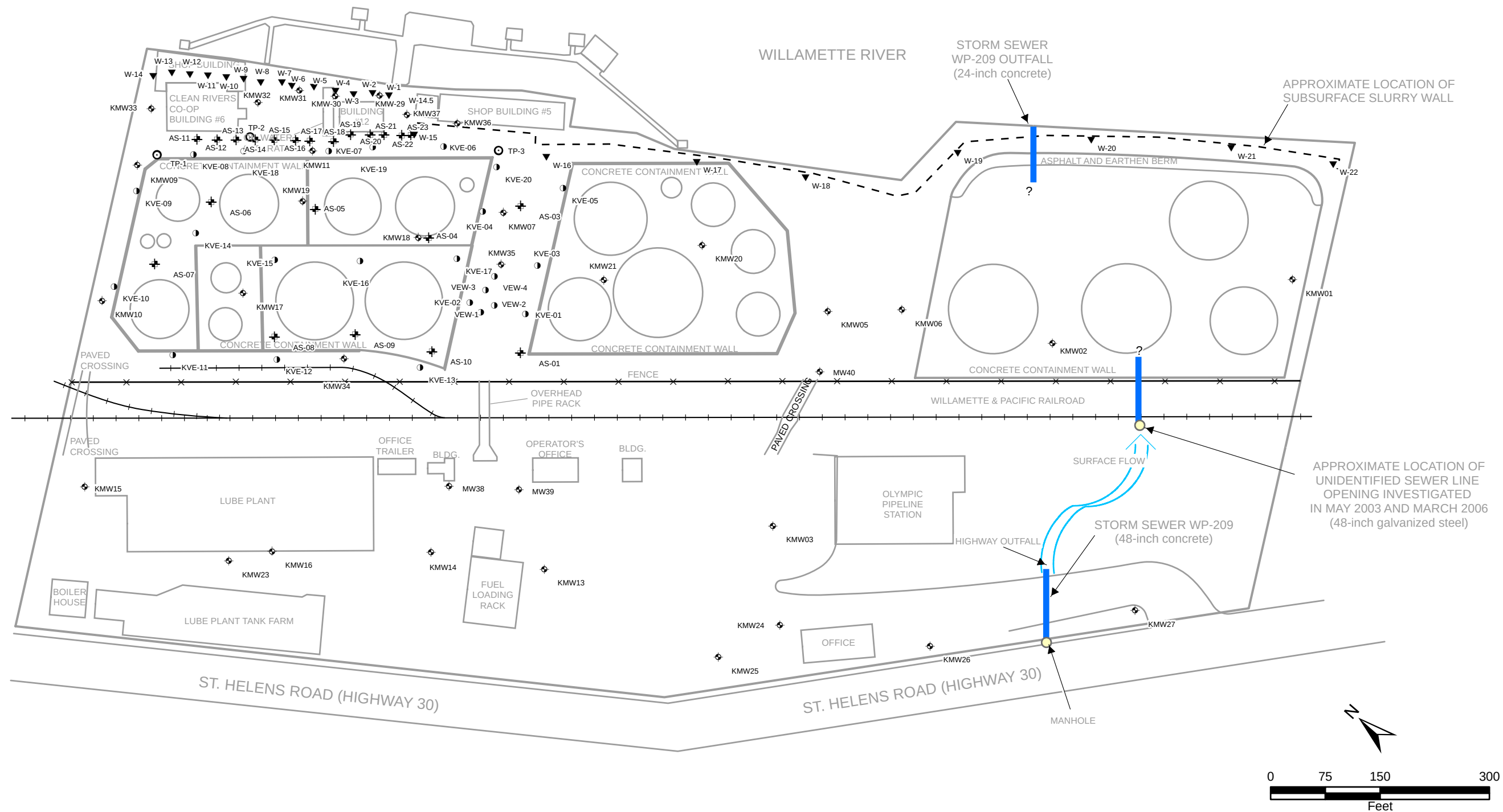
1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.

FIGURE 1
SITE MAP WITH HISTORICALLY INFERRED
LOCATION OF STORM SEWER WP-209

Former ExxonMobil Portland Terminal
9420 NW St. Helens Road, Portland, Oregon

**Acton •
Mickelson •
Environmental, Inc.**

Consulting Scientists, Engineers, and Geologists
5175 Hillsdale Circle #100, El Dorado Hills, California 95762 (916) 939-7550



LEGEND

KMW11	MONITORING WELL LOCATION AND DESIGNATION
AS-05	AIR SPARGING WELL LOCATION AND DESIGNATION
KVE-01	VAPOR EXTRACTION WELL LOCATION AND DESIGNATION
W-11	GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)
TP-1	TEMPORARY VAPOR MONITORING WELL LOCATION AND DESIGNATION
	STORM SEWER
	SURFACE FLOW

NOTES

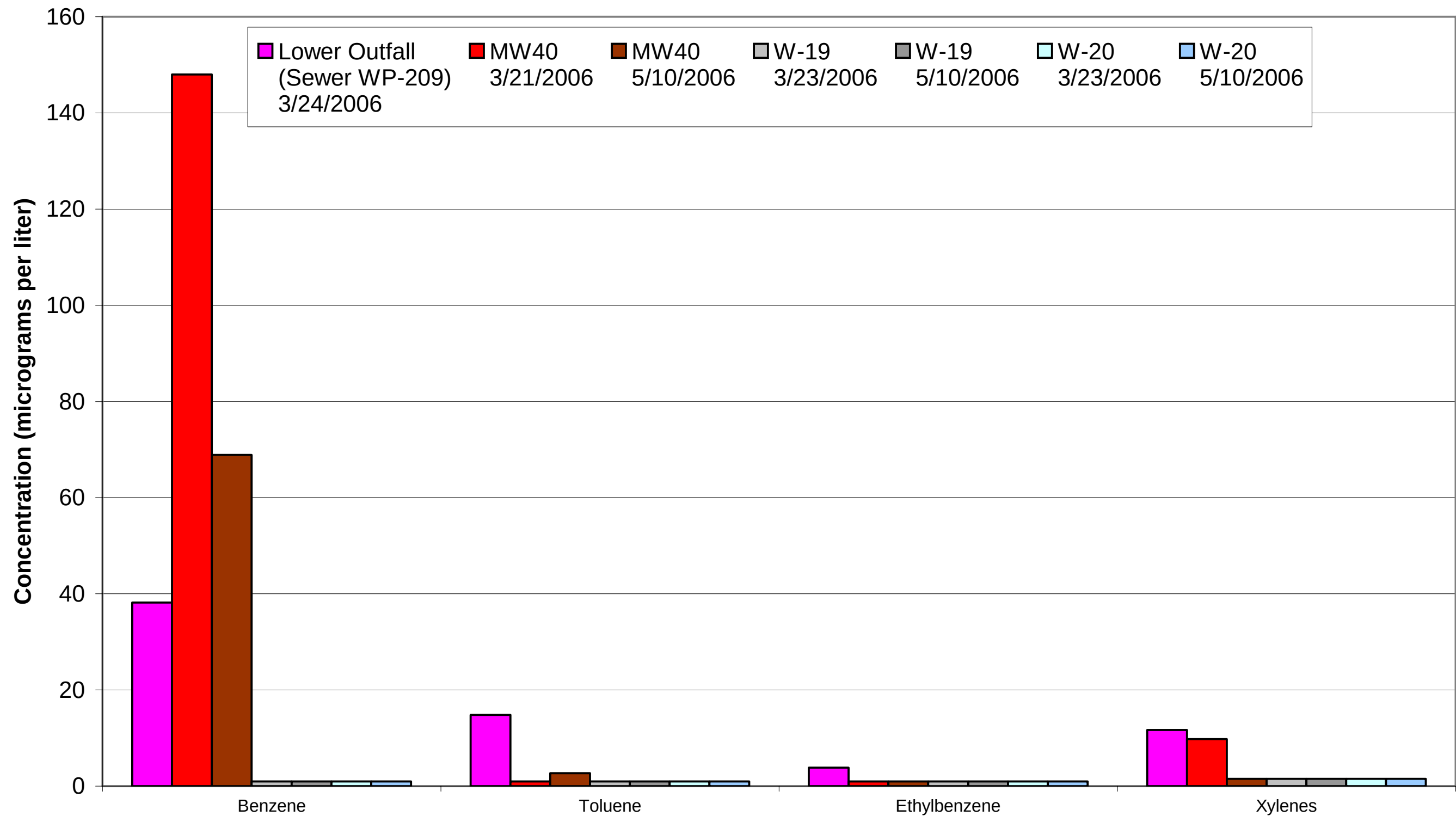
1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.

FIGURE 2
MARCH 2006 DETERMINATION OF
STORM SEWER CONFIGURATIONS

Former ExxonMobil Portland Terminal
9420 NW St. Helens Road, Portland, Oregon

**Acton •
Mickelson •
Environmental, Inc.**

Consulting Scientists, Engineers, and Geologists
5175 Hillsdale Circle #100, El Dorado Hills, California 95762 (916) 939-7550



Analyte

FIGURE 3
SEWER AND GROUND WATER MONITORING
WELLS COMPARISON OF BENZENE, TOLUENE,
ETHYLBENZENE, AND XYLENES CONCENTRATIONS
 Former Mobil Portland Terminal
 9420 NW St. Helens Road, Portland, Oregon

Acton •
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Environmental, Inc.
 Consulting Scientists, Engineers, and Geologists
 5175 Hillsdale Circle #100, El Dorado Hills, California 95762 (916) 939-7550

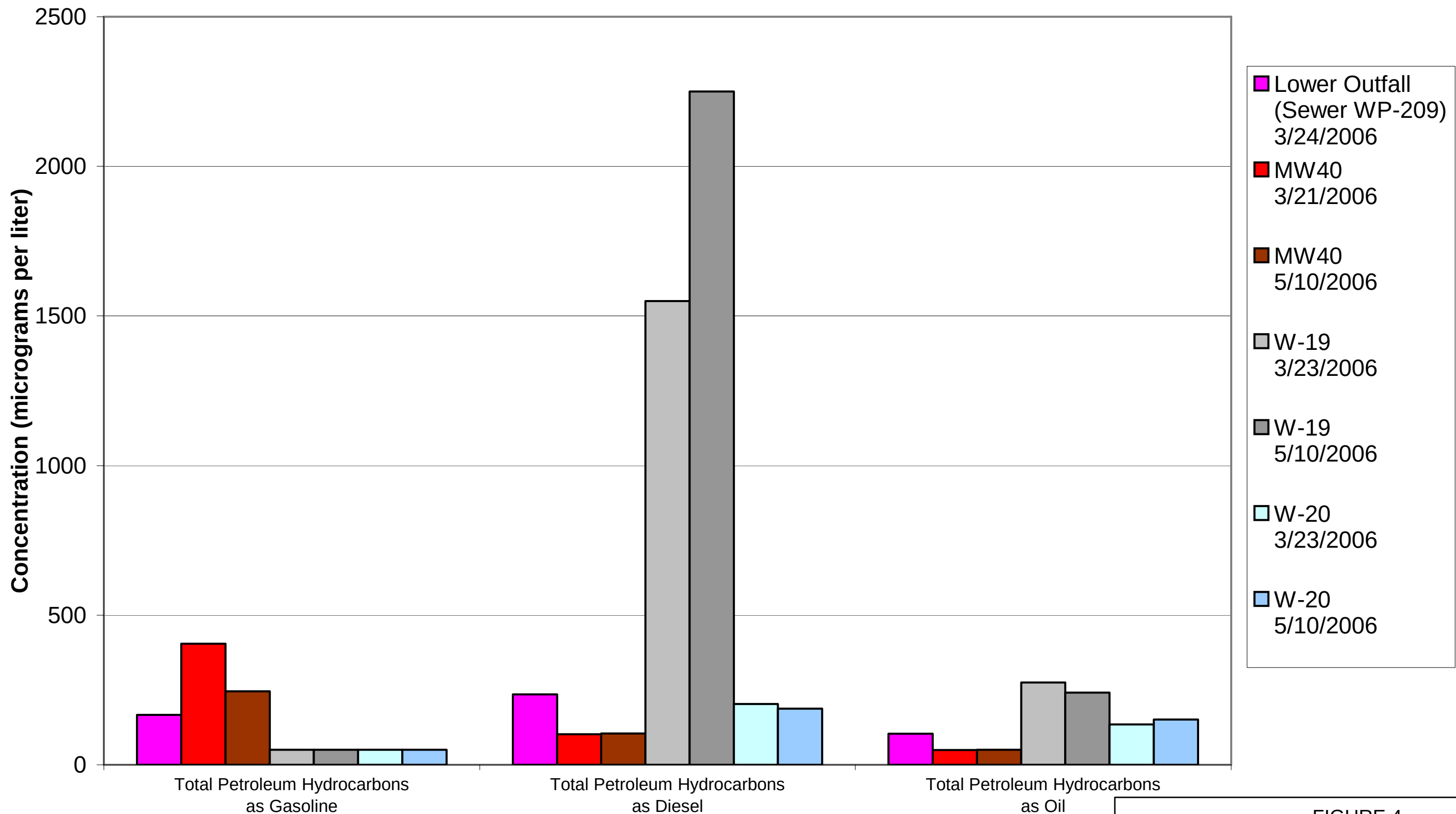


FIGURE 4
SEWER AND GROUND WATER MONITORING
WELLS COMPARISON OF TOTAL
HYDROCARBON CONCENTRATIONS

Former Mobil Portland Terminal
9420 NW St. Helens Road, Portland, Oregon

Acton •
Mickelson •
Environmental, Inc.

Consulting Scientists, Engineers, and Geologists

5175 Hillsdale Circle #100, El Dorado Hills, California 95762 (916) 939-7550

ENCLOSURE A

Laboratory Analytical Reports

April 07, 2006

Client: Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn: John Shaal

Work Order: NPD0494
Project Name: Former Portland Terminal #36-001
Project Nbr: 13041.05
P/O Nbr:
Date Received: 03/28/06

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
Mid-inlet	NPD0494-01	03/24/06 13:45

An executed copy of the chain of custody, the project quality control data, and the sample receipt form are also included as an addendum to this report. If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-800-765-0980. Any opinions, if expressed, are outside the scope of the Laboratory's accreditation.

This material is intended only for the use of the individual(s) or entity to whom it is addressed, and may contain information that is privileged and confidential. If you are not the intended recipient, or the employee or agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution, or copying of this material is strictly prohibited. If you have received this material in error, please notify us immediately at 615-726-0177.

Oregon Certification Number: TN200001

The Chain(s) of Custody, 3 pages, are included and are an integral part of this report.

These results relate only to the items tested. This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By:



Leah R. Klingensmith
Senior Project Management

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPD0494
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPD0494-01 (Mid-inlet - Ground Water) Sampled: 03/24/06 13:45								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	04/06/06 16:33	SW846 8260B	6040855
Ethylbenzene	ND		ug/L	1.00	1	04/06/06 16:33	SW846 8260B	6040855
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	04/06/06 16:33	SW846 8260B	6040855
Naphthalene	ND		ug/L	5.00	1	04/06/06 16:33	SW846 8260B	6040855
Toluene	ND		ug/L	1.00	1	04/06/06 16:33	SW846 8260B	6040855
Xylenes, total	ND		ug/L	3.00	1	04/06/06 16:33	SW846 8260B	6040855
Surr: 1,2-Dichloroethane-d4 (70-130%)	89 %					04/06/06 16:33	SW846 8260B	6040855
Surr: Dibromofluoromethane (79-122%)	94 %					04/06/06 16:33	SW846 8260B	6040855
Surr: Toluene-d8 (78-121%)	116 %					04/06/06 16:33	SW846 8260B	6040855
Surr: 4-Bromofluorobenzene (78-126%)	106 %					04/06/06 16:33	SW846 8260B	6040855
Extractable Petroleum Hydrocarbons								
Diesel	ND	H1, QSG	ug/L	96.2	1	04/06/06 20:31	NWTPH-Dx	6040871
Motor Oil	ND	H1, QSG	ug/L	96.2	1	04/06/06 20:31	NWTPH-Dx	6040871
Surr: o-Terphenyl (51-142%)	118 %	H1				04/06/06 20:31	NWTPH-Dx	6040871
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	04/06/06 21:09	NWTPH-Gx	6040987
Surr: a,a,a-Trifluorotoluene (63-134%)	95 %					04/06/06 21:09	NWTPH-Gx	6040987

Client Acton Mickelson Environmental, Inc. (I3785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPD0494
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

SAMPLE EXTRACTION DATA

Parameter	Batch	Lab Number	Wt/Vol Extracted	Extracted Vol	Date	Analyst	Extraction Method
Extractable Petroleum Hydrocarbons							
NWTPH-Dx	6040871	NPD0494-01	1040.00	1.00	04/06/06 11:30	KLG	EPA 3510C

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPD0494
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

PROJECT QUALITY CONTROL DATA

Blank

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time

Selected Volatile Organic Compounds by EPA Method 8260B

6040855-BLK1

Benzene	<0.290		ug/L	6040855	6040855-BLK1	04/06/06 09:55
Ethylbenzene	<0.340		ug/L	6040855	6040855-BLK1	04/06/06 09:55
Methyl tert-Butyl Ether	<0.320		ug/L	6040855	6040855-BLK1	04/06/06 09:55
Naphthalene	<1.13		ug/L	6040855	6040855-BLK1	04/06/06 09:55
Toluene	<0.280		ug/L	6040855	6040855-BLK1	04/06/06 09:55
Xylenes, total	<0.820		ug/L	6040855	6040855-BLK1	04/06/06 09:55
Surrogate: 1,2-Dichloroethane-d4	84%			6040855	6040855-BLK1	04/06/06 09:55
Surrogate: Dibromofluoromethane	94%			6040855	6040855-BLK1	04/06/06 09:55
Surrogate: Toluene-d8	112%			6040855	6040855-BLK1	04/06/06 09:55
Surrogate: 4-Bromofluorobenzene	104%			6040855	6040855-BLK1	04/06/06 09:55

Extractable Petroleum Hydrocarbons

6040871-BLK1

Diesel	38.7		ug/L	6040871	6040871-BLK1	04/06/06 19:58
Motor Oil	<38.0		ug/L	6040871	6040871-BLK1	04/06/06 19:58
Surrogate: o-Terphenyl	117%			6040871	6040871-BLK1	04/06/06 19:58

Purgeable Petroleum Hydrocarbons

6040987-BLK1

GRO as Gasoline	<40.0		ug/L	6040987	6040987-BLK1	04/06/06 20:36
Surrogate: a,a,a-Trifluorotoluene	92%			6040987	6040987-BLK1	04/07/06 12:32

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPD0494
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

PROJECT QUALITY CONTROL DATA LCS

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B								
6040855-BS1								
Benzene	50.0	52.2		ug/L	104%	78 - 122	6040855	04/06/06 08:48
Ethylbenzene	50.0	51.8		ug/L	104%	82 - 122	6040855	04/06/06 08:48
Methyl tert-Butyl Ether	50.0	44.6		ug/L	89%	65 - 144	6040855	04/06/06 08:48
Naphthalene	50.0	63.6		ug/L	127%	64 - 144	6040855	04/06/06 08:48
Toluene	50.0	52.6		ug/L	105%	80 - 120	6040855	04/06/06 08:48
Xylenes, total	150	154		ug/L	103%	81 - 125	6040855	04/06/06 08:48
Surrogate: 1,2-Dichloroethane-d4	50.0	44.6			89%	70 - 130	6040855	04/06/06 08:48
Surrogate: Dibromofluoromethane	50.0	46.1			92%	79 - 122	6040855	04/06/06 08:48
Surrogate: Toluene-d8	50.0	57.5			115%	78 - 121	6040855	04/06/06 08:48
Surrogate: 4-Bromofluorobenzene	50.0	49.8			100%	78 - 126	6040855	04/06/06 08:48

Extractable Petroleum Hydrocarbons

6040871-BS1

Diesel	1000	737		ug/L	74%	56 - 116	6040871	04/06/06 20:15
Surrogate: o-Terphenyl	20.0	21.6			108%	51 - 142	6040871	04/06/06 20:15

Purgeable Petroleum Hydrocarbons

6040987-BS2

GRO as Gasoline	1000	904		ug/L	90%	66 - 132	6040987	04/07/06 03:42
Surrogate: a,a,a-Trifluorotoluene	30.0	27.3			91%	63 - 134	6040987	04/07/06 03:42

Client Acton Mickelson Environmental, Inc. (13785)
 5175 Hillsdale Circle, Suite 100
 El Dorado Hills, CA 95762
 Attn John Shaal

Work Order: NPD0494
 Project Name: Former Portland Terminal #36-001
 Project Number: 13041.05
 Received: 03/28/06 08:45

PROJECT QUALITY CONTROL DATA

Matrix Spike

Analyte	Orig. Val.	MS Val	Q	Units	Spike Conc	% Rec.	Target Range	Batch	Sample Spiked	Analyzed Date/Time
Purgeable Petroleum Hydrocarbons										
6040987-MS1										
GRO as Gasoline	ND	739		ug/L	550	134%	48 - 138	6040987	NPD0090-01	04/07/06 02:04
Surrogate: <i>a,a,a</i> -Trifluorotoluene		30.6		ug/L	30.0	102%	63 - 134	6040987	NPD0090-01	04/07/06 02:04

Client Acton Mickelson Environmental, Inc. (13785)
 5175 Hillsdale Circle, Suite 100
 El Dorado Hills, CA 95762
 Attn John Shaal

Work Order: NPD0494
 Project Name: Former Portland Terminal #36-001
 Project Number: 13041.05
 Received: 03/28/06 08:45

PROJECT QUALITY CONTROL DATA

Matrix Spike Dup

Analyte	Orig. Val.	Duplicate	Q	Units	Spike Conc	% Rec.	Target Range	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
Purgeable Petroleum Hydrocarbons												
6040987-MSD1												
GRO as Gasoline	ND	757		ug/L	550	138%	48 - 138	2	36	6040987	NPD0090-01	04/07/06 02:37
Surrogate: <i>a,a,a</i> -Trifluorotoluene		28.3		ug/L	30.0	94%	63 - 134			6040987	NPD0090-01	04/07/06 02:37

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
EI Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPD0494
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville

Method	Matrix	AIHA	Nelac	Oregon
NA	Water			
NWTPH-Dx	Water	N/A	X	X
NWTPH-Gx	Water	N/A	X	X
SW846 8260B	Water	N/A	X	X

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPD0494
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

NELAC CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville does not hold NELAC certifications for the following analytes included in this report

Method

Matrix

Analyte

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPD0494
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

DATA QUALIFIERS AND DEFINITIONS

H1 Sample analysis performed past the method-specified holding time per client's approval.
QSG Silica Gel clean-up performed on extracts.

METHOD MODIFICATION NOTES



Nashville Division
COOLER RECEIPT FORM



BC#

NPD0494

Cooler Received/Opened On 03/28/2006 @ 10:15

1. Indicate the Airbill Tracking Number (last 4 digits for Fedex only) and Name of Courier below: 1Z1A2587019028
9296

Fed-Ex UPS Velocity DHL Route Off-street Misc.

2. Temperature of representative sample or temperature blank when opened: 4.7 Degrees Celsius
(Indicate IR Gun ID#)

NA A00466 A00750 A01124 100190 101282 Raynger ST
YES...NO...NA

3. Were custody seals on outside of cooler?.....NA

a. If yes, how many and where:.....

4. Were the seals intact, signed, and dated correctly?.....

5. Were custody papers inside cooler?.....PRB

I certify that I opened the cooler and answered questions 1-5 (initial).....

6. Were custody seals on containers: YES NO and Intact

YES NO NA

were these signed, and dated correctly?.....

YES...NO...NA

7. What kind of packing material used? Bubblewrap Peanuts Vermiculite Foam Insert
Plastic bag Paper Other _____ None

8. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

9. Did all containers arrive in good condition (unbroken)?.....YES...NO...NA

10. Were all container labels complete (#, date, signed, pres., etc)?.....YES...NO...NA

11. Did all container labels and tags agree with custody papers?.....YES...NO...NA

12. a. Were VOA vials received?.....YES...NO...NA

b. Was there any observable head space present in any VOA vial?.....NO

I certify that I unloaded the cooler and answered questions 6-12 (initial).....

13. a. On preserved bottles did the pH test strips suggest that preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used?.....YES...NO...NA

If preservation in-house was needed, record standard ID of preservative used here _____

14. Was residual chlorine present?.....YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 13-14 (initial).....

15. Were custody papers properly filled out (ink, signed, etc)?.....YES...NO...NA

16. Did you sign the custody papers in the appropriate place?.....YES...NO...NA

17. Were correct containers used for the analysis requested?.....YES...NO...NA

18. Was sufficient amount of sample sent in each container?.....YES

I certify that I entered this project into LIMS and answered questions 15-18 (initial).....

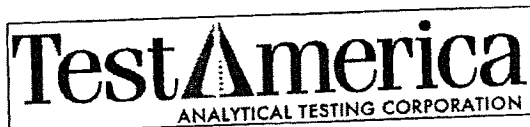
I certify that I attached a label with the unique LIMS number to each container (initial).....

19. Were there Non-Conformance issues at login YES NO Was a PIPE generated YES

BIS = Broken in shipment
Cooler Receipt Form

LF-1
End of Form

Revised 3/9/06



Sample Request From Sample Storage Form

DATE: 4.5.06

CLIENT NAME: Acton

Per John Shaal
4.5.06 @ H36

CLIENT CODE: 13785

SAMPLE ID #: C3486-02

CONTAINER TYPE:

LAG w/HCl, vials w/HCl as many as possible

REQUEST:

Tag and run for NWTPH-Dx,
NWTPH-6x, BTEX /m /Nap by 8260

Level IV required.

Client aware DRO extract
past hold time.

Thanks! Leah R. Klingensmith x1254

Tag as 1 day TAT - Samples go out
of hold 4.7.06
SCOTTREQ. CSF-9

10-11-99

April 06, 2006

Client: Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn: John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Nbr: 13041.05
P/O Nbr:
Date Received: 03/28/06

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
Upper Sewer	NPC3486-01	03/24/06 13:30
Lower outfall	NPC3486-03	03/24/06 14:30
TB-1-032406	NPC3486-04	03/24/06 13:30

An executed copy of the chain of custody, the project quality control data, and the sample receipt form are also included as an addendum to this report. If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-800-765-0980. Any opinions, if expressed, are outside the scope of the Laboratory's accreditation.

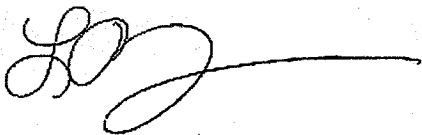
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Oregon Certification Number: TN200001

The Chain(s) of Custody, 2 pages, are included and are an integral part of this report.

These results relate only to the items tested. This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By:



Leah R. Klingensmith
Senior Project Management

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3486-01 (Upper Sewer - Ground Water) Sampled: 03/24/06 13:30								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	03/30/06 06:04	SW846 8260B	6035526
Ethylbenzene	ND		ug/L	1.00	1	03/30/06 06:04	SW846 8260B	6035526
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/30/06 06:04	SW846 8260B	6035526
Naphthalene	ND		ug/L	5.00	1	03/30/06 06:04	SW846 8260B	6035526
Toluene	ND		ug/L	1.00	1	03/30/06 06:04	SW846 8260B	6035526
Xylenes, total	ND		ug/L	3.00	1	03/30/06 06:04	SW846 8260B	6035526
Surr: 1,2-Dichloroethane-d4 (70-130%)	112 %					03/30/06 06:04	SW846 8260B	6035526
Surr: Dibromofluoromethane (79-122%)	110 %					03/30/06 06:04	SW846 8260B	6035526
Surr: Toluene-d8 (78-121%)	107 %					03/30/06 06:04	SW846 8260B	6035526
Surr: 4-Bromofluorobenzene (78-126%)	100 %					03/30/06 06:04	SW846 8260B	6035526
Extractable Petroleum Hydrocarbons								
Diesel	ND	QSG	ug/L	100	1	04/01/06 12:05	NWTPH-Dx	6035386
Motor Oil	142	QSG	ug/L	100	1	04/01/06 12:05	NWTPH-Dx	6035386
Surr: o-Terphenyl (51-142%)	134 %					04/01/06 12:05	NWTPH-Dx	6035386
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	04/03/06 06:07	NWTPH-Gx	6036176
Surr: a,a,a-Trifluorotoluene (63-134%)	77 %					04/03/06 06:07	NWTPH-Gx	6036176
Sample ID: NPC3486-03 (Lower outfall - Ground Water) Sampled: 03/24/06 14:30								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	38.2		ug/L	1.00	1	03/30/06 05:16	SW846 8260B	6035526
Ethylbenzene	3.82		ug/L	1.00	1	03/30/06 05:16	SW846 8260B	6035526
Methyl tert-Butyl Ether	40.3		ug/L	1.00	1	03/30/06 05:16	SW846 8260B	6035526
Naphthalene	ND		ug/L	5.00	1	03/30/06 05:16	SW846 8260B	6035526
Toluene	14.8		ug/L	1.00	1	03/30/06 05:16	SW846 8260B	6035526
Xylenes, total	11.7		ug/L	3.00	1	03/30/06 05:16	SW846 8260B	6035526
Surr: 1,2-Dichloroethane-d4 (70-130%)	113 %					03/30/06 05:16	SW846 8260B	6035526
Surr: Dibromofluoromethane (79-122%)	111 %					03/30/06 05:16	SW846 8260B	6035526
Surr: Toluene-d8 (78-121%)	107 %					03/30/06 05:16	SW846 8260B	6035526
Surr: 4-Bromofluorobenzene (78-126%)	100 %					03/30/06 05:16	SW846 8260B	6035526
Extractable Petroleum Hydrocarbons								
Diesel	235	QSG	ug/L	100	1	04/01/06 12:22	NWTPH-Dx	6035386
Motor Oil	104	QSG	ug/L	100	1	04/01/06 12:22	NWTPH-Dx	6035386
Surr: o-Terphenyl (51-142%)	126 %					04/01/06 12:22	NWTPH-Dx	6035386
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	167		ug/L	100	1	04/01/06 19:08	NWTPH-Gx	6036177
Surr: a,a,a-Trifluorotoluene (63-134%)	83 %					04/01/06 19:08	NWTPH-Gx	6036177

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillside Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3486-04 (TB-1-032406 - Ground Water) Sampled: 03/24/06 13:30								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	03/30/06 04:52	SW846 8260B	6035526
Ethylbenzene	ND		ug/L	1.00	1	03/30/06 04:52	SW846 8260B	6035526
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/30/06 04:52	SW846 8260B	6035526
Naphthalene	ND		ug/L	5.00	1	03/30/06 04:52	SW846 8260B	6035526
Toluene	ND		ug/L	1.00	1	03/30/06 04:52	SW846 8260B	6035526
Xylenes, total	ND		ug/L	3.00	1	03/30/06 04:52	SW846 8260B	6035526
<i>Surr: 1,2-Dichloroethane-d4 (70-130%)</i>	<i>112 %</i>					<i>03/30/06 04:52</i>	<i>SW846 8260B</i>	<i>6035526</i>
<i>Surr: Dibromofluoromethane (79-122%)</i>	<i>111 %</i>					<i>03/30/06 04:52</i>	<i>SW846 8260B</i>	<i>6035526</i>
<i>Surr: Toluene-d8 (78-121%)</i>	<i>107 %</i>					<i>03/30/06 04:52</i>	<i>SW846 8260B</i>	<i>6035526</i>
<i>Surr: 4-Bromofluorobenzene (78-126%)</i>	<i>100 %</i>					<i>03/30/06 04:52</i>	<i>SW846 8260B</i>	<i>6035526</i>
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	04/02/06 11:23	NWTPH-Gx	6036177
<i>Surr: a,a,a-Trifluorotoluene (63-134%)</i>	<i>84 %</i>					<i>04/02/06 11:23</i>	<i>NWTPH-Gx</i>	<i>6036177</i>

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5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

SAMPLE EXTRACTION DATA

Parameter	Batch	Lab Number	Wt/Vol Extracted	Extracted Vol	Date	Analyst	Extraction Method
Extractable Petroleum Hydrocarbons							
NWTPH-Dx	6035386	NPC3486-01	1000.00	1.00	03/29/06 09:00	DAH	EPA 3510C
NWTPH-Dx	6035386	NPC3486-03	1000.00	1.00	03/29/06 09:00	DAH	EPA 3510C

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El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

PROJECT QUALITY CONTROL DATA

Blank

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B						
6035526-BLK1						
Benzene	<0.290		ug/L	6035526	6035526-BLK1	03/30/06 04:28
Ethylbenzene	<0.340		ug/L	6035526	6035526-BLK1	03/30/06 04:28
Methyl tert-Butyl Ether	<0.320		ug/L	6035526	6035526-BLK1	03/30/06 04:28
Naphthalene	<1.13		ug/L	6035526	6035526-BLK1	03/30/06 04:28
Toluene	<0.280		ug/L	6035526	6035526-BLK1	03/30/06 04:28
Xylenes, total	<0.820		ug/L	6035526	6035526-BLK1	03/30/06 04:28
Surrogate: 1,2-Dichloroethane-d4	111%			6035526	6035526-BLK1	03/30/06 04:28
Surrogate: Dibromofluoromethane	111%			6035526	6035526-BLK1	03/30/06 04:28
Surrogate: Toluene-d8	107%			6035526	6035526-BLK1	03/30/06 04:28
Surrogate: 4-Bromofluorobenzene	100%			6035526	6035526-BLK1	03/30/06 04:28
Extractable Petroleum Hydrocarbons						
6035386-BLK2						
Diesel	72.6		ug/L	6035386	6035386-BLK2	04/03/06 22:28
Motor Oil	88.5		ug/L	6035386	6035386-BLK2	04/03/06 22:28
Surrogate: o-Terphenyl	178%	Z2		6035386	6035386-BLK2	04/03/06 22:28
Purgeable Petroleum Hydrocarbons						
6036176-BLK1						
GRO as Gasoline	<40.0		ug/L	6036176	6036176-BLK1	04/02/06 17:53
Surrogate: a,a,a-Trifluorotoluene	77%			6036176	6036176-BLK1	04/02/06 17:53
6036177-BLK1						
GRO as Gasoline	<40.0		ug/L	6036177	6036177-BLK1	04/01/06 16:52
Surrogate: a,a,a-Trifluorotoluene	82%			6036177	6036177-BLK1	04/01/06 16:52

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

PROJECT QUALITY CONTROL DATA LCS

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B								
6035526-BS1								
Benzene	50.0	54.2		ug/L	108%	78 - 122	6035526	03/30/06 03:15
Ethylbenzene	50.0	52.4		ug/L	105%	82 - 122	6035526	03/30/06 03:15
Methyl tert-Butyl Ether	50.0	52.8		ug/L	106%	65 - 144	6035526	03/30/06 03:15
Naphthalene	50.0	63.1		ug/L	126%	64 - 144	6035526	03/30/06 03:15
Toluene	50.0	52.4		ug/L	105%	80 - 120	6035526	03/30/06 03:15
Xylenes, total	150	163		ug/L	109%	81 - 125	6035526	03/30/06 03:15
Surrogate: 1,2-Dichloroethane-d4	30.0	33.0			110%	70 - 130	6035526	03/30/06 03:15
Surrogate: Dibromofluoromethane	30.0	33.6			112%	79 - 122	6035526	03/30/06 03:15
Surrogate: Toluene-d8	30.0	32.3			108%	78 - 121	6035526	03/30/06 03:15
Surrogate: 4-Bromofluorobenzene	30.0	30.3			101%	78 - 126	6035526	03/30/06 03:15
Extractable Petroleum Hydrocarbons								
6035386-BS1								
Diesel	1000	848		ug/L	85%	60 - 107	6035386	04/01/06 11:48
Surrogate: o-Terphenyl	20.0	25.2			126%	51 - 142	6035386	04/01/06 11:48
Purgeable Petroleum Hydrocarbons								
6036176-BS1								
GRO as Gasoline	1000	833		ug/L	83%	66 - 132	6036176	04/03/06 07:49
Surrogate: a,a,a-Trifluorotoluene	30.0	23.5			78%	63 - 134	6036176	04/03/06 07:49
6036177-BS1								
GRO as Gasoline	1000	1010		ug/L	101%	66 - 132	6036177	04/02/06 05:19
Surrogate: a,a,a-Trifluorotoluene	30.0	26.7			89%	63 - 134	6036177	04/02/06 05:19

Client Acton Mickelson Environmental, Inc. (13785)
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El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

PROJECT QUALITY CONTROL DATA Matrix Spike

Analyte	Orig. Val.	MS Val	Q	Units	Spike Conc	% Rec.	Target Range	Batch	Sample Spiked	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B										
6035526-MS1										
Benzene	38.2	96.0		ug/L	50.0	116%	74 - 133	6035526	NPC3486-03	03/30/06 12:56
Ethylbenzene	3.82	60.7		ug/L	50.0	114%	74 - 134	6035526	NPC3486-03	03/30/06 12:56
Methyl tert-Butyl Ether	40.3	97.6		ug/L	50.0	115%	58 - 151	6035526	NPC3486-03	03/30/06 12:56
Naphthalene	1.02	55.2		ug/L	50.0	108%	47 - 154	6035526	NPC3486-03	03/30/06 12:56
Toluene	14.8	72.0		ug/L	50.0	114%	73 - 133	6035526	NPC3486-03	03/30/06 12:56
Xylenes, total	11.7	186		ug/L	150	116%	68 - 139	6035526	NPC3486-03	03/30/06 12:56
Surrogate: 1,2-Dichloroethane-d4		33.8		ug/L	30.0	113%	70 - 130	6035526	NPC3486-03	03/30/06 12:56
Surrogate: Dibromofluoromethane		33.8		ug/L	30.0	113%	79 - 122	6035526	NPC3486-03	03/30/06 12:56
Surrogate: Toluene-d8		32.4		ug/L	30.0	108%	78 - 121	6035526	NPC3486-03	03/30/06 12:56
Surrogate: 4-Bromofluorobenzene		30.2		ug/L	30.0	101%	78 - 126	6035526	NPC3486-03	03/30/06 12:56
Purgeable Petroleum Hydrocarbons										
6036176-MS1										
GRO as Gasoline	ND	847		ug/L	1000	85%	48 - 138	6036176	NPC3128-01	04/03/06 06:41
Surrogate: a,a,a-Trifluorotoluene		26.8		ug/L	30.0	89%	63 - 134	6036176	NPC3128-01	04/03/06 06:41
6036177-MS1										
GRO as Gasoline	167	1160		ug/L	1000	99%	48 - 138	6036177	NPC3486-03	04/02/06 04:11
Surrogate: a,a,a-Trifluorotoluene		27.5		ug/L	30.0	92%	63 - 134	6036177	NPC3486-03	04/02/06 04:11

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

PROJECT QUALITY CONTROL DATA

Matrix Spike Dup

Analyte	Orig. Val.	Duplicate	Q	Units	Spike Conc	% Rec.	Target Range	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B												
6035526-MSD1												
Benzene	38.2	94.7		ug/L	50.0	113%	74 - 133	1	19	6035526	NPC3486-03	03/30/06 13:21
Ethylbenzene	3.82	57.5		ug/L	50.0	107%	74 - 134	5	21	6035526	NPC3486-03	03/30/06 13:21
Methyl tert-Butyl Ether	40.3	99.1		ug/L	50.0	118%	58 - 151	2	28	6035526	NPC3486-03	03/30/06 13:21
Naphthalene	1.02	66.0		ug/L	50.0	130%	47 - 154	18	43	6035526	NPC3486-03	03/30/06 13:21
Toluene	14.8	69.4		ug/L	50.0	109%	73 - 133	4	20	6035526	NPC3486-03	03/30/06 13:21
Xylenes, total	11.7	178		ug/L	150	111%	68 - 139	4	23	6035526	NPC3486-03	03/30/06 13:21
Surrogate: 1,2-Dichloroethane-d4		33.6		ug/L	30.0	112%	70 - 130			6035526	NPC3486-03	03/30/06 13:21
Surrogate: Dibromofluoromethane		33.9		ug/L	30.0	113%	79 - 122			6035526	NPC3486-03	03/30/06 13:21
Surrogate: Toluene-d8		32.4		ug/L	30.0	108%	78 - 121			6035526	NPC3486-03	03/30/06 13:21
Surrogate: 4-Bromofluorobenzene		30.0		ug/L	30.0	100%	78 - 126			6035526	NPC3486-03	03/30/06 13:21
Purgeable Petroleum Hydrocarbons												
6036176-MSD1												
GRO as Gasoline	ND	929		ug/L	1000	93%	48 - 138	9	36	6036176	NPC3128-01	04/03/06 07:15
Surrogate: a,a,a-Trifluorotoluene		26.9		ug/L	30.0	90%	63 - 134			6036176	NPC3128-01	04/03/06 07:15
6036177-MSD1												
GRO as Gasoline	167	1180		ug/L	1000	101%	48 - 138	2	36	6036177	NPC3486-03	04/02/06 04:45
Surrogate: a,a,a-Trifluorotoluene		27.4		ug/L	30.0	91%	63 - 134			6036177	NPC3486-03	04/02/06 04:45

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville

Method	Matrix	AIHA	Nelac	Oregon
NA	Water			
NWTPH-Dx	Water	N/A	X	X
NWTPH-Gx	Water	N/A	X	X
SW846 8260B	Water	N/A	X	X

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

NELAC CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville does not hold NELAC certifications for the following analytes included in this report

Method

Matrix

Analyte

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3486
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/28/06 08:45

DATA QUALIFIERS AND DEFINITIONS

QSG Silica Gel clean-up performed on extracts.
Z2 Surrogate recovery was above the acceptance limits. Data not impacted.

METHOD MODIFICATION NOTES



Nashville Division
COOLER RECEIPT FORM

BC#



NPC3486

Cooler Received/Opened On 03/28/2006 @ 10:15

1. Indicate the Airbill Tracking Number (last 4 digits for Fedex only) and Name of Courier below: 1Z1A2587019028
9296

Fed-Ex UPS Velocity DHL Route Off-street Misc.

2. Temperature of representative sample or temperature blank when opened: 4.7 Degrees Celsius
(indicate IR Gun ID#)

NA A00466 A00750 A01124 100190 101282 Kaynger ST
YES...NO...NA

3. Were custody seals on outside of cooler?.....NA

a. If yes, how many and where:.....

4. Were the seals intact, signed, and dated correctly?.....

5. Were custody papers inside cooler?.....

I certify that I opened the cooler and answered questions 1-5 (initial).....

6. Were custody seals on containers: YES NO and Intact

were these signed, and dated correctly?.....

7. What kind of packing material used? Bubblewrap Peanuts Vermiculite Foam Insert

Plastic bag Paper Other _____ None

8. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

9. Did all containers arrive in good condition (unbroken)?.....

10. Were all container labels complete (#, date, signed, pres., etc)?.....

11. Did all container labels and tags agree with custody papers?.....

12. a. Were VOA vials received?.....

b. Was there any observable head space present in any VOA vial?.....

I certify that I unloaded the cooler and answered questions 6-12 (initial).....

13. a. On preserved bottles did the pH test strips suggest that preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used?.....

If preservation in-house was needed, record standard ID of preservative used here _____

14. Was residual chlorine present?.....

I certify that I checked for chlorine and pH as per SOP and answered questions 13-14 (initial).....

15. Were custody papers properly filled out (ink, signed, etc)?.....

16. Did you sign the custody papers in the appropriate place?.....

17. Were correct containers used for the analysis requested?.....

18. Was sufficient amount of sample sent in each container?.....

I certify that I entered this project into LIMS and answered questions 15-18 (initial).....

I certify that I attached a label with the unique LIMS number to each container (initial).....

19. Were there Non-Conformance issues at login YES NO Was a PIPE generated YES NO # _____

BIS = Broken in shipment
Cooler Receipt Form

LF-1
End of Form

Revised 3/9/06

PINK - Originator

April 04, 2006

Client: Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn: John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Nbr: 13041.05
P/O Nbr:
Date Received: 03/23/06

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
KMW35-032106	NPC3028-01	03/21/06 09:25
KMW07-032106	NPC3028-02	03/21/06 10:00
KMW14-032106	NPC3028-03	03/21/06 11:55
MW38-032106	NPC3028-04	03/21/06 13:25
KMW13-032106	NPC3028-05	03/21/06 13:50
MW39-032106	NPC3028-06	03/21/06 14:20
DUPE-1-032106	NPC3028-07	03/21/06 00:01
TB-2-032106	NPC3028-08	03/21/06 08:35
MW40-032106	NPC3028-09	03/21/06 15:00
W16-032106	NPC3028-10	03/21/06 15:45

An executed copy of the chain of custody, the project quality control data, and the sample receipt form are also included as an addendum to this report. If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-800-765-0980. Any opinions, if expressed, are outside the scope of the Laboratory's accreditation.

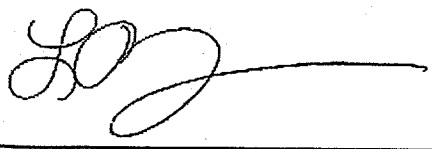
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Oregon Certification Number: TN200001

The Chain(s) of Custody, 4 pages, are included and are an integral part of this report.

These results relate only to the items tested. This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By:



Leah R. Klingensmith
Senior Project Management

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3028-01 (KMW35-032106 - Ground Water) Sampled: 03/21/06 09:25								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	03/25/06 11:05	SW846 8260B	6034573
Ethylbenzene	1.95		ug/L	1.00	1	03/25/06 11:05	SW846 8260B	6034573
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/25/06 11:05	SW846 8260B	6034573
Naphthalene	16.4		ug/L	5.00	1	03/25/06 11:05	SW846 8260B	6034573
Toluene	ND		ug/L	1.00	1	03/25/06 11:05	SW846 8260B	6034573
Xylenes, total	ND		ug/L	3.00	1	03/25/06 11:05	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	113 %					03/25/06 11:05	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	117 %					03/25/06 11:05	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	120 %					03/25/06 11:05	SW846 8260B	6034573
Surr: 4-Bromofluorobenzene (78-126%)	93 %					03/25/06 11:05	SW846 8260B	6034573
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	588		ug/L	100	1	03/31/06 20:58	NWTPH-Gx	6036047
Surr: a,a,a-Trifluorotoluene (63-134%)	80 %					03/31/06 20:58	NWTPH-Gx	6036047
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00388		mg/l	0.00100	1	03/25/06 05:52	EPA 6020	6031109
Copper	0.00897		mg/l	0.00200	1	03/24/06 21:00	EPA 6020	6031109
Lead	0.00215		mg/l	0.00100	1	03/25/06 05:52	EPA 6020	6031109
Zinc	0.0102		mg/l	0.00500	1	03/24/06 21:00	EPA 6020	6031109
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00412		mg/l	0.00100	1	03/27/06 19:44	EPA 6020	6031209
Copper	0.00232		mg/l	0.00200	1	03/27/06 19:44	EPA 6020	6031209
Lead	0.00170		mg/l	0.00100	1	03/27/06 19:44	EPA 6020	6031209
Zinc	0.0122		mg/l	0.00500	1	03/27/06 19:44	EPA 6020	6031209
Sample ID: NPC3028-02 (KMW07-032106 - Water) Sampled: 03/21/06 10:00								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	03/25/06 15:57	SW846 8260B	6034573
Ethylbenzene	ND		ug/L	1.00	1	03/25/06 15:57	SW846 8260B	6034573
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/25/06 15:57	SW846 8260B	6034573
Naphthalene	ND		ug/L	5.00	1	03/25/06 15:57	SW846 8260B	6034573
Toluene	ND		ug/L	1.00	1	03/25/06 15:57	SW846 8260B	6034573
Xylenes, total	ND		ug/L	3.00	1	03/25/06 15:57	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	101 %					03/25/06 15:57	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	111 %					03/25/06 15:57	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	119 %					03/25/06 15:57	SW846 8260B	6034573
Surr: 4-Bromofluorobenzene (78-126%)	104 %					03/25/06 15:57	SW846 8260B	6034573
Extractable Petroleum Hydrocarbons								
Diesel	2830	QSG	ug/L	101	1	03/29/06 02:06	NWTPH-Dx	6034543
Motor Oil	255	QSG	ug/L	101	1	03/29/06 02:06	NWTPH-Dx	6034543
Surr: o-Terphenyl (51-142%)	27 %	Z				03/29/06 02:06	NWTPH-Dx	6034543
Purgeable Petroleum Hydrocarbons								
RO as Gasoline	ND		ug/L	100	1	03/31/06 21:32	NWTPH-Gx	6036047

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3028-02RE1 (KMW07-032106 - Water) - cont. Sampled: 03/21/06 10:00								
Purgeable Petroleum Hydrocarbons - cont.								
Surr: <i>a,a,a</i> -Trifluorotoluene (63-134%)	82 %					03/31/06 21:32	NWTPH-Gx	6036047
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/25/06 06:00	EPA 6020	6031109
Copper	0.00568		mg/l	0.00200	1	03/24/06 21:08	EPA 6020	6031109
Lead	ND		mg/l	0.00100	1	03/25/06 06:00	EPA 6020	6031109
Zinc	0.0112		mg/l	0.00500	1	03/24/06 21:08	EPA 6020	6031109
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/27/06 19:52	EPA 6020	6031209
Copper	0.00887		mg/l	0.00200	1	03/27/06 19:52	EPA 6020	6031209
Lead	ND		mg/l	0.00100	1	03/27/06 19:52	EPA 6020	6031209
Zinc	0.0159		mg/l	0.00500	1	03/27/06 19:52	EPA 6020	6031209
Sample ID: NPC3028-03 (KMW14-032106 - Water) Sampled: 03/21/06 11:55								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	19.3		ug/L	1.00	1	03/25/06 11:50	SW846 8260B	6034573
Ethylbenzene	ND		ug/L	1.00	1	03/25/06 11:50	SW846 8260B	6034573
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/25/06 11:50	SW846 8260B	6034573
Naphthalene	ND		ug/L	5.00	1	03/25/06 11:50	SW846 8260B	6034573
Toluene	ND		ug/L	1.00	1	03/25/06 11:50	SW846 8260B	6034573
Xylenes, total	ND		ug/L	3.00	1	03/25/06 11:50	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	111 %					03/25/06 11:50	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	114 %					03/25/06 11:50	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	117 %					03/25/06 11:50	SW846 8260B	6034573
Surr: 4-Bromofluorobenzene (78-126%)	103 %					03/25/06 11:50	SW846 8260B	6034573
Extractable Petroleum Hydrocarbons								
Diesel	ND	QSG	ug/L	101	1	03/29/06 02:26	NWTPH-Dx	6034543
Motor Oil	174	QSG	ug/L	101	1	03/29/06 02:26	NWTPH-Dx	6034543
Surr: <i>o</i> -Terphenyl (51-142%)	68 %					03/29/06 02:26	NWTPH-Dx	6034543
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	337		ug/L	100	1	03/31/06 22:06	NWTPH-Gx	6036047
Surr: <i>a,a,a</i> -Trifluorotoluene (63-134%)	100 %					03/31/06 22:06	NWTPH-Gx	6036047
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/25/06 06:08	EPA 6020	6031109
Copper	0.00442		mg/l	0.00200	1	03/24/06 21:31	EPA 6020	6031109
Lead	ND		mg/l	0.00100	1	03/25/06 06:08	EPA 6020	6031109
Zinc	0.0222		mg/l	0.00500	1	03/24/06 21:31	EPA 6020	6031109
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00115		mg/l	0.00100	1	03/27/06 19:59	EPA 6020	6031209
Copper	ND		mg/l	0.00200	1	03/27/06 19:59	EPA 6020	6031209
Lead	ND		mg/l	0.00100	1	03/27/06 19:59	EPA 6020	6031209
Zinc	ND		mg/l	0.00500	1	03/27/06 19:59	EPA 6020	6031209

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3028-04 (MW38-032106 - Water) Sampled: 03/21/06 13:25								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	263		ug/L	5.00	5	03/25/06 17:50	SW846 8260B	6034573
Ethylbenzene	3.88		ug/L	1.00	1	03/25/06 17:27	SW846 8260B	6034573
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/25/06 17:27	SW846 8260B	6034573
Naphthalene	ND		ug/L	5.00	1	03/25/06 17:27	SW846 8260B	6034573
Toluene	3.63		ug/L	1.00	1	03/25/06 17:27	SW846 8260B	6034573
Xylenes, total	7.62		ug/L	3.00	1	03/25/06 17:27	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	107 %					03/25/06 17:27	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	112 %					03/25/06 17:27	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	120 %					03/25/06 17:27	SW846 8260B	6034573
Surr: 4-Bromofluorobenzene (78-126%)	100 %					03/25/06 17:27	SW846 8260B	6034573
Extractable Petroleum Hydrocarbons								
Diesel	934	QSG	ug/L	99.5	1	03/29/06 02:47	NWTPH-Dx	6034543
Motor Oil	185	QSG	ug/L	99.5	1	03/29/06 02:47	NWTPH-Dx	6034543
Surr: o-Terphenyl (51-142%)	80 %					03/29/06 02:47	NWTPH-Dx	6034543
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	1300		ug/L	100	1	04/01/06 00:42	NWTPH-Gx	6036047
Surr: a,a,a-Trifluorotoluene (63-134%)	67 %					04/01/06 00:42	NWTPH-Gx	6036047
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.0123		mg/l	0.00100	1	03/27/06 13:46	EPA 6020	6031109
Copper	ND		mg/l	0.00200	1	03/24/06 21:38	EPA 6020	6031109
Lead	ND		mg/l	0.00100	1	03/27/06 13:46	EPA 6020	6031109
Zinc	ND		mg/l	0.00500	1	03/24/06 21:38	EPA 6020	6031109
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.0118		mg/l	0.00100	1	03/27/06 20:07	EPA 6020	6031209
Copper	ND		mg/l	0.00200	1	03/27/06 20:07	EPA 6020	6031209
Lead	ND		mg/l	0.00100	1	03/27/06 20:07	EPA 6020	6031209
Zinc	ND		mg/l	0.00500	1	03/27/06 20:07	EPA 6020	6031209

Sample ID: NPC3028-05RE1 (KMW13-032106 - Water) Sampled: 03/21/06 13:50

Selected Volatile Organic Compounds by EPA Method 8260B

Benzene	555		ug/L	10.0	10	03/25/06 18:12	SW846 8260B	6034573
Ethylbenzene	282		ug/L	10.0	10	03/25/06 18:12	SW846 8260B	6034573
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/25/06 12:35	SW846 8260B	6034573
Naphthalene	85.7		ug/L	5.00	1	03/25/06 12:35	SW846 8260B	6034573
Toluene	197		ug/L	1.00	1	03/25/06 12:35	SW846 8260B	6034573
Xylenes, total	1650		ug/L	30.0	10	03/25/06 18:12	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	108 %					03/25/06 12:35	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	107 %					03/25/06 18:12	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	113 %					03/25/06 12:35	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	111 %					03/25/06 18:12	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	116 %					03/25/06 12:35	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	117 %					03/25/06 18:12	SW846 8260B	6034573
Surr: 4-Bromofluorobenzene (78-126%)	95 %					03/25/06 12:35	SW846 8260B	6034573

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3028-05RE1 (KMW13-032106 - Water) - cont. Sampled: 03/21/06 13:50								
Selected Volatile Organic Compounds by EPA Method 8260B - cont.								
Surr: 4-Bromofluorobenzene (78-126%)	99 %					03/25/06 18:12	SW846 8260B	6034573
Extractable Petroleum Hydrocarbons								
Diesel	1270	QSG	ug/L	100	1	03/29/06 03:47	NWTPH-Dx	6034543
Motor Oil	ND	QSG	ug/L	100	1	03/29/06 03:47	NWTPH-Dx	6034543
Surr: o-Terphenyl (51-142%)	85 %					03/29/06 03:47	NWTPH-Dx	6034543
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	8530		ug/L	500	5	04/01/06 01:16	NWTPH-Gx	6036047
Surr: a,a,a-Trifluorotoluene (63-134%)	102 %					04/01/06 01:16	NWTPH-Gx	6036047
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00971		mg/l	0.00100	1	03/27/06 13:53	EPA 6020	6031109
Copper	0.00365		mg/l	0.00200	1	03/24/06 21:46	EPA 6020	6031109
Lead	0.00477		mg/l	0.00100	1	03/27/06 13:53	EPA 6020	6031109
Zinc	0.0291		mg/l	0.00500	1	03/24/06 21:46	EPA 6020	6031109
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00914		mg/l	0.00100	1	03/27/06 20:14	EPA 6020	6031209
Copper	ND		mg/l	0.00200	1	03/27/06 20:14	EPA 6020	6031209
Lead	ND		mg/l	0.00100	1	03/27/06 20:14	EPA 6020	6031209
Zinc	ND		mg/l	0.00500	1	03/27/06 20:14	EPA 6020	6031209
Sample ID: NPC3028-06RE1 (MW39-032106 - Water) Sampled: 03/21/06 14:20								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	25500		ug/L	200	200	03/28/06 08:18	SW846 8260B	6035388
Ethylbenzene	2590		ug/L	200	200	03/28/06 08:18	SW846 8260B	6035388
Methyl tert-Butyl Ether	873		ug/L	10.0	10	03/25/06 22:19	SW846 8260B	6034849
Naphthalene	292		ug/L	50.0	10	03/25/06 22:19	SW846 8260B	6034849
Toluene	1800		ug/L	10.0	10	03/25/06 22:19	SW846 8260B	6034849
Xylenes, total	7950		ug/L	600	200	03/28/06 08:18	SW846 8260B	6035388
Surr: 1,2-Dichloroethane-d4 (70-130%)	104 %					03/25/06 22:19	SW846 8260B	6034849
Surr: 1,2-Dichloroethane-d4 (70-130%)	112 %					03/28/06 08:18	SW846 8260B	6035388
Surr: Dibromofluoromethane (79-122%)	110 %					03/25/06 22:19	SW846 8260B	6034849
Surr: Dibromofluoromethane (79-122%)	110 %					03/28/06 08:18	SW846 8260B	6035388
Surr: Toluene-d8 (78-121%)	121 %					03/25/06 22:19	SW846 8260B	6034849
Surr: Toluene-d8 (78-121%)	106 %					03/28/06 08:18	SW846 8260B	6035388
Surr: 4-Bromofluorobenzene (78-126%)	97 %					03/25/06 22:19	SW846 8260B	6034849
Surr: 4-Bromofluorobenzene (78-126%)	103 %					03/28/06 08:18	SW846 8260B	6035388
Extractable Petroleum Hydrocarbons								
Diesel	9480	QSG	ug/L	503	5	03/29/06 08:30	NWTPH-Dx	6034543
Motor Oil	ND	QSG	ug/L	503	5	03/29/06 08:30	NWTPH-Dx	6034543
Surr: o-Terphenyl (51-142%)	42 %	Z				03/29/06 08:30	NWTPH-Dx	6034543
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	82500		ug/L	5000	50	04/01/06 01:50	NWTPH-Gx	6036047
Surr: a,a,a-Trifluorotoluene (63-134%)	77 %					04/01/06 01:50	NWTPH-Gx	6036047

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3028-06RE1 (MW39-032106 - Water) - cont. Sampled: 03/21/06 14:20								
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.0593		mg/l	0.00100	1	03/27/06 14:01	EPA 6020	6031109
Copper	ND		mg/l	0.00200	1	03/24/06 21:54	EPA 6020	6031109
Lead	ND		mg/l	0.00100	1	03/27/06 14:01	EPA 6020	6031109
Zinc	ND		mg/l	0.00500	1	03/24/06 21:54	EPA 6020	6031109
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.0582		mg/l	0.00100	1	03/27/06 20:22	EPA 6020	6031209
Copper	ND		mg/l	0.00200	1	03/27/06 20:22	EPA 6020	6031209
Lead	ND		mg/l	0.00100	1	03/27/06 20:22	EPA 6020	6031209
Zinc	ND		mg/l	0.00500	1	03/27/06 20:22	EPA 6020	6031209
Sample ID: NPC3028-07 (DUPE-1-032106 - Water) Sampled: 03/21/06 00:01								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	1.24		ug/L	1.00	1	03/25/06 16:20	SW846 8260B	6034573
Ethylbenzene	ND		ug/L	1.00	1	03/25/06 16:20	SW846 8260B	6034573
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/25/06 16:20	SW846 8260B	6034573
Naphthalene	ND		ug/L	5.00	1	03/25/06 16:20	SW846 8260B	6034573
Toluene	ND		ug/L	1.00	1	03/25/06 16:20	SW846 8260B	6034573
Xylenes, total	ND		ug/L	3.00	1	03/25/06 16:20	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	106 %					03/25/06 16:20	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	113 %					03/25/06 16:20	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	118 %					03/25/06 16:20	SW846 8260B	6034573
Surr: 4-Bromofluorobenzene (78-126%)	105 %					03/25/06 16:20	SW846 8260B	6034573
Extractable Petroleum Hydrocarbons								
Diesel	2100	QSG	ug/L	102	1	03/29/06 04:26	NWTPH-Dx	6034543
Motor Oil	308	QSG	ug/L	102	1	03/29/06 04:26	NWTPH-Dx	6034543
Surr: o-Terphenyl (51-142%)	31 %	Z				03/29/06 04:26	NWTPH-Dx	6034543
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	127		ug/L	100	1	04/01/06 14:15	NWTPH-Gx	6040085
Surr: a,a,a-Trifluorotoluene (63-134%)	86 %					04/01/06 14:15	NWTPH-Gx	6040085
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00133		mg/l	0.00100	1	03/27/06 15:17	EPA 6020	6031109
Copper	0.00618		mg/l	0.00200	1	03/24/06 23:17	EPA 6020	6031109
Lead	ND		mg/l	0.00100	1	03/27/06 15:17	EPA 6020	6031109
Zinc	0.0101		mg/l	0.00500	1	03/24/06 23:17	EPA 6020	6031109
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/28/06 23:54	EPA 6020	6031209
Copper	0.00711		mg/l	0.00200	1	03/28/06 23:54	EPA 6020	6031209
Lead	ND		mg/l	0.00100	1	03/28/06 23:54	EPA 6020	6031209
Zinc	0.0124		mg/l	0.00500	1	03/28/06 23:54	EPA 6020	6031209

Sample ID: NPC3028-08 (TB-2-032106 - Water) Sampled: 03/21/06 08:35

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3028-08 (TB-2-032106 - Water) - cont. Sampled: 03/21/06 08:35								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	03/25/06 10:20	SW846 8260B	6034573
Ethylbenzene	ND		ug/L	1.00	1	03/25/06 10:20	SW846 8260B	6034573
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/25/06 10:20	SW846 8260B	6034573
Naphthalene	ND		ug/L	5.00	1	03/25/06 10:20	SW846 8260B	6034573
Toluene	ND		ug/L	1.00	1	03/25/06 10:20	SW846 8260B	6034573
Xylenes, total	ND		ug/L	3.00	1	03/25/06 10:20	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	114 %					03/25/06 10:20	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	117 %					03/25/06 10:20	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	124 %	Z10				03/25/06 10:20	SW846 8260B	6034573
Surr: 4-Bromofluorobenzene (78-126%)	104 %					03/25/06 10:20	SW846 8260B	6034573
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	03/31/06 19:49	NWTPH-Gx	6036047
Surr: a,a,a-Trifluorotoluene (63-134%)	83 %					03/31/06 19:49	NWTPH-Gx	6036047
Sample ID: NPC3028-09 (MW40-032106 - Water) Sampled: 03/21/06 15:00								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	148		ug/L	1.00	1	03/25/06 17:05	SW846 8260B	6034573
Ethylbenzene	ND		ug/L	1.00	1	03/25/06 17:05	SW846 8260B	6034573
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/25/06 17:05	SW846 8260B	6034573
Naphthalene	5.70		ug/L	5.00	1	03/25/06 17:05	SW846 8260B	6034573
Toluene	ND		ug/L	1.00	1	03/25/06 17:05	SW846 8260B	6034573
Xylenes, total	9.80		ug/L	3.00	1	03/25/06 17:05	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	107 %					03/25/06 17:05	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	113 %					03/25/06 17:05	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	123 %	Z10				03/25/06 17:05	SW846 8260B	6034573
Surr: 4-Bromofluorobenzene (78-126%)	103 %					03/25/06 17:05	SW846 8260B	6034573
Extractable Petroleum Hydrocarbons								
Diesel	102	QSG	ug/L	98.0	1	03/29/06 04:46	NWTPH-Dx	6034543
Motor Oil	ND	QSG	ug/L	98.0	1	03/29/06 04:46	NWTPH-Dx	6034543
Surr: o-Terphenyl (51-142%)	67 %					03/29/06 04:46	NWTPH-Dx	6034543
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	405		ug/L	100	1	04/01/06 02:58	NWTPH-Gx	6036047
Surr: a,a,a-Trifluorotoluene (63-134%)	75 %					04/01/06 02:58	NWTPH-Gx	6036047
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/27/06 14:09	EPA 6020	6031109
Copper	ND		mg/l	0.00200	1	03/24/06 22:01	EPA 6020	6031109
Lead	ND		mg/l	0.00100	1	03/27/06 14:09	EPA 6020	6031109
Zinc	ND		mg/l	0.00500	1	03/24/06 22:01	EPA 6020	6031109
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/27/06 20:30	EPA 6020	6031209
Copper	ND		mg/l	0.00200	1	03/27/06 20:30	EPA 6020	6031209
Lead	ND		mg/l	0.00100	1	03/27/06 20:30	EPA 6020	6031209

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3028-09 (MW40-032106 - Water) - cont. Sampled: 03/21/06 15:00								
Dissolved Metals per EPA 6000/7000 Series Methods - cont.								
Zinc	ND		mg/l	0.00500	1	03/27/06 20:30	EPA 6020	6031209
Sample ID: NPC3028-10 (W16-032106 - Water) Sampled: 03/21/06 15:45								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	11.6		ug/L	1.00	1	03/25/06 16:42	SW846 8260B	6034573
Ethylbenzene	ND		ug/L	1.00	1	03/25/06 16:42	SW846 8260B	6034573
Methyl tert-Butyl Ether	3.01		ug/L	1.00	1	03/25/06 16:42	SW846 8260B	6034573
Naphthalene	ND		ug/L	5.00	1	03/25/06 16:42	SW846 8260B	6034573
Toluene	ND		ug/L	1.00	1	03/25/06 16:42	SW846 8260B	6034573
Xylenes, total	ND		ug/L	3.00	1	03/25/06 16:42	SW846 8260B	6034573
Surr: 1,2-Dichloroethane-d4 (70-130%)	109 %					03/25/06 16:42	SW846 8260B	6034573
Surr: Dibromofluoromethane (79-122%)	115 %					03/25/06 16:42	SW846 8260B	6034573
Surr: Toluene-d8 (78-121%)	122 %	Z10				03/25/06 16:42	SW846 8260B	6034573
Surr: 4-Bromofluorobenzene (78-126%)	96 %					03/25/06 16:42	SW846 8260B	6034573
Extractable Petroleum Hydrocarbons								
Diesel	7620	QSG	ug/L	485	5	03/29/06 08:50	NWTPH-Dx	6034543
Motor Oil	1120	QSG	ug/L	485	5	03/29/06 08:50	NWTPH-Dx	6034543
Surr: o-Terphenyl (51-142%)	40 %	Z				03/29/06 08:50	NWTPH-Dx	6034543
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	600		ug/L	100	1	04/01/06 03:32	NWTPH-Gx	6036047
Surr: a,a,a-Trifluorotoluene (63-134%)	81 %					04/01/06 03:32	NWTPH-Gx	6036047
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.0298		mg/l	0.00100	1	03/27/06 14:39	EPA 6020	6031109
Copper	0.00632		mg/l	0.00200	1	03/24/06 22:39	EPA 6020	6031109
Lead	0.00363		mg/l	0.00100	1	03/27/06 14:39	EPA 6020	6031109
Zinc	0.0203		mg/l	0.00500	1	03/24/06 22:39	EPA 6020	6031109
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.0277		mg/l	0.00100	1	03/28/06 23:16	EPA 6020	6031209
Copper	ND		mg/l	0.00200	1	03/28/06 23:16	EPA 6020	6031209
Lead	0.00233		mg/l	0.00100	1	03/28/06 23:16	EPA 6020	6031209
Zinc	ND		mg/l	0.00500	1	03/28/06 23:16	EPA 6020	6031209

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Work Order: NPC3028
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 Received: 03/23/06 09:00

SAMPLE EXTRACTION DATA

Parameter	Batch	Lab Number	Wt/Vol Extracted	Extracted Vol	Date	Analyst	Extraction Method
Extractable Petroleum Hydrocarbons							
NWTPH-Dx	6034543	NPC3028-02	990.00	1.00	03/24/06 12:15	DAP	EPA 3510C
NWTPH-Dx	6034543	NPC3028-03	995.00	1.00	03/24/06 12:15	DAP	EPA 3510C
NWTPH-Dx	6034543	NPC3028-04	1005.00	1.00	03/24/06 12:15	DAP	EPA 3510C
NWTPH-Dx	6034543	NPC3028-05	1000.00	1.00	03/24/06 12:15	DAP	EPA 3510C
NWTPH-Dx	6034543	NPC3028-06	995.00	1.00	03/24/06 12:15	DAP	EPA 3510C
NWTPH-Dx	6034543	NPC3028-06RE1	995.00	1.00	03/24/06 12:15	DAP	EPA 3510C
NWTPH-Dx	6034543	NPC3028-07	985.00	1.00	03/24/06 12:15	DAP	EPA 3510C
NWTPH-Dx	6034543	NPC3028-09	1020.00	1.00	03/24/06 12:15	DAP	EPA 3510C
NWTPH-Dx	6034543	NPC3028-10	1030.00	1.00	03/24/06 12:15	DAP	EPA 3510C
NWTPH-Dx	6034543	NPC3028-10RE1	1030.00	1.00	03/24/06 12:15	DAP	EPA 3510C

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Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
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Received: 03/23/06 09:00

PROJECT QUALITY CONTROL DATA

Blank

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B						
6034573-BLK1						
Benzene	<0.290		ug/L	6034573	6034573-BLK1	03/25/06 09:58
Ethylbenzene	<0.340		ug/L	6034573	6034573-BLK1	03/25/06 09:58
Methyl tert-Butyl Ether	<0.320		ug/L	6034573	6034573-BLK1	03/25/06 09:58
Naphthalene	<1.13		ug/L	6034573	6034573-BLK1	03/25/06 09:58
Toluene	<0.280		ug/L	6034573	6034573-BLK1	03/25/06 09:58
Xylenes, total	<0.820		ug/L	6034573	6034573-BLK1	03/25/06 09:58
Surrogate: 1,2-Dichloroethane-d4	113%			6034573	6034573-BLK1	03/25/06 09:58
Surrogate: Dibromofluoromethane	116%			6034573	6034573-BLK1	03/25/06 09:58
Surrogate: Toluene-d8	126%	Z10		6034573	6034573-BLK1	03/25/06 09:58
Surrogate: 4-Bromofluorobenzene	106%			6034573	6034573-BLK1	03/25/06 09:58
6034849-BLK1						
Benzene	<0.290		ug/L	6034849	6034849-BLK1	03/25/06 21:34
Ethylbenzene	<0.340		ug/L	6034849	6034849-BLK1	03/25/06 21:34
Methyl tert-Butyl Ether	<0.320		ug/L	6034849	6034849-BLK1	03/25/06 21:34
Naphthalene	<1.13		ug/L	6034849	6034849-BLK1	03/25/06 21:34
Toluene	<0.280		ug/L	6034849	6034849-BLK1	03/25/06 21:34
Xylenes, total	<0.820		ug/L	6034849	6034849-BLK1	03/25/06 21:34
Surrogate: 1,2-Dichloroethane-d4	109%			6034849	6034849-BLK1	03/25/06 21:34
Surrogate: Dibromofluoromethane	113%			6034849	6034849-BLK1	03/25/06 21:34
Surrogate: Toluene-d8	123%	Z10		6034849	6034849-BLK1	03/25/06 21:34
Surrogate: 4-Bromofluorobenzene	104%			6034849	6034849-BLK1	03/25/06 21:34
6035388-BLK1						
Benzene	<0.290		ug/L	6035388	6035388-BLK1	03/28/06 05:40
Ethylbenzene	<0.340		ug/L	6035388	6035388-BLK1	03/28/06 05:40
Methyl tert-Butyl Ether	<0.320		ug/L	6035388	6035388-BLK1	03/28/06 05:40
Naphthalene	<1.13		ug/L	6035388	6035388-BLK1	03/28/06 05:40
Toluene	<0.280		ug/L	6035388	6035388-BLK1	03/28/06 05:40
Xylenes, total	<0.820		ug/L	6035388	6035388-BLK1	03/28/06 05:40
Surrogate: 1,2-Dichloroethane-d4	111%			6035388	6035388-BLK1	03/28/06 05:40
Surrogate: Dibromofluoromethane	111%			6035388	6035388-BLK1	03/28/06 05:40
Surrogate: Toluene-d8	110%			6035388	6035388-BLK1	03/28/06 05:40
Surrogate: 4-Bromofluorobenzene	109%			6035388	6035388-BLK1	03/28/06 05:40

Extractable Petroleum Hydrocarbons

6034543-BLK2

Diesel	64.0		ug/L	6034543	6034543-BLK2	03/29/06 07:50
Motor Oil	48.8		ug/L	6034543	6034543-BLK2	03/29/06 07:50
Surrogate: o-Terphenyl	90%			6034543	6034543-BLK2	03/29/06 07:50

Purgeable Petroleum Hydrocarbons

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time
Purgeable Petroleum Hydrocarbons						
6036047-BLK1						
GRO as Gasoline	<40.0		ug/L	6036047	6036047-BLK1	03/31/06 19:15
Surrogate: a,a,a-Trifluorotoluene	80%			6036047	6036047-BLK1	03/31/06 19:15
6040085-BLK1						
GRO as Gasoline	<40.0		ug/L	6040085	6040085-BLK1	04/01/06 14:01
Surrogate: a,a,a-Trifluorotoluene	110%			6040085	6040085-BLK1	04/01/06 14:01
Total Metals per EPA 6000/7000 Series Methods						
6031109-BLK1						
Arsenic	<0.000664		mg/l	6031109	6031109-BLK1	03/25/06 05:07
Copper	<0.000133		mg/l	6031109	6031109-BLK1	03/24/06 20:15
Lead	0.0000670		mg/l	6031109	6031109-BLK1	03/25/06 05:07
Zinc	0.00165		mg/l	6031109	6031109-BLK1	03/24/06 20:15
Dissolved Metals per EPA 6000/7000 Series Methods						
6031209-BLK1						
Arsenic	<0.000664		mg/l	6031209	6031209-BLK1	03/27/06 17:50
Copper	<0.000133		mg/l	6031209	6031209-BLK1	03/27/06 17:50
Lead	<0.0000553		mg/l	6031209	6031209-BLK1	03/27/06 17:50
Zinc	<0.000469		mg/l	6031209	6031209-BLK1	03/27/06 17:50

Client Acton Mickelson Environmental, Inc. (13785)
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Attn John Shaal

Work Order: NPC3028
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PROJECT QUALITY CONTROL DATA

Duplicate

Analyte	Orig. Val.	Duplicate	Q	Units	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
Total Metals per EPA 6000/7000 Series Methods									
6031109-DUP1									
Arsenic	ND	ND		mg/l		20	6031109	NPC3028-09	03/27/06 14:16
Copper	0.000679	0.000721		mg/l	6.00	20	6031109	NPC3028-09	03/24/06 22:09
Lead	0.000445	0.000442		mg/l	0.676	20	6031109	NPC3028-09	03/27/06 14:16
Zinc	0.00348	0.00352		mg/l	1.14	20	6031109	NPC3028-09	03/24/06 22:09
Dissolved Metals per EPA 6000/7000 Series Methods									
6031209-DUP1									
Arsenic	ND	ND		mg/l		20	6031209	NPC3028-09	03/27/06 20:37
Copper	0.000441	0.000485		mg/l	9.50	20	6031209	NPC3028-09	03/27/06 20:37
Lead	ND	ND		mg/l		20	6031209	NPC3028-09	03/27/06 20:37
Zinc	0.00284	0.00344		mg/l	19.1	20	6031209	NPC3028-09	03/27/06 20:37

Client Acton Mickelson Environmental, Inc. (13785)
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Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

PROJECT QUALITY CONTROL DATA

LCS

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B								
6034573-BS1								
Benzene	50.0	47.3		ug/L	95%	78 - 122	6034573	03/25/06 08:51
Ethylbenzene	50.0	53.9		ug/L	108%	82 - 122	6034573	03/25/06 08:51
Methyl tert-Butyl Ether	50.0	49.4		ug/L	99%	65 - 144	6034573	03/25/06 08:51
Naphthalene	50.0	53.6		ug/L	107%	64 - 144	6034573	03/25/06 08:51
Toluene	50.0	53.7		ug/L	107%	80 - 120	6034573	03/25/06 08:51
Xylenes, total	150	161		ug/L	107%	81 - 125	6034573	03/25/06 08:51
Surrogate: 1,2-Dichloroethane-d4	30.0	34.2			114%	70 - 130	6034573	03/25/06 08:51
Surrogate: Dibromofluoromethane	30.0	34.5			115%	79 - 122	6034573	03/25/06 08:51
Surrogate: Toluene-d8	30.0	35.8			119%	78 - 121	6034573	03/25/06 08:51
Surrogate: 4-Bromofluorobenzene	30.0	32.2			107%	78 - 126	6034573	03/25/06 08:51
6034849-BS1								
Benzene	50.0	46.5		ug/L	93%	78 - 122	6034849	03/25/06 20:27
Ethylbenzene	50.0	53.6		ug/L	107%	82 - 122	6034849	03/25/06 20:27
Methyl tert-Butyl Ether	50.0	47.8		ug/L	96%	65 - 144	6034849	03/25/06 20:27
Naphthalene	50.0	47.9		ug/L	96%	64 - 144	6034849	03/25/06 20:27
Toluene	50.0	53.5		ug/L	107%	80 - 120	6034849	03/25/06 20:27
Xylenes, total	150	158		ug/L	105%	81 - 125	6034849	03/25/06 20:27
Surrogate: 1,2-Dichloroethane-d4	30.0	33.4			111%	70 - 130	6034849	03/25/06 20:27
Surrogate: Dibromofluoromethane	30.0	34.3			114%	79 - 122	6034849	03/25/06 20:27
Surrogate: Toluene-d8	30.0	36.4			121%	78 - 121	6034849	03/25/06 20:27
Surrogate: 4-Bromofluorobenzene	30.0	27.8			93%	78 - 126	6034849	03/25/06 20:27
6035388-BS1								
Benzene	50.0	54.7		ug/L	109%	78 - 122	6035388	03/28/06 04:33
Ethylbenzene	50.0	55.5		ug/L	111%	82 - 122	6035388	03/28/06 04:33
Methyl tert-Butyl Ether	50.0	55.1		ug/L	110%	65 - 144	6035388	03/28/06 04:33
Naphthalene	50.0	58.9		ug/L	118%	64 - 144	6035388	03/28/06 04:33
Toluene	50.0	50.4		ug/L	101%	80 - 120	6035388	03/28/06 04:33
Xylenes, total	150	165		ug/L	110%	81 - 125	6035388	03/28/06 04:33
Surrogate: 1,2-Dichloroethane-d4	30.0	33.5			112%	70 - 130	6035388	03/28/06 04:33
Surrogate: Dibromofluoromethane	30.0	32.9			110%	79 - 122	6035388	03/28/06 04:33
Surrogate: Toluene-d8	30.0	30.8			103%	78 - 121	6035388	03/28/06 04:33
Surrogate: 4-Bromofluorobenzene	30.0	29.1			97%	78 - 126	6035388	03/28/06 04:33

Extractable Petroleum Hydrocarbons

6034543-BS1								
Diesel	1000	668		ug/L	67%	60 - 107	6034543	03/29/06 01:06
Surrogate: o-Terphenyl	20.0	11.1			56%	51 - 142	6034543	03/29/06 01:06

Purgeable Petroleum Hydrocarbons

6036047-BS1

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
Purgeable Petroleum Hydrocarbons								
6036047-BS1								
GRO as Gasoline	1000	889		ug/L	89%	66 - 132	6036047	04/01/06 14:20
Surrogate: <i>a,a,a</i> -Trifluorotoluene	30.0	23.1			77%	63 - 134	6036047	04/01/06 14:20
6040085-BS2								
GRO as Gasoline	1000	1170	MNR1	ug/L	117%	66 - 132	6040085	04/01/06 18:12
Surrogate: <i>a,a,a</i> -Trifluorotoluene	30.0	22.5			75%	63 - 134	6040085	04/01/06 18:12
Total Metals per EPA 6000/7000 Series Methods								
6031109-BS1								
Arsenic	0.100	0.0967		mg/l	97%	80 - 120	6031109	03/25/06 05:14
Copper	0.100	0.0920		mg/l	92%	80 - 120	6031109	03/24/06 20:23
Lead	0.100	0.0921		mg/l	92%	80 - 120	6031109	03/25/06 05:14
Zinc	0.100	0.0902		mg/l	90%	80 - 120	6031109	03/24/06 20:23
Dissolved Metals per EPA 6000/7000 Series Methods								
6031209-BS1								
Arsenic	0.100	0.102		mg/l	102%	80 - 120	6031209	03/27/06 18:13
Copper	0.100	0.103		mg/l	103%	80 - 120	6031209	03/27/06 18:13
Lead	0.100	0.0948		mg/l	95%	80 - 120	6031209	03/27/06 18:13
Zinc	0.100	0.0983		mg/l	98%	80 - 120	6031209	03/27/06 18:13

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

PROJECT QUALITY CONTROL DATA

Matrix Spike

Analyte	Orig. Val.	MS Val	Q	Units	Spike Conc	% Rec.	Target Range	Batch	Sample Spiked	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B										
6034573-MS1										
Benzene	148	174	M2	ug/L	50.0	52%	74 - 133	6034573	NPC3028-09	03/25/06 18:34
Ethylbenzene	ND	58.1		ug/L	50.0	116%	74 - 134	6034573	NPC3028-09	03/25/06 18:34
Methyl tert-Butyl Ether	0.490	53.0		ug/L	50.0	105%	58 - 151	6034573	NPC3028-09	03/25/06 18:34
Naphthalene	5.70	45.0		ug/L	50.0	79%	47 - 154	6034573	NPC3028-09	03/25/06 18:34
Toluene	0.250	58.3		ug/L	50.0	116%	73 - 133	6034573	NPC3028-09	03/25/06 18:34
Xylenes, total	9.80	184		ug/L	150	116%	68 - 139	6034573	NPC3028-09	03/25/06 18:34
Surrogate: 1,2-Dichloroethane-d4		33.6		ug/L	30.0	112%	70 - 130	6034573	NPC3028-09	03/25/06 18:34
Surrogate: Dibromofluoromethane		34.1		ug/L	30.0	114%	79 - 122	6034573	NPC3028-09	03/25/06 18:34
Surrogate: Toluene-d8		36.1		ug/L	30.0	120%	78 - 121	6034573	NPC3028-09	03/25/06 18:34
Surrogate: 4-Bromofluorobenzene		28.0		ug/L	30.0	93%	78 - 126	6034573	NPC3028-09	03/25/06 18:34
6034849-MS1										
Benzene	39.7	86.9		ug/L	50.0	94%	74 - 133	6034849	NPC2992-01	03/26/06 05:25
Ethylbenzene	2.51	62.0		ug/L	50.0	119%	74 - 134	6034849	NPC2992-01	03/26/06 05:25
Methyl tert-Butyl Ether	1.00E9	1630	M1	ug/L	50.0	2000000000%	58 - 151	6034849	NPC2992-01	03/26/06 05:25
Naphthalene	12.5	127	M1	ug/L	50.0	229%	47 - 154	6034849	NPC2992-01	03/26/06 05:25
Toluene	22.4	85.9		ug/L	50.0	127%	73 - 133	6034849	NPC2992-01	03/26/06 05:25
Xylenes, total	143	298		ug/L	150	103%	68 - 139	6034849	NPC2992-01	03/26/06 05:25
Surrogate: 1,2-Dichloroethane-d4		27.7		ug/L	30.0	92%	70 - 130	6034849	NPC2992-01	03/26/06 05:25
Surrogate: Dibromofluoromethane		31.7		ug/L	30.0	106%	79 - 122	6034849	NPC2992-01	03/26/06 05:25
Surrogate: Toluene-d8		35.3		ug/L	30.0	118%	78 - 121	6034849	NPC2992-01	03/26/06 05:25
Surrogate: 4-Bromofluorobenzene		26.1		ug/L	30.0	87%	78 - 126	6034849	NPC2992-01	03/26/06 05:25
Extractable Petroleum Hydrocarbons										
6034543-MS1										
Diesel	102	779		ug/L	980	69%	54 - 114	6034543	NPC3028-09	03/29/06 01:26
Surrogate: o-Terphenyl		13.0		ug/L	19.6	66%	51 - 142	6034543	NPC3028-09	03/29/06 01:26
Purgeable Petroleum Hydrocarbons										
6036047-MS1										
GRO as Gasoline	405	1390		ug/L	1000	98%	48 - 138	6036047	NPC3028-09RE 1	04/01/06 13:12
Surrogate: a,a,a-Trifluorotoluene		24.8		ug/L	30.0	83%	63 - 134	6036047	NPC3028-09RE 1	04/01/06 13:12
Total Metals per EPA 6000/7000 Series Methods										
6031109-MS1										
Arsenic	ND	0.106		mg/l	0.100	106%	75 - 125	6031109	NPC3028-09	03/27/06 14:24
Copper	0.000679	0.0936		mg/l	0.100	93%	75 - 125	6031109	NPC3028-09	03/24/06 22:24
Lead	0.000445	0.0985		mg/l	0.100	98%	75 - 125	6031109	NPC3028-09	03/27/06 14:24

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillside Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

PROJECT QUALITY CONTROL DATA

Matrix Spike - Cont.

Analyte	Orig. Val.	MS Val	Q	Units	Spike Conc	% Rec.	Target Range	Batch	Sample Spiked	Analyzed Date/Time
Total Metals per EPA 6000/7000 Series Methods										
6031109-MS1										
Zinc	0.00348	0.100		mg/l	0.100	97%	75 - 125	6031109	NPC3028-09	03/24/06 22:24
6031109-MS2										
Arsenic	0.0260	0.125		mg/l	0.100	99%	75 - 125	6031109	P6C0873-01	03/25/06 05:30
Copper	0.0188	0.115		mg/l	0.100	96%	75 - 125	6031109	P6C0873-01	03/24/06 20:38
Lead	0.0468	0.138		mg/l	0.100	91%	75 - 125	6031109	P6C0873-01	03/25/06 05:30
Zinc	0.0120	0.105		mg/l	0.100	93%	75 - 125	6031109	P6C0873-01	03/24/06 20:38
Dissolved Metals per EPA 6000/7000 Series Methods										
6031209-MS1										
Arsenic	ND	0.105		mg/l	0.100	105%	75 - 125	6031209	NPC3028-09	03/27/06 20:53
Copper	0.000441	0.103		mg/l	0.100	103%	75 - 125	6031209	NPC3028-09	03/27/06 20:53
Lead	ND	0.0938		mg/l	0.100	94%	75 - 125	6031209	NPC3028-09	03/27/06 20:53
Zinc	0.00284	0.105		mg/l	0.100	102%	75 - 125	6031209	NPC3028-09	03/27/06 20:53
6031209-MS2										
Arsenic	0.00111	0.115		mg/l	0.100	114%	75 - 125	6031209	P6C0900-02	03/27/06 18:36
Copper	0.00172	0.113		mg/l	0.100	111%	75 - 125	6031209	P6C0900-02	03/27/06 18:36
Lead	0.0000810	0.0875		mg/l	0.100	87%	75 - 125	6031209	P6C0900-02	03/27/06 18:36
Zinc	0.00980	0.117		mg/l	0.100	107%	75 - 125	6031209	P6C0900-02	03/27/06 18:36

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

PROJECT QUALITY CONTROL DATA

Matrix Spike Dup

Analyte	Orig. Val.	Duplicate	Q	Units	Spike Conc	% Rec.	Target Range	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B												
6034573-MSD1												
Benzene	148	181	M2	ug/L	50.0	66%	74 - 133	4	19	6034573	NPC3028-09	03/25/06 18:57
Ethylbenzene	ND	62.7		ug/L	50.0	125%	74 - 134	8	21	6034573	NPC3028-09	03/25/06 18:57
Methyl tert-Butyl Ether	0.490	59.0		ug/L	50.0	117%	58 - 151	11	28	6034573	NPC3028-09	03/25/06 18:57
Naphthalene	5.70	60.7		ug/L	50.0	110%	47 - 154	30	43	6034573	NPC3028-09	03/25/06 18:57
Toluene	0.250	63.1		ug/L	50.0	126%	73 - 133	8	20	6034573	NPC3028-09	03/25/06 18:57
Xylenes, total	9.80	196		ug/L	150	124%	68 - 139	6	23	6034573	NPC3028-09	03/25/06 18:57
Surrogate: 1,2-Dichloroethane-d4		33.2		ug/L	30.0	111%	70 - 130			6034573	NPC3028-09	03/25/06 18:57
Surrogate: Dibromofluoromethane		33.7		ug/L	30.0	112%	79 - 122			6034573	NPC3028-09	03/25/06 18:57
Surrogate: Toluene-d8		36.2		ug/L	30.0	121%	78 - 121			6034573	NPC3028-09	03/25/06 18:57
Surrogate: 4-Bromofluorobenzene		28.4		ug/L	30.0	95%	78 - 126			6034573	NPC3028-09	03/25/06 18:57
6034849-MSD1												
Benzene	39.7	84.6		ug/L	50.0	90%	74 - 133	3	19	6034849	NPC2992-01	03/26/06 05:48
Ethylbenzene	2.51	59.4		ug/L	50.0	114%	74 - 134	4	21	6034849	NPC2992-01	03/26/06 05:48
Methyl tert-Butyl Ether	1.00E9	1550	M1	ug/L	50.0	0000000	58 - 151	5	28	6034849	NPC2992-01	03/26/06 05:48
Naphthalene	12.5	67.1	R3	ug/L	50.0	109%	47 - 154	62	43	6034849	NPC2992-01	03/26/06 05:48
Toluene	22.4	78.2		ug/L	50.0	112%	73 - 133	9	20	6034849	NPC2992-01	03/26/06 05:48
Xylenes, total	143	283		ug/L	150	93%	68 - 139	5	23	6034849	NPC2992-01	03/26/06 05:48
Surrogate: 1,2-Dichloroethane-d4		27.6		ug/L	30.0	92%	70 - 130			6034849	NPC2992-01	03/26/06 05:48
Surrogate: Dibromofluoromethane		31.9		ug/L	30.0	106%	79 - 122			6034849	NPC2992-01	03/26/06 05:48
Surrogate: Toluene-d8		35.3		ug/L	30.0	118%	78 - 121			6034849	NPC2992-01	03/26/06 05:48
Surrogate: 4-Bromofluorobenzene		25.9		ug/L	30.0	86%	78 - 126			6034849	NPC2992-01	03/26/06 05:48
Extractable Petroleum Hydrocarbons												
6034543-MSD1												
Diesel	102	810		ug/L	990	72%	54 - 114	4	27	6034543	NPC3028-09	03/29/06 01:46
Surrogate: o-Terphenyl		13.2		ug/L	19.8	67%	51 - 142			6034543	NPC3028-09	03/29/06 01:46
Purgeable Petroleum Hydrocarbons												
6036047-MSD1												
GRO as Gasoline	405	1420		ug/L	1000	102%	48 - 138	2	36	6036047	NPC3028-09RE 1	04/01/06 13:46
Surrogate: a,a,a-Trifluorotoluene		24.9		ug/L	30.0	83%	63 - 134			6036047	NPC3028-09RE 1	04/01/06 13:46
Total Metals per EPA 6000/7000 Series Methods												
6031109-MSD1												
Arsenic	ND	0.105		mg/l	0.100	105%	75 - 125	0.948	20	6031109	NPC3028-09	03/27/06 14:32
Copper	0.000679	0.0908		mg/l	0.100	90%	75 - 125	3.04	20	6031109	NPC3028-09	03/24/06 22:32
Lead	0.000445	0.0964		mg/l	0.100	96%	75 - 125	2.15	20	6031109	NPC3028-09	03/27/06 14:32
Zinc	0.00348	0.0940		mg/l	0.100	91%	75 - 125	6.19	20	6031109	NPC3028-09	03/24/06 22:32

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

PROJECT QUALITY CONTROL DATA

Matrix Spike Dup - Cont.

Analyte	Orig. Val.	Duplicate	Q	Units	Spike Conc	% Rec.	Target Range	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
Dissolved Metals per EPA 6000/7000 Series Methods												
6031209-MSD1												
Arsenic	ND	0.0988		mg/l	0.100	99%	75 - 125	6.08	20	6031209	NPC3028-09	03/28/06 23:08
Copper	0.000441	0.0987		mg/l	0.100	98%	75 - 125	4.26	20	6031209	NPC3028-09	03/28/06 23:08
Lead	ND	0.0909		mg/l	0.100	91%	75 - 125	3.14	20	6031209	NPC3028-09	03/28/06 23:08
Zinc	0.00284	0.0987		mg/l	0.100	96%	75 - 125	6.19	20	6031209	NPC3028-09	03/28/06 23:08

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville

Method	Matrix	AIHA	Nelac	Oregon
NA	Water			
NWTPH-Dx	Water	N/A	X	X
NWTPH-Gx	Water	N/A	X	X
subcontract	Water			
SW846 8260B	Water	N/A	X	X

Subcontracted Laboratories

North Creek Analytical - Beaverton (11664)

9405 SW Nimbus Avenue - Beaverton, OR 97008

Method Performed: EPA 6020

Samples: NPC3028-01, NPC3028-02, NPC3028-03, NPC3028-04, NPC3028-05, NPC3028-06, NPC3028-07,
NPC3028-09, NPC3028-10

North Creek Analytical - Beaverton (11664)

9405 SW Nimbus Avenue - Beaverton, OR 97008

Analysis Performed: Subcontract - Outside1

Samples: NPC3028-01, NPC3028-02, NPC3028-03, NPC3028-04, NPC3028-05, NPC3028-06, NPC3028-07,
NPC3028-09, NPC3028-10

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

NELAC CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville does not hold NELAC certifications for the following analytes included in this report

Method

Matrix

Analyte

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3028
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/23/06 09:00

DATA QUALIFIERS AND DEFINITIONS

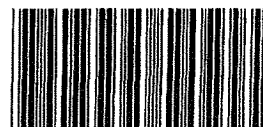
M1 The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
M2 The MS and/or MSD were below the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
MNR1 There was no MS/MSD analyzed with this batch due to insufficient sample volume. See Blank Spike.
QSG Silica Gel clean-up performed on extracts.
R3 The RPD exceeded the acceptance limit due to sample matrix effects.
Z Due to sample matrix effects, the surrogate recovery was below the acceptance limits.
Z10 Surrogate outside laboratory historical limits but within method guidelines. No effect on data.
Z2 Surrogate recovery was above the acceptance limits. Data not impacted.
ZX Due to sample matrix effects, the surrogate recovery was outside the acceptance limits.

METHOD MODIFICATION NOTES



Nashville Division
COOLER RECEIPT FORM

BC#



NPC3028

Cooler Received/Opened On 03/23/2006 @ 09:00

1. Indicate the Airbill Tracking Number (last 4 digits for Fedex only) and Name of Courier below:

1Z1AE587049536
2057

Fed-Ex UPS Velocity DHL Route Off-street Misc.

2. Temperature of representative sample or temperature blank when opened: 2.7 Degrees Celsius
(indicate IR Gun ID#)

NA A00466 A00750 A01124 100190 101282

Raynger ST

3. Were custody seals on outside of cooler?..... YES...NO...NA

a. If yes, how many and where:

1 Front

4. Were the seals intact, signed, and dated correctly?..... YES...NO...NA

5. Were custody papers inside cooler?..... YES...NO...NA

I certify that I opened the cooler and answered questions 1-5 (initial).....

PRS

6. Were custody seals on containers: YES NO and Intact

YES NO NA

were these signed, and dated correctly?.....

YES...NO...NA

7. What kind of packing material used? Bubblewrap Peanuts Vermiculite Foam Insert

Plastic bag Paper Other _____ None

8. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

9. Did all containers arrive in good condition (unbroken)?..... YES...NO...NA

10. Were all container labels complete (#, date, signed, pres., etc)?..... YES...NO...NA

11. Did all container labels and tags agree with custody papers?..... YES...NO...NA

12. a. Were VOA vials received?..... YES...NO...NA

b. Was there any observable head space present in any VOA vial?..... YES...NO...NA

I certify that I unloaded the cooler and answered questions 6-12 (initial).....

13. a. On preserved bottles did the pH test strips suggest that preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used?..... YES...NO...NA

If preservation in-house was needed, record standard ID of preservative used here _____

14. Was residual chlorine present?..... YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 13-14 (initial).....

15. Were custody papers properly filled out (ink, signed, etc)?..... YES...NO...NA

16. Did you sign the custody papers in the appropriate place?..... YES...NO...NA

17. Were correct containers used for the analysis requested?..... YES...NO...NA

18. Was sufficient amount of sample sent in each container?..... YES...NO...NA

I certify that I entered this project into LIMS and answered questions 15-18 (initial).....

I certify that I attached a label with the unique LIMS number to each container (initial).....

19. Were there Non-Conformance issues at login YES NO Was a PIPE generated YES NO # _____



Nashville Division

COOLER RECEIPT FORM

BC#

Cooler Received/Opened On 03/23/2006 @ 09:00

1. Indicate the Airbill Tracking Number (last 4 digits for Fedex only) and Name of Courier below: 121A258701 9738

Fed-Ex UPS Velocity DHL Route Off-street Misc. 6463

2. Temperature of representative sample or temperature blank when opened: 1.1 Degrees Celsius
(indicate IR Gun ID#)

NA A00466 A00750 A01124 100190 101282 Raynger ST

3. Were custody seals on outside of cooler?..... YES...NO...NA

a. If yes, how many and where: 1 front

4. Were the seals intact, signed, and dated correctly?..... YES...NO...NA

5. Were custody papers inside cooler?..... YES...NO...NA

I certify that I opened the cooler and answered questions 1-5 (initial)..... RSB

6. Were custody seals on containers: YES NO and Intact YES NO NA

were these signed, and dated correctly?..... YES...NO...NA

7. What kind of packing material used? Bubblewrap Peanuts Vermiculite Foam Insert

Plastic bag Paper Other _____ None

8. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

9. Did all containers arrive in good condition (unbroken)?..... YES...NO...NA

10. Were all container labels complete (#, date, signed, pres., etc)?..... YES...NO...NA

11. Did all container labels and tags agree with custody papers?..... YES...NO...NA

12. a. Were VOA vials received?..... YES...NO...NA

b. Was there any observable head space present in any VOA vial?..... YES...NO...NA

I certify that I unloaded the cooler and answered questions 6-12 (initial).....

13. a. On preserved bottles did the pH test strips suggest that preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used?..... YES...NO...NA

If preservation in-house was needed, record standard ID of preservative used here _____

14. Was residual chlorine present?..... YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 13-14 (initial).....

15. Were custody papers properly filled out (ink, signed, etc)?..... YES...NO...NA

16. Did you sign the custody papers in the appropriate place?..... YES...NO...NA

17. Were correct containers used for the analysis requested?..... YES...NO...NA

18. Was sufficient amount of sample sent in each container?..... YES...NO...NA

I certify that I entered this project into LIMS and answered questions 15-18 (initial).....

I certify that I attached a label with the unique LIMS number to each container (initial).....

19. Were there Non-Conformance issues at login YES NO Was a PIPE generated YES NO # _____

BIS = Broken in shipment
Cooler Receipt Form

LF-1
End of Form

Revised 3/9/06

223, 295, 265

NPC3028

Acton • Mickelson • Envir 04/06/06 17:00

Chain of Custody and Analysis Request Form

Geotracker Global ID _____

C. ☒ Standard TAT☐ RUSH TAT☐ 24 hr. TAT☐ 48 hr. TAT☐ 72 hr. TAT☐ 5 day TAT

Page 1 of 2

Chain of Custody

1856

Send Results to:

5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
(916) 939-7550, FAX (916) 939-7570

Attn.: John Shuehl

Preliminary Fax Result

☒ Sample Receipt/ Log-In Confirmation☒ Electronic Data Deliverables email:

Geotracker EDF jshuehl@cumtine.net

☒ Raw Data Deliverables☐ Call with Verbal ResultsMatrix
Container
Number of Containers
PreservativeRequested Analysis
ELUGB NAPH, MTBT
B26GB BTEx
NNTPH
AIWTPH 4x (d+6)

Lab ID (LAB USE ONLY)	Field Point ID	Sample ID	Date Collected	Time Collected	Matrix	Container	Number of Containers	Preservative	Requested Analysis	Comments
NPC3028-01	MW35	MW35-032106	3/21/06	0925	GW	V	6	HC	X X X X	
2	KMW07	KMW07-032106	3/21/06	1000	GW	V	6	HC	X X X X	
	MW33	MW33-032106	3/21/06	1045	GW	V	6	HC	X X X X	} see c-o-c # 4859
	MW09	MW09-032106	3/21/06	1115	GW	V	6	HC	X X X X	
3	KMW14	KMW14-032106	3/21/06	1155	GW	V	6	HC	X X X X	
4	MW38	MW38-032106	3/21/06	1325	GW	V	6	HC	X X X X	
5	KMW13	KMW13-032106	3/21/06	1350	GW	V	6	HC	X X X X	
6	MW39	MW39-032106	3/21/06	1420	GW	V	6	HC	X X X X	
7	QARC	DUPE-1-032106	3/21/06	—	GW	V	6	HC	X X X X	
8	QARC	TB-2-032106	3/21/06	0835	RW	V	4	HC	X X X	

Signature	Date	Time	Signature	Date	Time
Relinquished by:	3/21/06	1631	Relinquished by: _____		
Received by:	3/21/06	1653	Received by:	3/23/06	9:20
Relinquished by:	3-22-06	lab 17:25	Relinquished by: _____		
Received by: _____			Received by: _____		

Matrix: W - Water; DW - Drinking Water; SW - Surface Water; GW - Ground Water; WW - Waste Water;
 RW - Reagent Water; S - Soil; SE - Sediment; SV - Soil Vapor; AA - Ambient Air; WS - Waste (Solid); O - Other
 Container: GB - Glass Bottle (Amber); V - 40 ml VOA Vial; BT, ST, PT - Brass, Steel, and Plastic Tube;
 P - Polyethylene; GJ - Glass Jar, SC - Summa Canister; TD - Tedlar
 Preservative: C - Cold; HS - Sulfuric Acid; HC - Hydrochloric Acid; HN - Nitric Acid; Na - Sodium Hydroxide; O - Other

ORIGINAL - Laboratory (Return with Report)

Project Name and Location: Former Portland Terminal #36-001

Project Number: 13041.05

Receiving Lab: Test America

Sampled by: Brian Richardson (BAR)

Print Name

Signature

PINK - Originator

3.6 4 8 2.2

April 10, 2006

Client: Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn: John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Nbr: 13041.05
P/O Nbr:
Date Received: 03/25/06

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
W-22-032306	NPC3271-01	03/23/06 09:35
W-20-032306	NPC3271-02	03/23/06 10:00
W-19-032306	NPC3271-03	03/23/06 10:25
KMW31-032306	NPC3271-04	03/23/06 14:20
KMW30-032306	NPC3271-05	03/23/06 14:45
KMW29-032306	NPC3271-06	03/23/06 15:15
KMW18-032306	NPC3271-07	03/23/06 13:45
DUPE-2-032306	NPC3271-08	03/23/06
TB-3-032306	NPC3271-09	03/23/06 09:00

An executed copy of the chain of custody, the project quality control data, and the sample receipt form are also included as an addendum to this report. If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-800-765-0980. Any opinions, if expressed, are outside the scope of the Laboratory's accreditation.

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Oregon Certification Number: TN200001

The Chain(s) of Custody, 3 pages, are included and are an integral part of this report.

These results relate only to the items tested. This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By:



Leah R. Klingensmith
Senior Project Management

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3271-01 (W-22-032306 - Water) Sampled: 03/23/06 09:35								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	03/29/06 00:53	SW846 8260B	6035039
Ethylbenzene	ND		ug/L	1.00	1	03/29/06 00:53	SW846 8260B	6035039
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/29/06 00:53	SW846 8260B	6035039
Naphthalene	ND		ug/L	5.00	1	03/29/06 00:53	SW846 8260B	6035039
Toluene	ND		ug/L	1.00	1	03/29/06 00:53	SW846 8260B	6035039
Xylenes, total	ND		ug/L	3.00	1	03/29/06 00:53	SW846 8260B	6035039
Surr: 1,2-Dichloroethane-d4 (70-130%)	100 %					03/29/06 00:53	SW846 8260B	6035039
Surr: Dibromofluoromethane (79-122%)	100 %					03/29/06 00:53	SW846 8260B	6035039
Surr: Toluene-d8 (78-121%)	101 %					03/29/06 00:53	SW846 8260B	6035039
Surr: 4-Bromofluorobenzene (78-126%)	98 %					03/29/06 00:53	SW846 8260B	6035039
Extractable Petroleum Hydrocarbons								
Diesel	122	QSG	ug/L	95.2	1	03/30/06 02:13	NWTPH-Dx	6035142
Motor Oil	112	QSG	ug/L	95.2	1	03/30/06 02:13	NWTPH-Dx	6035142
Surr: o-Terphenyl (51-142%)	113 %					03/30/06 02:13	NWTPH-Dx	6035142
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	04/03/06 01:35	NWTPH-Gx	6036176
Surr: a,a,a-Trifluorotoluene (63-134%)	81 %					04/03/06 01:35	NWTPH-Gx	6036176
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/29/06 05:44	EPA 6020	6031337
Copper	0.00484		mg/l	0.00200	1	03/29/06 05:44	EPA 6020	6031337
Lead	0.00140		mg/l	0.00100	1	03/29/06 05:44	EPA 6020	6031337
Zinc	0.0379		mg/l	0.00500	1	03/29/06 05:44	EPA 6020	6031337
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/29/06 10:10	EPA 6020	6031344
Copper	0.00576		mg/l	0.00200	1	03/29/06 10:10	EPA 6020	6031344
Lead	ND		mg/l	0.00100	1	03/29/06 10:10	EPA 6020	6031344
Zinc	0.0286		mg/l	0.00500	1	03/30/06 14:13	EPA 6020	6031344

Sample ID: NPC3271-02 (W-20-032306 - Water) Sampled: 03/23/06 10:00

Selected Volatile Organic Compounds by EPA Method 8260B

Benzene	ND		ug/L	1.00	1	03/29/06 01:15	SW846 8260B	6035039
Ethylbenzene	ND		ug/L	1.00	1	03/29/06 01:15	SW846 8260B	6035039
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/29/06 01:15	SW846 8260B	6035039
Naphthalene	ND		ug/L	5.00	1	03/29/06 01:15	SW846 8260B	6035039
Toluene	ND		ug/L	1.00	1	03/29/06 01:15	SW846 8260B	6035039
Xylenes, total	ND		ug/L	3.00	1	03/29/06 01:15	SW846 8260B	6035039
Surr: 1,2-Dichloroethane-d4 (70-130%)	103 %					03/29/06 01:15	SW846 8260B	6035039
Surr: Dibromofluoromethane (79-122%)	101 %					03/29/06 01:15	SW846 8260B	6035039
Surr: Toluene-d8 (78-121%)	103 %					03/29/06 01:15	SW846 8260B	6035039
Surr: 4-Bromofluorobenzene (78-126%)	96 %					03/29/06 01:15	SW846 8260B	6035039

Extractable Petroleum Hydrocarbons

Diesel	203	QSG	ug/L	95.2	1	03/30/06 02:29	NWTPH-Dx	6035142

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3271-02 (W-20-032306 - Water) - cont. Sampled: 03/23/06 10:00								
Extractable Petroleum Hydrocarbons - cont.								
Motor Oil	135	QSG	ug/L	95.2	1	03/30/06 02:29	NWTPH-Dx	6035142
Surr: o-Terphenyl (51-142%)	114 %					03/30/06 02:29	NWTPH-Dx	6035142
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	04/03/06 02:09	NWTPH-Gx	6036176
Surr: a,a,a-Trifluorotoluene (63-134%)	81 %					04/03/06 02:09	NWTPH-Gx	6036176
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/29/06 05:57	EPA 6020	6031337
Copper	0.00378		mg/l	0.00200	1	03/29/06 05:57	EPA 6020	6031337
Lead	ND		mg/l	0.00100	1	03/29/06 05:57	EPA 6020	6031337
Zinc	0.0304		mg/l	0.00500	1	03/29/06 05:57	EPA 6020	6031337
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	ND		mg/l	0.00100	1	03/29/06 11:04	EPA 6020	6031344
Copper	0.00241		mg/l	0.00200	1	03/29/06 11:04	EPA 6020	6031344
Lead	ND		mg/l	0.00100	1	03/29/06 11:04	EPA 6020	6031344
Zinc	0.0119		mg/l	0.00500	1	03/29/06 11:04	EPA 6020	6031344
Sample ID: NPC3271-03 (W-19-032306 - Water) Sampled: 03/23/06 10:25								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	03/29/06 01:37	SW846 8260B	6035039
Ethylbenzene	ND		ug/L	1.00	1	03/29/06 01:37	SW846 8260B	6035039
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/29/06 01:37	SW846 8260B	6035039
Naphthalene	ND		ug/L	5.00	1	03/29/06 01:37	SW846 8260B	6035039
Toluene	ND		ug/L	1.00	1	03/29/06 01:37	SW846 8260B	6035039
Xylenes, total	ND		ug/L	3.00	1	03/29/06 01:37	SW846 8260B	6035039
Surr: 1,2-Dichloroethane-d4 (70-130%)	101 %					03/29/06 01:37	SW846 8260B	6035039
Surr: Dibromofluoromethane (79-122%)	99 %					03/29/06 01:37	SW846 8260B	6035039
Surr: Toluene-d8 (78-121%)	103 %					03/29/06 01:37	SW846 8260B	6035039
Surr: 4-Bromofluorobenzene (78-126%)	92 %					03/29/06 01:37	SW846 8260B	6035039
Extractable Petroleum Hydrocarbons								
Diesel	1550	QSG	ug/L	95.2	1	03/31/06 16:13	NWTPH-Dx	6034969
Motor Oil	275	QSG	ug/L	95.2	1	03/31/06 16:13	NWTPH-Dx	6034969
Surr: o-Terphenyl (51-142%)	132 %					03/31/06 16:13	NWTPH-Dx	6034969
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	04/03/06 02:43	NWTPH-Gx	6036176
Surr: a,a,a-Trifluorotoluene (63-134%)	81 %					04/03/06 02:43	NWTPH-Gx	6036176
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00559		mg/l	0.00100	1	03/29/06 06:11	EPA 6020	6031337
Copper	ND		mg/l	0.00200	1	03/29/06 06:11	EPA 6020	6031337
Lead	ND		mg/l	0.00100	1	03/29/06 06:11	EPA 6020	6031337
Zinc	ND		mg/l	0.00500	1	03/29/06 06:11	EPA 6020	6031337

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3271-03 (W-19-032306 - Water) - cont. Sampled: 03/23/06 10:25								
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00399		mg/l	0.00100	1	03/29/06 11:17	EPA 6020	6031344
Copper	ND		mg/l	0.00200	1	03/29/06 11:17	EPA 6020	6031344
Lead	ND		mg/l	0.00100	1	03/29/06 11:17	EPA 6020	6031344
Zinc	ND		mg/l	0.00500	1	03/29/06 11:17	EPA 6020	6031344

Sample ID: NPC3271-04 (KMW31-032306 - Water) Sampled: 03/23/06 14:20

Selected Volatile Organic Compounds by EPA Method 8260B

Benzene	2.46		ug/L	1.00	1	03/29/06 01:59	SW846 8260B	6035039
Ethylbenzene	3.40		ug/L	1.00	1	03/29/06 01:59	SW846 8260B	6035039
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/29/06 01:59	SW846 8260B	6035039
Naphthalene	ND		ug/L	5.00	1	03/29/06 01:59	SW846 8260B	6035039
Toluene	ND		ug/L	1.00	1	03/29/06 01:59	SW846 8260B	6035039
Xylenes, total	7.87		ug/L	3.00	1	03/29/06 01:59	SW846 8260B	6035039
Surr: 1,2-Dichloroethane-d4 (70-130%)	104 %					03/29/06 01:59	SW846 8260B	6035039
Surr: Dibromofluoromethane (79-122%)	100 %					03/29/06 01:59	SW846 8260B	6035039
Surr: Toluene-d8 (78-121%)	106 %					03/29/06 01:59	SW846 8260B	6035039
Surr: 4-Bromofluorobenzene (78-126%)	100 %					03/29/06 01:59	SW846 8260B	6035039

Extractable Petroleum Hydrocarbons

Diesel	3710	QSG	ug/L	189	2	04/03/06 20:00	NWTPH-Dx	6034969
Motor Oil	239	QSG	ug/L	189	2	04/03/06 20:00	NWTPH-Dx	6034969
Surr: o-Terphenyl (51-142%)	91 %					04/03/06 20:00	NWTPH-Dx	6034969

Purgeable Petroleum Hydrocarbons

GRO as Gasoline	1360		ug/L	100	1	04/03/06 03:17	NWTPH-Gx	6036176
Surr: a,a,a-Trifluorotoluene (63-134%)	321 %	ZX				04/03/06 03:17	NWTPH-Gx	6036176

Total Metals per EPA 6000/7000 Series Methods

Arsenic	0.0202		mg/l	0.00100	1	03/30/06 23:23	EPA 6020	6031399
Copper	0.00805		mg/l	0.00200	1	03/30/06 23:23	EPA 6020	6031399
Lead	0.00342		mg/l	0.00100	1	03/31/06 16:10	EPA 6020	6031399
Zinc	ND		mg/l	0.00500	1	03/30/06 23:23	EPA 6020	6031399

Dissolved Metals per EPA 6000/7000 Series Methods

Arsenic	0.0196		mg/l	0.00100	1	03/29/06 19:47	EPA 6020	6031344
Copper	ND		mg/l	0.00200	1	03/29/06 19:47	EPA 6020	6031344
Lead	0.00268		mg/l	0.00100	1	03/29/06 19:47	EPA 6020	6031344
Zinc	ND		mg/l	0.00500	1	03/29/06 19:47	EPA 6020	6031344

Sample ID: NPC3271-05 (KMW30-032306 - Water) Sampled: 03/23/06 14:45

Selected Volatile Organic Compounds by EPA Method 8260B

Benzene	ND		ug/L	1.00	1	03/29/06 02:21	SW846 8260B	6035039
Ethylbenzene	ND		ug/L	1.00	1	03/29/06 02:21	SW846 8260B	6035039
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/29/06 02:21	SW846 8260B	6035039
Naphthalene	ND		ug/L	5.00	1	03/29/06 02:21	SW846 8260B	6035039
Toluene	ND		ug/L	1.00	1	03/29/06 02:21	SW846 8260B	6035039

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch

Sample ID: NPC3271-05 (KMW30-032306 - Water) - cont. Sampled: 03/23/06 14:45

Selected Volatile Organic Compounds by EPA Method 8260B - cont.

Xylenes, total	ND		ug/L	3.00	1	03/29/06 02:21	SW846 8260B	6035039
Surr: 1,2-Dichloroethane-d4 (70-130%)	103 %					03/29/06 02:21	SW846 8260B	6035039
Surr: Dibromofluoromethane (79-122%)	98 %					03/29/06 02:21	SW846 8260B	6035039
Surr: Toluene-d8 (78-121%)	102 %					03/29/06 02:21	SW846 8260B	6035039
Surr: 4-Bromofluorobenzene (78-126%)	106 %					03/29/06 02:21	SW846 8260B	6035039

Extractable Petroleum Hydrocarbons

Diesel	866	QSG	ug/L	96.2	1	03/31/06 17:19	NWTPH-Dx	6034969
Motor Oil	236	QSG	ug/L	96.2	1	03/31/06 17:19	NWTPH-Dx	6034969
Surr: o-Terphenyl (51-142%)	110 %					03/31/06 17:19	NWTPH-Dx	6034969

Purgeable Petroleum Hydrocarbons

GRO as Gasoline	174		ug/L	100	1	04/03/06 03:51	NWTPH-Gx	6036176
Surr: a,a,a-Trifluorotoluene (63-134%)	105 %					04/03/06 03:51	NWTPH-Gx	6036176

Total Metals per EPA 6000/7000 Series Methods

Arsenic	0.00426		mg/l	0.00100	1	03/30/06 23:46	EPA 6020	6031399
Copper	0.00593		mg/l	0.00200	1	03/30/06 23:46	EPA 6020	6031399
Lead	ND		mg/l	0.00100	1	03/31/06 16:18	EPA 6020	6031399
Zinc	0.0296		mg/l	0.00500	1	03/30/06 23:46	EPA 6020	6031399

Dissolved Metals per EPA 6000/7000 Series Methods

Arsenic	0.00201		mg/l	0.00100	1	03/29/06 20:01	EPA 6020	6031344
Copper	ND		mg/l	0.00200	1	03/29/06 20:01	EPA 6020	6031344
Lead	ND		mg/l	0.00100	1	03/29/06 20:01	EPA 6020	6031344
Zinc	0.0240		mg/l	0.00500	1	03/29/06 20:01	EPA 6020	6031344

Sample ID: NPC3271-06 (KMW29-032306 - Water) Sampled: 03/23/06 15:15

Selected Volatile Organic Compounds by EPA Method 8260B

Benzene	1.09		ug/L	1.00	1	03/29/06 02:42	SW846 8260B	6035039
Ethylbenzene	ND		ug/L	1.00	1	03/29/06 02:42	SW846 8260B	6035039
Methyl tert-Butyl Ether	1.45		ug/L	1.00	1	03/29/06 02:42	SW846 8260B	6035039
Naphthalene	ND		ug/L	5.00	1	03/29/06 02:42	SW846 8260B	6035039
Toluene	ND		ug/L	1.00	1	03/29/06 02:42	SW846 8260B	6035039
Xylenes, total	ND		ug/L	3.00	1	03/29/06 02:42	SW846 8260B	6035039
Surr: 1,2-Dichloroethane-d4 (70-130%)	105 %					03/29/06 02:42	SW846 8260B	6035039
Surr: Dibromofluoromethane (79-122%)	99 %					03/29/06 02:42	SW846 8260B	6035039
Surr: Toluene-d8 (78-121%)	101 %					03/29/06 02:42	SW846 8260B	6035039
Surr: 4-Bromofluorobenzene (78-126%)	95 %					03/29/06 02:42	SW846 8260B	6035039

Extractable Petroleum Hydrocarbons

Diesel	3860	QSG	ug/L	189	2	04/03/06 20:17	NWTPH-Dx	6034969
Motor Oil	252	QSG	ug/L	189	2	04/03/06 20:17	NWTPH-Dx	6034969
Surr: o-Terphenyl (51-142%)	97 %					04/03/06 20:17	NWTPH-Dx	6034969

Purgeable Petroleum Hydrocarbons

GRO as Gasoline	971		ug/L	100	1	04/03/06 04:25	NWTPH-Gx	6036176

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3271-06 (KMW29-032306 - Water) - cont. Sampled: 03/23/06 15:15								
Purgeable Petroleum Hydrocarbons - cont.								
Surr: a,a,a-Trifluorotoluene (63-134%)	171 %	ZX				04/03/06 04:25	NWTPH-Gx	6036176
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00647		mg/l	0.00100	1	03/30/06 23:53	EPA 6020	6031399
Copper	0.00258		mg/l	0.00200	1	03/30/06 23:53	EPA 6020	6031399
Lead	ND		mg/l	0.00100	1	03/31/06 16:26	EPA 6020	6031399
Zinc	ND		mg/l	0.00500	1	03/30/06 23:53	EPA 6020	6031399
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00426		mg/l	0.00100	1	03/29/06 20:14	EPA 6020	6031344
Copper	ND		mg/l	0.00200	1	03/29/06 20:14	EPA 6020	6031344
Lead	ND		mg/l	0.00100	1	03/29/06 20:14	EPA 6020	6031344
Zinc	ND		mg/l	0.00500	1	03/29/06 20:14	EPA 6020	6031344
Sample ID: NPC3271-07 (KMW18-032306 - Water) Sampled: 03/23/06 13:45								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	10.6		ug/L	1.00	1	03/29/06 03:04	SW846 8260B	6035039
Ethylbenzene	ND		ug/L	1.00	1	03/29/06 03:04	SW846 8260B	6035039
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/29/06 03:04	SW846 8260B	6035039
Naphthalene	ND		ug/L	5.00	1	03/29/06 03:04	SW846 8260B	6035039
Toluene	ND		ug/L	1.00	1	03/29/06 03:04	SW846 8260B	6035039
Xylenes, total	ND		ug/L	3.00	1	03/29/06 03:04	SW846 8260B	6035039
Surr: 1,2-Dichloroethane-d4 (70-130%)	102 %					03/29/06 03:04	SW846 8260B	6035039
Surr: Dibromofluoromethane (79-122%)	102 %					03/29/06 03:04	SW846 8260B	6035039
Surr: Toluene-d8 (78-121%)	104 %					03/29/06 03:04	SW846 8260B	6035039
Surr: 4-Bromofluorobenzene (78-126%)	109 %					03/29/06 03:04	SW846 8260B	6035039
Extractable Petroleum Hydrocarbons								
Diesel	997	QSG	ug/L	98.0	1	03/31/06 18:02	NWTPH-Dx	6034969
Motor Oil	428	QSG	ug/L	98.0	1	03/31/06 18:02	NWTPH-Dx	6034969
Surr: o-Terphenyl (51-142%)	112 %					03/31/06 18:02	NWTPH-Dx	6034969
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	137		ug/L	100	1	04/03/06 04:59	NWTPH-Gx	6036176
Surr: a,a,a-Trifluorotoluene (63-134%)	86 %					04/03/06 04:59	NWTPH-Gx	6036176
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00621		mg/l	0.00100	1	03/31/06 00:01	EPA 6020	6031399
Copper	0.00311		mg/l	0.00200	1	03/31/06 00:01	EPA 6020	6031399
Lead	0.00116		mg/l	0.00100	1	03/31/06 16:33	EPA 6020	6031399
Zinc	0.00581		mg/l	0.00500	1	03/31/06 00:01	EPA 6020	6031399
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00511		mg/l	0.00100	1	03/29/06 20:28	EPA 6020	6031344
Copper	ND		mg/l	0.00200	1	03/29/06 20:28	EPA 6020	6031344
Lead	ND		mg/l	0.00100	1	03/29/06 20:28	EPA 6020	6031344
Zinc	0.00776		mg/l	0.00500	1	03/29/06 20:28	EPA 6020	6031344

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3271-08 (DUPE-2-032306 - Water) Sampled: 03/23/06								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	03/29/06 03:26	SW846 8260B	6035039
Ethylbenzene	ND		ug/L	1.00	1	03/29/06 03:26	SW846 8260B	6035039
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/29/06 03:26	SW846 8260B	6035039
Naphthalene	ND		ug/L	5.00	1	03/29/06 03:26	SW846 8260B	6035039
Toluene	ND		ug/L	1.00	1	03/29/06 03:26	SW846 8260B	6035039
Xylenes, total	ND		ug/L	3.00	1	03/29/06 03:26	SW846 8260B	6035039
<i>Surr: 1,2-Dichloroethane-d4 (70-130%)</i>	104 %					03/29/06 03:26	SW846 8260B	6035039
<i>Surr: Dibromofluoromethane (79-122%)</i>	102 %					03/29/06 03:26	SW846 8260B	6035039
<i>Surr: Toluene-d8 (78-121%)</i>	106 %					03/29/06 03:26	SW846 8260B	6035039
<i>Surr: 4-Bromofluorobenzene (78-126%)</i>	94 %					03/29/06 03:26	SW846 8260B	6035039
Extractable Petroleum Hydrocarbons								
Diesel	896	QSG	ug/L	96.2	1	03/31/06 18:19	NWTPH-Dx	6034969
Motor Oil	408	QSG	ug/L	96.2	1	03/31/06 18:19	NWTPH-Dx	6034969
<i>Surr: o-Terphenyl (51-142%)</i>	105 %					03/31/06 18:19	NWTPH-Dx	6034969
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	04/03/06 05:33	NWTPH-Gx	6036176
<i>Surr: a,a,a-Trifluorotoluene (63-134%)</i>	84 %					04/03/06 05:33	NWTPH-Gx	6036176
Total Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00275		mg/l	0.00100	1	03/29/06 06:24	EPA 6020	6031337
Copper	0.00600		mg/l	0.00200	1	03/29/06 06:24	EPA 6020	6031337
Lead	0.00343		mg/l	0.00100	1	03/29/06 06:24	EPA 6020	6031337
Zinc	0.00761		mg/l	0.00500	1	03/29/06 06:24	EPA 6020	6031337
Dissolved Metals per EPA 6000/7000 Series Methods								
Arsenic	0.00242		mg/l	0.00100	1	03/29/06 11:31	EPA 6020	6031344
Copper	ND		mg/l	0.00200	1	03/29/06 11:31	EPA 6020	6031344
Lead	ND		mg/l	0.00100	1	03/29/06 11:31	EPA 6020	6031344
Zinc	0.00669		mg/l	0.00500	1	03/29/06 11:31	EPA 6020	6031344
Sample ID: NPC3271-09 (TB-3-032306 - Water) Sampled: 03/23/06 09:00								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	03/29/06 03:48	SW846 8260B	6035039
Ethylbenzene	ND		ug/L	1.00	1	03/29/06 03:48	SW846 8260B	6035039
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	03/29/06 03:48	SW846 8260B	6035039
Naphthalene	ND		ug/L	5.00	1	03/29/06 03:48	SW846 8260B	6035039
Toluene	ND		ug/L	1.00	1	03/29/06 03:48	SW846 8260B	6035039
Xylenes, total	ND		ug/L	3.00	1	03/29/06 03:48	SW846 8260B	6035039
<i>Surr: 1,2-Dichloroethane-d4 (70-130%)</i>	107 %					03/29/06 03:48	SW846 8260B	6035039
<i>Surr: Dibromofluoromethane (79-122%)</i>	104 %					03/29/06 03:48	SW846 8260B	6035039
<i>Surr: Toluene-d8 (78-121%)</i>	103 %					03/29/06 03:48	SW846 8260B	6035039
<i>Surr: 4-Bromofluorobenzene (78-126%)</i>	99 %					03/29/06 03:48	SW846 8260B	6035039
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	04/07/06 14:42	NWTPH-Gx	6041268

Client Acton Mickelson Environmental, Inc. (13785)
 5175 Hillsdale Circle, Suite 100
 El Dorado Hills, CA 95762
 Attn John Shaal

Work Order: NPC3271
 Project Name: Former Portland Terminal #36-001
 Project Number: 13041.05
 Received: 03/25/06 08:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPC3271-09 (TB-3-032306 - Water) - cont. Sampled: 03/23/06 09:00								
Purgeable Petroleum Hydrocarbons - cont.								
Surr: a,a,a-Trifluorotoluene (63-134%)	80 %					04/07/06 14:42	NWTPH-Gx	6041268

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Work Order: NPC3271
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 Project Number: 13041.05
 Received: 03/25/06 08:00

SAMPLE EXTRACTION DATA

Parameter	Batch	Lab Number	Wt/Vol Extracted	Extracted Vol	Date	Analyst	Extraction Method
Extractable Petroleum Hydrocarbons							
NWTPH-Dx	6035142	NPC3271-01	1050.00	1.00	03/28/06 09:15	KLK	EPA 3510C
NWTPH-Dx	6035142	NPC3271-02	1050.00	1.00	03/28/06 09:15	KLK	EPA 3510C
NWTPH-Dx	6034969	NPC3271-03	1050.00	1.00	03/27/06 16:07	KLK	EPA 3510C
NWTPH-Dx	6034969	NPC3271-04	1060.00	1.00	03/27/06 16:07	KLK	EPA 3510C
NWTPH-Dx	6034969	NPC3271-04RE1	1060.00	1.00	03/27/06 16:07	KLK	EPA 3510C
NWTPH-Dx	6034969	NPC3271-05	1040.00	1.00	03/27/06 16:07	KLK	EPA 3510C
NWTPH-Dx	6034969	NPC3271-06	1060.00	1.00	03/27/06 16:07	KLK	EPA 3510C
NWTPH-Dx	6034969	NPC3271-06RE1	1060.00	1.00	03/27/06 16:07	KLK	EPA 3510C
NWTPH-Dx	6034969	NPC3271-07	1020.00	1.00	03/27/06 16:07	KLK	EPA 3510C
NWTPH-Dx	6034969	NPC3271-08	1040.00	1.00	03/27/06 16:07	KLK	EPA 3510C

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Received: 03/25/06 08:00

PROJECT QUALITY CONTROL DATA

Blank

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time

Selected Volatile Organic Compounds by EPA Method 8260B

6035039-BLK1

Benzene	<0.290		ug/L	6035039	6035039-BLK1	03/28/06 23:47
Ethylbenzene	<0.340		ug/L	6035039	6035039-BLK1	03/28/06 23:47
Methyl tert-Butyl Ether	<0.320		ug/L	6035039	6035039-BLK1	03/28/06 23:47
Naphthalene	<1.13		ug/L	6035039	6035039-BLK1	03/28/06 23:47
Toluene	<0.280		ug/L	6035039	6035039-BLK1	03/28/06 23:47
Xylenes, total	<0.820		ug/L	6035039	6035039-BLK1	03/28/06 23:47
Surrogate: 1,2-Dichloroethane-d4	101%			6035039	6035039-BLK1	03/28/06 23:47
Surrogate: Dibromofluoromethane	102%			6035039	6035039-BLK1	03/28/06 23:47
Surrogate: Toluene-d8	102%			6035039	6035039-BLK1	03/28/06 23:47
Surrogate: 4-Bromofluorobenzene	94%			6035039	6035039-BLK1	03/28/06 23:47

Extractable Petroleum Hydrocarbons

6034969-BLK1

Diesel	51.0		ug/L	6034969	6034969-BLK1	03/31/06 15:28
Motor Oil	72.6		ug/L	6034969	6034969-BLK1	03/31/06 15:28
Surrogate: o-Terphenyl	114%			6034969	6034969-BLK1	03/31/06 15:28

6035142-BLK1

Diesel	44.1		ug/L	6035142	6035142-BLK1	03/30/06 01:40
Motor Oil	82.9		ug/L	6035142	6035142-BLK1	03/30/06 01:40
Surrogate: o-Terphenyl	124%			6035142	6035142-BLK1	03/30/06 01:40

Purgeable Petroleum Hydrocarbons

6036176-BLK1

GRO as Gasoline	<40.0		ug/L	6036176	6036176-BLK1	04/02/06 17:53
Surrogate: a,a,a-Trifluorotoluene	77%			6036176	6036176-BLK1	04/02/06 17:53

6041268-BLK1

GRO as Gasoline	<40.0		ug/L	6041268	6041268-BLK1	04/07/06 05:19
Surrogate: a,a,a-Trifluorotoluene	82%			6041268	6041268-BLK1	04/07/06 05:19

Total Metals per EPA 6000/7000 Series Methods

6031337-BLK1

Arsenic	<0.000664		mg/l	6031337	6031337-BLK1	03/29/06 00:26
Copper	<0.000133		mg/l	6031337	6031337-BLK1	03/29/06 00:26
Lead	<0.0000553		mg/l	6031337	6031337-BLK1	03/29/06 00:26
Zinc	0.00123		mg/l	6031337	6031337-BLK1	03/29/06 00:26

6031399-BLK1

Arsenic	<0.000664		mg/l	6031399	6031399-BLK1	03/30/06 20:51
Copper	<0.000133		mg/l	6031399	6031399-BLK1	03/30/06 20:51
Lead	<0.0000553		mg/l	6031399	6031399-BLK1	03/31/06 13:45

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Received: 03/25/06 08:00

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time
Total Metals per EPA 6000/7000 Series Methods						
6031399-BLK1						
Zinc	<0.000469		mg/l	6031399	6031399-BLK1	03/30/06 20:51
Dissolved Metals per EPA 6000/7000 Series Methods						
6031344-BLK1						
Arsenic	<0.000664		mg/l	6031344	6031344-BLK1	03/29/06 07:17
Copper	<0.000133		mg/l	6031344	6031344-BLK1	03/29/06 07:17
Lead	<0.0000553		mg/l	6031344	6031344-BLK1	03/29/06 07:17
Zinc	<0.000469		mg/l	6031344	6031344-BLK1	03/29/06 07:17

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Project Name: Former Portland Terminal #36-001
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PROJECT QUALITY CONTROL DATA

Duplicate

Analyte	Orig. Val.	Duplicate	Q	Units	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
Total Metals per EPA 6000/7000 Series Methods									
6031337-DUP1									
Arsenic	ND	ND		mg/l		20	6031337	P6C0900-02	03/29/06 01:44
Copper	0.00189	0.00186		mg/l	1.60	20	6031337	P6C0900-02	03/29/06 01:44
Lead	0.000482	0.000494		mg/l	2.46	20	6031337	P6C0900-02	03/29/06 01:44
Zinc	0.0124	0.0113		mg/l	9.28	20	6031337	P6C0900-02	03/29/06 01:44
6031399-DUP1									
Arsenic	0.000939	0.000768		mg/l	20.0	20	6031399	P6C1015-03	03/30/06 21:36
Copper	0.00171	0.00168		mg/l	1.77	20	6031399	P6C1015-03	03/30/06 21:36
Lead	0.000345	0.000327		mg/l	5.36	20	6031399	P6C1015-03	03/31/06 14:16
Zinc	0.0110	0.0106		mg/l	3.70	20	6031399	P6C1015-03	03/30/06 21:36
Dissolved Metals per EPA 6000/7000 Series Methods									
6031344-DUP1									
Arsenic	ND	ND		mg/l		20	6031344	NPC3271-01	03/29/06 10:24
Copper	0.00576	0.00232	Q-06	mg/l	85.1	20	6031344	NPC3271-01	03/29/06 18:15
Lead	0.000603	0.000315	Q-06	mg/l	62.7	20	6031344	NPC3271-01	03/29/06 18:15
Zinc	0.0286	0.0297		mg/l	3.77	20	6031344	NPC3271-01	03/29/06 18:15

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Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

PROJECT QUALITY CONTROL DATA LCS

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B								
6035039-BS1								
Benzene	50.0	48.4		ug/L	97%	78 - 122	6035039	03/28/06 22:42
Ethylbenzene	50.0	54.0		ug/L	108%	82 - 122	6035039	03/28/06 22:42
Methyl tert-Butyl Ether	50.0	50.1		ug/L	100%	65 - 144	6035039	03/28/06 22:42
Naphthalene	50.0	79.6	L	ug/L	159%	64 - 144	6035039	03/28/06 22:42
Toluene	50.0	48.9		ug/L	98%	80 - 120	6035039	03/28/06 22:42
Xylenes, total	150	161		ug/L	107%	81 - 125	6035039	03/28/06 22:42
Surrogate: 1,2-Dichloroethane-d4	25.0	25.0			100%	70 - 130	6035039	03/28/06 22:42
Surrogate: Dibromofluoromethane	25.0	25.7			103%	79 - 122	6035039	03/28/06 22:42
Surrogate: Toluene-d8	25.0	26.3			105%	78 - 121	6035039	03/28/06 22:42
Surrogate: 4-Bromofluorobenzene	25.0	25.4			102%	78 - 126	6035039	03/28/06 22:42
Extractable Petroleum Hydrocarbons								
6034969-BS1								
Diesel	1000	735		ug/L	74%	60 - 107	6034969	03/31/06 15:45
Surrogate: o-Terphenyl	20.0	21.1			106%	51 - 142	6034969	03/31/06 15:45
6035142-BS1								
Diesel	1000	774		ug/L	77%	56 - 116	6035142	03/30/06 01:56
Surrogate: o-Terphenyl	20.0	22.4			112%	51 - 142	6035142	03/30/06 01:56
Purgeable Petroleum Hydrocarbons								
6036176-BS1								
GRO as Gasoline	1000	833		ug/L	83%	66 - 132	6036176	04/03/06 07:49
Surrogate: a,a,a-Trifluorotoluene	30.0	23.5			78%	63 - 134	6036176	04/03/06 07:49
6041268-BS1								
GRO as Gasoline	1000	926		ug/L	93%	66 - 132	6041268	04/07/06 13:11
Surrogate: a,a,a-Trifluorotoluene	30.0	26.1			87%	63 - 134	6041268	04/07/06 13:11
Total Metals per EPA 6000/7000 Series Methods								
6031337-BS1								
Arsenic	0.100	0.0971		mg/l	97%	80 - 120	6031337	03/29/06 00:40
Copper	0.100	0.0956		mg/l	96%	80 - 120	6031337	03/29/06 00:40
Lead	0.100	0.0972		mg/l	97%	80 - 120	6031337	03/29/06 00:40
Zinc	0.100	0.0911		mg/l	91%	80 - 120	6031337	03/29/06 00:40
6031399-BS1								
Arsenic	0.100	0.0972		mg/l	97%	80 - 120	6031399	03/30/06 20:58
Copper	0.100	0.0976		mg/l	98%	80 - 120	6031399	03/30/06 20:58
Lead	0.100	0.0948		mg/l	95%	80 - 120	6031399	03/31/06 13:53
Zinc	0.100	0.0945		mg/l	95%	80 - 120	6031399	03/30/06 20:58

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Received: 03/25/06 08:00

PROJECT QUALITY CONTROL DATA
LCS - Cont.

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
Dissolved Metals per EPA 6000/7000 Series Methods								
6031344-BS1								
Arsenic	0.100	0.101		mg/l	101%	80 - 120	6031344	03/29/06 07:31
Copper	0.100	0.0975		mg/l	98%	80 - 120	6031344	03/29/06 07:31
Lead	0.100	0.0983		mg/l	98%	80 - 120	6031344	03/29/06 07:31
Zinc	0.100	0.0920		mg/l	92%	80 - 120	6031344	03/29/06 07:31

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Received: 03/25/06 08:00

PROJECT QUALITY CONTROL DATA

Matrix Spike

Analyte	Orig. Val.	MS Val	Q	Units	Spike Conc	% Rec.	Target Range	Batch	Sample Spiked	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B										
6035039-MS1										
Benzene	ND	61.6		ug/L	50.0	123%	74 - 133	6035039	NPC3279-04	03/29/06 07:27
Ethylbenzene	ND	69.5	M7	ug/L	50.0	139%	74 - 134	6035039	NPC3279-04	03/29/06 07:27
Methyl tert-Butyl Ether	ND	53.4		ug/L	50.0	107%	58 - 151	6035039	NPC3279-04	03/29/06 07:27
Naphthalene	ND	91.3	M7	ug/L	50.0	183%	47 - 154	6035039	NPC3279-04	03/29/06 07:27
Toluene	ND	62.0		ug/L	50.0	124%	73 - 133	6035039	NPC3279-04	03/29/06 07:27
Xylenes, total	ND	204		ug/L	150	136%	68 - 139	6035039	NPC3279-04	03/29/06 07:27
Surrogate: 1,2-Dichloroethane-d4		24.5		ug/L	25.0	98%	70 - 130	6035039	NPC3279-04	03/29/06 07:27
Surrogate: Dibromofluoromethane		25.3		ug/L	25.0	101%	79 - 122	6035039	NPC3279-04	03/29/06 07:27
Surrogate: Toluene-d8		26.8		ug/L	25.0	107%	78 - 121	6035039	NPC3279-04	03/29/06 07:27
Surrogate: 4-Bromofluorobenzene		25.6		ug/L	25.0	102%	78 - 126	6035039	NPC3279-04	03/29/06 07:27
Purgeable Petroleum Hydrocarbons										
6036176-MS1										
GRO as Gasoline	ND	847		ug/L	1000	85%	48 - 138	6036176	NPC3128-01	04/03/06 06:41
Surrogate: a,a,a-Trifluorotoluene		26.8		ug/L	30.0	89%	63 - 134	6036176	NPC3128-01	04/03/06 06:41
Total Metals per EPA 6000/7000 Series Methods										
6031337-MS1										
Arsenic	ND	0.0967		mg/l	0.100	97%	75 - 125	6031337	P6C0900-02	03/29/06 02:11
Copper	0.00189	0.0898		mg/l	0.100	88%	75 - 125	6031337	P6C0900-02	03/29/06 02:11
Lead	0.000482	0.0894		mg/l	0.100	89%	75 - 125	6031337	P6C0900-02	03/29/06 02:11
Zinc	0.0124	0.0981		mg/l	0.100	86%	75 - 125	6031337	P6C0900-02	03/29/06 02:11
6031337-MS2										
Arsenic	ND	0.0956		mg/l	0.100	96%	75 - 125	6031337	P6C0976-03	03/29/06 04:51
Copper	0.000215	0.0945		mg/l	0.100	94%	75 - 125	6031337	P6C0976-03	03/29/06 04:51
Lead	0.000446	0.0981		mg/l	0.100	98%	75 - 125	6031337	P6C0976-03	03/29/06 04:51
Zinc	ND	0.0907		mg/l	0.100	91%	75 - 125	6031337	P6C0976-03	03/29/06 04:51
6031399-MS1										
Arsenic	0.000939	0.104		mg/l	0.100	103%	75 - 125	6031399	P6C1015-03	03/30/06 21:52
Copper	0.00171	0.102		mg/l	0.100	100%	75 - 125	6031399	P6C1015-03	03/30/06 21:52
Lead	0.000345	0.0917		mg/l	0.100	91%	75 - 125	6031399	P6C1015-03	03/31/06 14:39
Zinc	0.0110	0.110		mg/l	0.100	99%	75 - 125	6031399	P6C1015-03	03/30/06 21:52
6031399-MS2										
Arsenic	0.00280	0.108		mg/l	0.100	105%	75 - 125	6031399	P6C1032-07	03/30/06 23:08
Copper	0.00948	0.109		mg/l	0.100	100%	75 - 125	6031399	P6C1032-07	03/30/06 23:08
Lead	0.00378	0.0960		mg/l	0.100	92%	75 - 125	6031399	P6C1032-07	03/31/06 15:40

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

PROJECT QUALITY CONTROL DATA
Matrix Spike - Cont.

Analyte	Orig. Val.	MS Val	Q	Units	Spike Conc	% Rec.	Target Range	Batch	Sample Spiked	Analyzed Date/Time
Total Metals per EPA 6000/7000 Series Methods										
6031399-MS2										
Zinc	1.58	1.68		mg/l	0.100	100%	75 - 125	6031399	P6C1032-07	03/31/06 15:25
Dissolved Metals per EPA 6000/7000 Series Methods										
6031344-MS1										
Arsenic	ND	0.0964		mg/l	0.100	96%	75 - 125	6031344	NPC3271-01	03/29/06 10:52
Copper	0.00576	0.0946		mg/l	0.100	89%	75 - 125	6031344	NPC3271-01	03/29/06 10:52
Lead	0.000603	0.0942		mg/l	0.100	94%	75 - 125	6031344	NPC3271-01	03/29/06 10:52
Zinc	0.0286	0.117		mg/l	0.100	88%	75 - 125	6031344	NPC3271-01	03/29/06 10:52
6031344-MS2										
Arsenic	0.00245	0.103		mg/l	0.100	101%	75 - 125	6031344	P6C1032-05	03/29/06 18:54
Copper	0.00137	0.0966		mg/l	0.100	95%	75 - 125	6031344	P6C1032-05	03/29/06 18:54
Lead	0.000526	0.0967		mg/l	0.100	96%	75 - 125	6031344	P6C1032-05	03/29/06 18:54
Zinc	0.00897	0.101		mg/l	0.100	92%	75 - 125	6031344	P6C1032-05	03/29/06 18:54

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

PROJECT QUALITY CONTROL DATA

Matrix Spike Dup

Analyte	Orig. Val.	Duplicate	Q	Units	Spike Conc	% Rec.	Target Range	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B												
6035039-MSD1												
Benzene	ND	54.7		ug/L	50.0	109%	74 - 133	12	19	6035039	NPC3279-04	03/29/06 07:49
Ethylbenzene	ND	58.1		ug/L	50.0	116%	74 - 134	18	21	6035039	NPC3279-04	03/29/06 07:49
Methyl tert-Butyl Ether	ND	50.9		ug/L	50.0	102%	58 - 151	5	28	6035039	NPC3279-04	03/29/06 07:49
Naphthalene	ND	78.7	M7	ug/L	50.0	157%	47 - 154	15	43	6035039	NPC3279-04	03/29/06 07:49
Toluene	ND	53.7		ug/L	50.0	107%	73 - 133	14	20	6035039	NPC3279-04	03/29/06 07:49
Xylenes, total	ND	168		ug/L	150	112%	68 - 139	19	23	6035039	NPC3279-04	03/29/06 07:49
Surrogate: 1,2-Dichloroethane-d4		26.1		ug/L	25.0	104%	70 - 130			6035039	NPC3279-04	03/29/06 07:49
Surrogate: Dibromofluoromethane		25.9		ug/L	25.0	104%	79 - 122			6035039	NPC3279-04	03/29/06 07:49
Surrogate: Toluene-d8		26.0		ug/L	25.0	104%	78 - 121			6035039	NPC3279-04	03/29/06 07:49
Surrogate: 4-Bromofluorobenzene		25.1		ug/L	25.0	100%	78 - 126			6035039	NPC3279-04	03/29/06 07:49
Purgeable Petroleum Hydrocarbons												
6036176-MSD1												
GRO as Gasoline	ND	929		ug/L	1000	93%	48 - 138	9	36	6036176	NPC3128-01	04/03/06 07:15
Surrogate: a,a,a-Trifluorotoluene		26.9		ug/L	30.0	90%	63 - 134			6036176	NPC3128-01	04/03/06 07:15

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville

Method	Matrix	AIHA	Nelac	Oregon
NA	Water			
NWTPH-Dx	Water	N/A	X	X
NWTPH-Gx	Water	N/A	X	X
subcontract	Water			
SW846 8260B	Water	N/A	X	X

Subcontracted Laboratories

North Creek Analytical - Beaverton (11664)

9405 SW Nimbus Avenue - Beaverton, OR 97008

Method Performed: EPA 6020

Samples: NPC3271-01, NPC3271-02, NPC3271-03, NPC3271-04, NPC3271-05, NPC3271-06, NPC3271-07,
NPC3271-08

North Creek Analytical - Beaverton (11664)

9405 SW Nimbus Avenue - Beaverton, OR 97008

Analysis Performed: Subcontract - Outside

Samples: NPC3271-01, NPC3271-02, NPC3271-03, NPC3271-04, NPC3271-05, NPC3271-06, NPC3271-07,
NPC3271-08

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

NELAC CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville does not hold NELAC certifications for the following analytes included in this report

Method

Matrix

Analyte

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPC3271
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 03/25/06 08:00

DATA QUALIFIERS AND DEFINITIONS

L Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was above the acceptance limits. Analyte not detected, data not impacted.
M7 The MS and/or MSD were above the acceptance limits. See Blank Spike (LCS).
Q-06 RPD is not applicable for analyte concentrations less than 5 times the MRL.
QSG Silica Gel clean-up performed on extracts.
ZX Due to sample matrix effects, the surrogate recovery was outside the acceptance limits.

METHOD MODIFICATION NOTES



Nashville Division

COOLER RECEIPT FORM

BC#



NPC3271

Cooler Received/Opened On 03/25/2006 @ 8:15

1. Indicate the Airbill Tracking Number (last 4 digits for Fedex only) and Name of Courier below: 121A2587449757

Fed-Ex UPS Velocity DHL Route Off-street Misc. 8425

2. Temperature of representative sample or temperature blank when opened: 1.4 Degrees Celsius
(indicate IR Gun ID#)

NA A00466 A00750 A01124 100190 101282 Raynger ST

3. Were custody seals on outside of cooler?..... YES...NO...NA

a. If yes, how many and where: 1 front

4. Were the seals intact, signed, and dated correctly?..... YES...NO...NA

5. Were custody papers inside cooler?..... YES...NO...NA

I certify that I opened the cooler and answered questions 1-5 (initial)..... VRS

6. Were custody seals on containers: YES NO and Intact YES NO NA
were these signed, and dated correctly?..... YES...NO...NA

7. What kind of packing material used? Bubblewrap Peanuts Vermiculite Foam Insert
Plastic bag Paper Other _____ None

8. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

9. Did all containers arrive in good condition (unbroken)?..... YES...NO...NA

10. Were all container labels complete (#, date, signed, pres., etc)?..... YES...NO...NA

11. Did all container labels and tags agree with custody papers?..... YES...NO...NA

12. a. Were VOA vials received?..... YES...NO...NA

b. Was there any observable head space present in any VOA vial?..... YES...NO...NA

I certify that I unloaded the cooler and answered questions 6-12 (initial)..... JK

13. a. On preserved bottles did the pH test strips suggest that preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used?..... YES...NO...NA

If preservation in-house was needed, record standard ID of preservative used here _____

14. Was residual chlorine present?..... YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 13-14 (initial)..... JK

15. Were custody papers properly filled out (ink, signed, etc)?..... YES...NO...NA

16. Did you sign the custody papers in the appropriate place?..... YES...NO...NA

17. Were correct containers used for the analysis requested?..... YES...NO...NA

18. Was sufficient amount of sample sent in each container?..... YES...NO...NA

I certify that I entered this project into LIMS and answered questions 15-18 (initial)..... JK

I certify that I attached a label with the unique LIMS number to each container (initial)..... JK

19. Were there Non-Conformance issues at login YES NO Was a PIPE generated YES NO # _____

BIS = Broken in shipment
Cooler Receipt Form

LF-I
End of Form

Revised 3/9/06



Nashville Division

COOLER RECEIPT FORM

BC#

Cooler Received/Opened On 03/25/2006 @ 8:15

1. Indicate the Airbill Tracking Number (last 4 digits for Fedex only) and Name of Courier below: 121AE58744 9835

Fed-Ex UPS Velocity DHL Route Off-street Misc. 1819

2. Temperature of representative sample or temperature blank when opened: 1.1 Degrees Celsius
(indicate IR Gun ID#)

NA A00466 A00750 A01124 100190 101282 Raynger ST

3. Were custody seals on outside of cooler?..... YES...NO...NA

a. If yes, how many and where: 1 Seal

4. Were the seals intact, signed, and dated correctly?..... YES...NO...NA

5. Were custody papers inside cooler?..... YES...NO...NA

I certify that I opened the cooler and answered questions 1-5 (initial)..... PR

6. Were custody seals on containers: YES NO and Intact YES NO NA

were these signed, and dated correctly?..... YES...NO...NA

7. What kind of packing material used? Bubblewrap Peanuts Vermiculite Foam Insert

Plastic bag Paper Other _____ None

8. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

9. Did all containers arrive in good condition (unbroken)?..... YES...NO...NA

10. Were all container labels complete (#, date, signed, pres., etc)?..... YES...NO...NA

11. Did all container labels and tags agree with custody papers?..... YES...NO...NA

12. a. Were VOA vials received?..... YES...NO...NA

b. Was there any observable head space present in any VOA vial?..... YES...NO...NA

I certify that I unloaded the cooler and answered questions 6-12 (initial)..... PR

13. a. On preserved bottles did the pH test strips suggest that preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used..... YES...NO...NA

If preservation in-house was needed, record standard ID of preservative used here _____

14. Was residual chlorine present?..... YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 13-14 (initial)..... PR

15. Were custody papers properly filled out (ink, signed, etc)?..... YES...NO...NA

16. Did you sign the custody papers in the appropriate place?..... YES...NO...NA

17. Were correct containers used for the analysis requested?..... YES...NO...NA

18. Was sufficient amount of sample sent in each container?..... YES...NO...NA

I certify that I entered this project into LIMS and answered questions 15-18 (initial)..... PR

I certify that I attached a label with the unique LIMS number to each container (initial)..... PR

19. Were there Non-Conformance issues at login YES NO Was a PIPE generated YES NO # _____

BIS = Broken in shipment

Cooler Receipt Form

Acton • Mickelson • Environmental, Inc.

Chain of Custody and Analysis Request Form

Geotracker Global ID _____



Standard TAT



RUSH TAT



24 hr. TAT



48 hr. TAT



72 hr. TAT



5 day TAT

Page 1 of 1

Chain of Custody

4861

Send Results to:

5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
(916) 939-7550, FAX (916) 939-7570

Attn: John Shaul

Preliminary Fax Result



Sample Receipt/ Log-In Confirmation



Electronic Data Deliverables EMAIL TO



Geotracker EDF



Raw Data Deliverables

Call with Verbal Results

Matrix
Container
Number of Containers
Preservative

Requested Analysis
82608 BTEX
82608 MTBE, DAPM
NWTPH Gx
NWTPH D2 (d+D)

Lab ID (LAB USE ONLY)	Field Point ID	Sample ID	Date Collected	Time Collected	Matrix	Container	Number of Containers	Preservative	82608 BTEX	82608 MTBE, DAPM	NWTPH Gx	NWTPH D2 (d+D)	Comments
NPC3271 04/10/06 17:00	W-22	W-22-032306	3/23/06	0935	GW	GB	1	HC	X	X	X	X	NPC 3271-1
	W-20	W-20-032306	3/23/06	1000	GW	GB	1	HC	X	X	X	X	2
	W-19	W-19-032306	3/23/06	1025	GW	GB	1	HC	X	X	X	X	3
	KMW31	KMW31-032306	3/23/06	1420	GW	GB	1	HC	X	X	X	X	4
	KMW30	KMW30-032306	3/23/06	1445	GW	GB	1	HC	X	X	X	X	5
	KMW29	KMW29-032306	3/23/06	1515	GW	GB	1	HC	X	X	X	X	6
	KMW18	KMW18-032306	3/23/06	1345	GW	GB	1	HC	X	X	X	X	7
	QA/QC	DUPE-2-032306	3/23/06	—	GW	GB	1	HC	X	X	X	X	8
	QA/QC	TB-3-032306	3/23/06	0900	RW	V	4	HC	X	X	X		9

Signature	Date	Time	Signature	Date	Time
Relinquished by: <u>[Signature]</u>	3/23/06	1600	Relinquished by: _____		
Received by: <u>[Signature]</u>	3/23/06	1600	Received by: _____		
Relinquished by: <u>[Signature]</u>	3-24-06 17:05	lab 17:05	Relinquished by: _____		
Received by: <u>[Signature]</u>	3-25-06	8:00	Received by: _____		

Matrix: W - Water; DW - Drinking Water; SW - Surface Water; GW - Ground Water; WW - Waste Water;
RW - Reagent Water; S - Soil; SE - Sediment; SV - Soil Vapor; AA - Ambient Air; WS - Waste (Solid); O - Other
Container: GB - Glass Bottle (Amber); V - 40 ml VOA Vial; BT, ST, PT - Brass, Steel, and Plastic Tube;
P - Polyethylene; GJ - Glass Jar, SC - Summa Canister; TD - Tedlar
Preservative: C - Cold; HS - Sulfuric Acid; HC - Hydrochloric Acid; HN - Nitric Acid; Na - Sodium Hydroxide; O - Other

Project Name and Location: Former Portland Terminal #36-001
Project Number: 13041.05 Receiving Lab: Test America
Sampled by: Brian Richardson (BAR) [Signature]
Print Name Signature

ORIGINAL - Laboratory (Return with Report)

YELLOW - Laboratory

PINK - Originator

May 26, 2006

Client: Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn: John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Nbr: 13041.05
P/O Nbr:
Date Received: 05/12/06

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
KMW14-05906	NPE1930-01	05/09/06 15:55
MW38-05906	NPE1930-02	05/09/06 16:15
MW39-05906	NPE1930-03	05/09/06 16:45
W-22-051006	NPE1930-04	05/10/06 08:50
W-20-051006	NPE1930-05	05/10/06 09:20
W-19-051006	NPE1930-06	05/10/06 09:50
MW40-051006	NPE1930-07	05/10/06 10:25
KMW35-051006	NPE1930-08	05/10/06 10:45
TB-2-05906	NPE1930-09	05/09/06 15:45
DUPE-2-05906	NPE1930-10	05/09/06 00:01
KMW36-051006	NPE1930-11	05/10/06 11:30
KMW37-051006	NPE1930-12	05/10/06 12:25
KMW29-051006	NPE1930-13	05/10/06 12:50
KMW30-051006	NPE1930-14	05/10/06 13:10
KMW31-051006	NPE1930-15	05/10/06 14:20
KMW33-051006	NPE1930-16	05/10/06 14:45
KMW34-051006	NPE1930-17	05/10/06 15:20
W-16-051006	NPE1930-18	05/10/06 15:45

An executed copy of the chain of custody, the project quality control data, and the sample receipt form are also included as an addendum to this report. If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-800-765-0980. Any opinions, if expressed, are outside the scope of the Laboratory's accreditation.

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Oregon Certification Number: TN200001

The Chain(s) of Custody, 4 pages, are included and are an integral part of this report.

These results relate only to the items tested. This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By:



Leah R. Klingensmith
Senior Project Management

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch

Sample ID: NPE1930-01 (KMW14-05906 - Ground Water) Sampled: 05/09/06 15:55

Selected Volatile Organic Compounds by EPA Method 8260B

Benzene	12.6		ug/L	1.00	1	05/22/06 20:21	SW846 8260B	6054612
Ethylbenzene	ND		ug/L	1.00	1	05/22/06 20:21	SW846 8260B	6054612
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/22/06 20:21	SW846 8260B	6054612
Naphthalene	ND		ug/L	5.00	1	05/22/06 20:21	SW846 8260B	6054612
Toluene	ND		ug/L	1.00	1	05/22/06 20:21	SW846 8260B	6054612
Xylenes, total	ND		ug/L	3.00	1	05/22/06 20:21	SW846 8260B	6054612
Surr: 1,2-Dichloroethane-d4 (70-130%)	103 %					05/22/06 20:21	SW846 8260B	6054612
Surr: Dibromofluoromethane (79-122%)	99 %					05/22/06 20:21	SW846 8260B	6054612
Surr: Toluene-d8 (78-121%)	100 %					05/22/06 20:21	SW846 8260B	6054612
Surr: 4-Bromofluorobenzene (78-126%)	108 %					05/22/06 20:21	SW846 8260B	6054612

Extractable Petroleum Hydrocarbons

Diesel	152	QSG	ug/L	95.2	1	05/20/06 05:12	NWTPH-Dx	6052881
Motor Oil	111	QSG	ug/L	95.2	1	05/20/06 05:12	NWTPH-Dx	6052881
Surr: o-Terphenyl (51-142%)	87 %					05/20/06 05:12	NWTPH-Dx	6052881

Purgeable Petroleum Hydrocarbons

GRO as Gasoline	275		ug/L	100	1	05/19/06 20:20	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	105 %					05/19/06 20:20	NWTPH-Gx	6053952

Sample ID: NPE1930-02RE1 (MW38-05906 - Ground Water) Sampled: 05/09/06 16:15

Selected Volatile Organic Compounds by EPA Method 8260B

Benzene	2840	H2	ug/L	100	100	05/24/06 02:09	SW846 8260B	6054855
Ethylbenzene	261	H2	ug/L	10.0	10	05/24/06 01:43	SW846 8260B	6054855
Methyl tert-Butyl Ether	3.66		ug/L	1.00	1	05/22/06 20:46	SW846 8260B	6054612
Naphthalene	5.48		ug/L	5.00	1	05/22/06 20:46	SW846 8260B	6054612
Toluene	47.7		ug/L	1.00	1	05/22/06 20:46	SW846 8260B	6054612
Xylenes, total	53.6		ug/L	3.00	1	05/22/06 20:46	SW846 8260B	6054612
Surr: 1,2-Dichloroethane-d4 (70-130%)	101 %					05/22/06 20:46	SW846 8260B	6054612
Surr: 1,2-Dichloroethane-d4 (70-130%)	105 %					05/24/06 01:43	SW846 8260B	6054855
Surr: Dibromofluoromethane (79-122%)	94 %					05/22/06 20:46	SW846 8260B	6054612
Surr: Dibromofluoromethane (79-122%)	98 %					05/24/06 01:43	SW846 8260B	6054855
Surr: Toluene-d8 (78-121%)	102 %					05/22/06 20:46	SW846 8260B	6054612
Surr: Toluene-d8 (78-121%)	101 %					05/24/06 01:43	SW846 8260B	6054855
Surr: 4-Bromofluorobenzene (78-126%)	108 %					05/22/06 20:46	SW846 8260B	6054612
Surr: 4-Bromofluorobenzene (78-126%)	108 %					05/24/06 01:43	SW846 8260B	6054855

Extractable Petroleum Hydrocarbons

Diesel	1060	QSG	ug/L	95.2	1	05/20/06 05:28	NWTPH-Dx	6052881
Motor Oil	104	QSG	ug/L	95.2	1	05/20/06 05:28	NWTPH-Dx	6052881
Surr: o-Terphenyl (51-142%)	124 %					05/20/06 05:28	NWTPH-Dx	6052881

Purgeable Petroleum Hydrocarbons

GRO as Gasoline	8040		ug/L	2000	20	05/22/06 10:26	NWTPH-Gx	6054393
Surr: a,a,a-Trifluorotoluene (63-134%)	91 %					05/22/06 10:26	NWTPH-Gx	6054393

Sample ID: NPE1930-03RE1 (MW39-05906 - Ground Water) Sampled: 05/09/06 16:45

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPE1930-03RE1 (MW39-05906 - Ground Water) - cont. Sampled: 05/09/06 16:45								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	31000	H2	ug/L	500	500	05/24/06 15:31	SW846 8260B	6055066
Ethylbenzene	3400	H	ug/L	100	100	05/24/06 03:49	SW846 8260B	6054855
Methyl tert-Butyl Ether	763	H	ug/L	100	100	05/24/06 03:49	SW846 8260B	6054855
Naphthalene	ND	H, RL1	ug/L	500	100	05/24/06 03:49	SW846 8260B	6054855
Toluene	1020	H	ug/L	100	100	05/24/06 03:49	SW846 8260B	6054855
Xylenes, total	10300	H	ug/L	300	100	05/24/06 03:49	SW846 8260B	6054855
Surr: 1,2-Dichloroethane-d4 (70-130%)	104 %					05/24/06 03:49	SW846 8260B	6054855
Surr: 1,2-Dichloroethane-d4 (70-130%)	103 %					05/24/06 15:31	SW846 8260B	6055066
Surr: Dibromofluoromethane (79-122%)	99 %					05/24/06 03:49	SW846 8260B	6054855
Surr: Dibromofluoromethane (79-122%)	99 %					05/24/06 15:31	SW846 8260B	6055066
Surr: Toluene-d8 (78-121%)	95 %					05/24/06 03:49	SW846 8260B	6054855
Surr: Toluene-d8 (78-121%)	94 %					05/24/06 15:31	SW846 8260B	6055066
Surr: 4-Bromofluorobenzene (78-126%)	107 %					05/24/06 03:49	SW846 8260B	6054855
Surr: 4-Bromofluorobenzene (78-126%)	108 %					05/24/06 15:31	SW846 8260B	6055066
Extractable Petroleum Hydrocarbons								
Diesel	9190	QSG	ug/L	952	10	05/23/06 12:34	NWTPH-Dx	6052881
Motor Oil	132	QSG	ug/L	95.2	1	05/20/06 06:16	NWTPH-Dx	6052881
Surr: o-Terphenyl (51-142%)	91 %					05/20/06 06:16	NWTPH-Dx	6052881
Surr: o-Terphenyl (51-142%)	*	Z3				05/23/06 12:34	NWTPH-Dx	6052881
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	93000		ug/L	5000	50	05/22/06 14:28	NWTPH-Gx	6054393
Surr: a,a,a-Trifluorotoluene (63-134%)	201 %	ZX				05/22/06 14:28	NWTPH-Gx	6054393
Sample ID: NPE1930-04 (W-22-051006 - Ground Water) Sampled: 05/10/06 08:50								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	05/23/06 19:50	SW846 8260B	6054850
Ethylbenzene	ND		ug/L	1.00	1	05/23/06 19:50	SW846 8260B	6054850
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/23/06 19:50	SW846 8260B	6054850
Naphthalene	ND		ug/L	5.00	1	05/23/06 19:50	SW846 8260B	6054850
Toluene	ND		ug/L	1.00	1	05/23/06 19:50	SW846 8260B	6054850
Xylenes, total	ND		ug/L	3.00	1	05/23/06 19:50	SW846 8260B	6054850
Surr: 1,2-Dichloroethane-d4 (70-130%)	102 %					05/23/06 19:50	SW846 8260B	6054850
Surr: Dibromofluoromethane (79-122%)	99 %					05/23/06 19:50	SW846 8260B	6054850
Surr: Toluene-d8 (78-121%)	96 %					05/23/06 19:50	SW846 8260B	6054850
Surr: 4-Bromofluorobenzene (78-126%)	106 %					05/23/06 19:50	SW846 8260B	6054850
Extractable Petroleum Hydrocarbons								
Diesel	176	QSG	ug/L	100	1	05/20/06 06:32	NWTPH-Dx	6052881
Motor Oil	138	QSG	ug/L	100	1	05/20/06 06:32	NWTPH-Dx	6052881
Surr: o-Terphenyl (51-142%)	82 %					05/20/06 06:32	NWTPH-Dx	6052881
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	05/19/06 22:02	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	86 %					05/19/06 22:02	NWTPH-Gx	6053952

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPE1930-05 (W-20-051006 - Ground Water) Sampled: 05/10/06 09:20								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	05/23/06 14:47	SW846 8260B	6054850
Ethylbenzene	ND		ug/L	1.00	1	05/23/06 14:47	SW846 8260B	6054850
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/23/06 14:47	SW846 8260B	6054850
Naphthalene	ND		ug/L	5.00	1	05/23/06 14:47	SW846 8260B	6054850
Toluene	ND		ug/L	1.00	1	05/23/06 14:47	SW846 8260B	6054850
Xylenes, total	ND		ug/L	3.00	1	05/23/06 14:47	SW846 8260B	6054850
Surr: 1,2-Dichloroethane-d4 (70-130%)	104 %					05/23/06 14:47	SW846 8260B	6054850
Surr: Dibromofluoromethane (79-122%)	100 %					05/23/06 14:47	SW846 8260B	6054850
Surr: Toluene-d8 (78-121%)	94 %					05/23/06 14:47	SW846 8260B	6054850
Surr: 4-Bromofluorobenzene (78-126%)	106 %					05/23/06 14:47	SW846 8260B	6054850
Extractable Petroleum Hydrocarbons								
Diesel	188	QSG	ug/L	100	1	05/20/06 06:48	NWTPH-Dx	6052881
Motor Oil	151	QSG	ug/L	100	1	05/20/06 06:48	NWTPH-Dx	6052881
Surr: o-Terphenyl (51-142%)	79 %					05/20/06 06:48	NWTPH-Dx	6052881
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	05/19/06 22:36	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	80 %					05/19/06 22:36	NWTPH-Gx	6053952
Sample ID: NPE1930-06 (W-19-051006 - Ground Water) Sampled: 05/10/06 09:50								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	05/23/06 20:15	SW846 8260B	6054850
Ethylbenzene	ND		ug/L	1.00	1	05/23/06 20:15	SW846 8260B	6054850
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/23/06 20:15	SW846 8260B	6054850
Naphthalene	ND		ug/L	5.00	1	05/23/06 20:15	SW846 8260B	6054850
Toluene	ND		ug/L	1.00	1	05/23/06 20:15	SW846 8260B	6054850
Xylenes, total	ND		ug/L	3.00	1	05/23/06 20:15	SW846 8260B	6054850
Surr: 1,2-Dichloroethane-d4 (70-130%)	103 %					05/23/06 20:15	SW846 8260B	6054850
Surr: Dibromofluoromethane (79-122%)	100 %					05/23/06 20:15	SW846 8260B	6054850
Surr: Toluene-d8 (78-121%)	95 %					05/23/06 20:15	SW846 8260B	6054850
Surr: 4-Bromofluorobenzene (78-126%)	107 %					05/23/06 20:15	SW846 8260B	6054850
Extractable Petroleum Hydrocarbons								
Diesel	2250	QSG	ug/L	99.0	1	05/20/06 07:04	NWTPH-Dx	6052881
Motor Oil	241	QSG	ug/L	99.0	1	05/20/06 07:04	NWTPH-Dx	6052881
Surr: o-Terphenyl (51-142%)	91 %					05/20/06 07:04	NWTPH-Dx	6052881
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	05/19/06 23:10	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	84 %					05/19/06 23:10	NWTPH-Gx	6053952

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
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Attn John Shaal

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Received: 05/12/06 08:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPE1930-07 (MW40-051006 - Ground Water) Sampled: 05/10/06 10:25								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	68.9		ug/L	1.00	1	05/23/06 20:41	SW846 8260B	6054850
Ethylbenzene	ND		ug/L	1.00	1	05/23/06 20:41	SW846 8260B	6054850
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/23/06 20:41	SW846 8260B	6054850
Naphthalene	ND		ug/L	5.00	1	05/23/06 20:41	SW846 8260B	6054850
Toluene	2.70		ug/L	1.00	1	05/23/06 20:41	SW846 8260B	6054850
Xylenes, total	ND		ug/L	3.00	1	05/23/06 20:41	SW846 8260B	6054850
Surr: 1,2-Dichloroethane-d4 (70-130%)	103 %					05/23/06 20:41	SW846 8260B	6054850
Surr: Dibromofluoromethane (79-122%)	100 %					05/23/06 20:41	SW846 8260B	6054850
Surr: Toluene-d8 (78-121%)	101 %					05/23/06 20:41	SW846 8260B	6054850
Surr: 4-Bromofluorobenzene (78-126%)	107 %					05/23/06 20:41	SW846 8260B	6054850
Extractable Petroleum Hydrocarbons								
Diesel	105	QSG	ug/L	100	1	05/20/06 07:20	NWTPH-Dx	6052881
Motor Oil	ND	QSG	ug/L	100	1	05/20/06 07:20	NWTPH-Dx	6052881
Surr: o-Terphenyl (51-142%)	88 %					05/20/06 07:20	NWTPH-Dx	6052881
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	246		ug/L	100	1	05/19/06 23:44	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	80 %					05/19/06 23:44	NWTPH-Gx	6053952
Sample ID: NPE1930-08 (KMW35-051006 - Ground Water) Sampled: 05/10/06 10:45								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	05/24/06 04:40	SW846 8260B	6054855
Ethylbenzene	10.6		ug/L	1.00	1	05/24/06 04:40	SW846 8260B	6054855
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/24/06 04:40	SW846 8260B	6054855
Naphthalene	45.2		ug/L	5.00	1	05/24/06 04:40	SW846 8260B	6054855
Toluene	ND		ug/L	1.00	1	05/24/06 04:40	SW846 8260B	6054855
Xylenes, total	3.13		ug/L	3.00	1	05/24/06 04:40	SW846 8260B	6054855
Surr: 1,2-Dichloroethane-d4 (70-130%)	104 %					05/24/06 04:40	SW846 8260B	6054855
Surr: Dibromofluoromethane (79-122%)	100 %					05/24/06 04:40	SW846 8260B	6054855
Surr: Toluene-d8 (78-121%)	102 %					05/24/06 04:40	SW846 8260B	6054855
Surr: 4-Bromofluorobenzene (78-126%)	107 %					05/24/06 04:40	SW846 8260B	6054855
Extractable Petroleum Hydrocarbons								
Diesel	1320	QSG	ug/L	95.2	1	05/17/06 18:40	NWTPH-Dx	6052880
Motor Oil	ND	QSG	ug/L	95.2	1	05/17/06 18:40	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	93 %					05/17/06 18:40	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	2290		ug/L	100	1	05/20/06 00:18	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	330 %	ZX				05/20/06 00:18	NWTPH-Gx	6053952

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Attn John Shaal

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Received: 05/12/06 08:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPE1930-09 (TB-2-05906 - Ground Water) Sampled: 05/09/06 15:45								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	05/22/06 17:49	SW846 8260B	6054612
Ethylbenzene	ND		ug/L	1.00	1	05/22/06 17:49	SW846 8260B	6054612
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/22/06 17:49	SW846 8260B	6054612
Naphthalene	ND		ug/L	5.00	1	05/22/06 17:49	SW846 8260B	6054612
Toluene	ND		ug/L	1.00	1	05/22/06 17:49	SW846 8260B	6054612
Xylenes, total	ND		ug/L	3.00	1	05/22/06 17:49	SW846 8260B	6054612
Surr: 1,2-Dichloroethane-d4 (70-130%)	103 %					05/22/06 17:49	SW846 8260B	6054612
Surr: Dibromofluoromethane (79-122%)	99 %					05/22/06 17:49	SW846 8260B	6054612
Surr: Toluene-d8 (78-121%)	101 %					05/22/06 17:49	SW846 8260B	6054612
Surr: 4-Bromofluorobenzene (78-126%)	106 %					05/22/06 17:49	SW846 8260B	6054612
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	05/19/06 19:46	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	80 %					05/19/06 19:46	NWTPH-Gx	6053952
Sample ID: NPE1930-10RE1 (DUPE-2-05906 - Ground Water) Sampled: 05/09/06 00:01								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	2990	H2	ug/L	20.0	20	05/24/06 14:40	SW846 8260B	6055066
Ethylbenzene	272	H2	ug/L	20.0	20	05/24/06 14:40	SW846 8260B	6055066
Methyl tert-Butyl Ether	3.51		ug/L	1.00	1	05/23/06 21:06	SW846 8260B	6054850
Naphthalene	5.46		ug/L	5.00	1	05/23/06 21:06	SW846 8260B	6054850
Toluene	44.0		ug/L	1.00	1	05/23/06 21:06	SW846 8260B	6054850
Xylenes, total	49.1		ug/L	3.00	1	05/23/06 21:06	SW846 8260B	6054850
Surr: 1,2-Dichloroethane-d4 (70-130%)	102 %					05/23/06 21:06	SW846 8260B	6054850
Surr: 1,2-Dichloroethane-d4 (70-130%)	104 %					05/24/06 14:40	SW846 8260B	6055066
Surr: Dibromofluoromethane (79-122%)	96 %					05/23/06 21:06	SW846 8260B	6054850
Surr: Dibromofluoromethane (79-122%)	100 %					05/24/06 14:40	SW846 8260B	6055066
Surr: Toluene-d8 (78-121%)	101 %					05/23/06 21:06	SW846 8260B	6054850
Surr: Toluene-d8 (78-121%)	101 %					05/24/06 14:40	SW846 8260B	6055066
Surr: 4-Bromofluorobenzene (78-126%)	107 %					05/23/06 21:06	SW846 8260B	6054850
Surr: 4-Bromofluorobenzene (78-126%)	106 %					05/24/06 14:40	SW846 8260B	6055066
Extractable Petroleum Hydrocarbons								
Diesel	2820	QSG	ug/L	200	1	05/17/06 18:56	NWTPH-Dx	6052880
Motor Oil	388	QSG	ug/L	200	1	05/17/06 18:56	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	69 %					05/17/06 18:56	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	8330		ug/L	2000	20	05/22/06 13:21	NWTPH-Gx	6054393
Surr: a,a,a-Trifluorotoluene (63-134%)	92 %					05/22/06 13:21	NWTPH-Gx	6054393
Sample ID: NPE1930-11 (KMW36-051006 - Ground Water) Sampled: 05/10/06 11:30								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	1.37		ug/L	1.00	1	05/24/06 05:05	SW846 8260B	6054855
Ethylbenzene	6.47		ug/L	1.00	1	05/24/06 05:05	SW846 8260B	6054855
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/24/06 05:05	SW846 8260B	6054855

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPE1930-11 (KMW36-051006 - Ground Water) - cont. Sampled: 05/10/06 11:30								
Selected Volatile Organic Compounds by EPA Method 8260B - cont.								
Naphthalene	ND		ug/L	5.00	1	05/24/06 05:05	SW846 8260B	6054855
Toluene	1.51		ug/L	1.00	1	05/24/06 05:05	SW846 8260B	6054855
Xylenes, total	ND		ug/L	3.00	1	05/24/06 05:05	SW846 8260B	6054855
Surr: 1,2-Dichloroethane-d4 (70-130%)	102 %					05/24/06 05:05	SW846 8260B	6054855
Surr: Dibromofluoromethane (79-122%)	99 %					05/24/06 05:05	SW846 8260B	6054855
Surr: Toluene-d8 (78-121%)	102 %					05/24/06 05:05	SW846 8260B	6054855
Surr: 4-Bromofluorobenzene (78-126%)	105 %					05/24/06 05:05	SW846 8260B	6054855
Extractable Petroleum Hydrocarbons								
Diesel	10100	QSG	ug/L	952	10	05/19/06 04:28	NWTPH-Dx	6052880
Motor Oil	ND	QSG, RL2	ug/L	952	10	05/19/06 04:28	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	*	Z3				05/19/06 04:28	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	1570		ug/L	100	1	05/20/06 01:26	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	204 %	ZX				05/20/06 01:26	NWTPH-Gx	6053952
Sample ID: NPE1930-12 (KMW37-051006 - Ground Water) Sampled: 05/10/06 12:25								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	2.37		ug/L	1.00	1	05/24/06 01:18	SW846 8260B	6054855
Ethylbenzene	ND		ug/L	1.00	1	05/24/06 01:18	SW846 8260B	6054855
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/24/06 01:18	SW846 8260B	6054855
Naphthalene	ND		ug/L	5.00	1	05/24/06 01:18	SW846 8260B	6054855
Toluene	ND		ug/L	1.00	1	05/24/06 01:18	SW846 8260B	6054855
Xylenes, total	ND		ug/L	3.00	1	05/24/06 01:18	SW846 8260B	6054855
Surr: 1,2-Dichloroethane-d4 (70-130%)	105 %					05/24/06 01:18	SW846 8260B	6054855
Surr: Dibromofluoromethane (79-122%)	101 %					05/24/06 01:18	SW846 8260B	6054855
Surr: Toluene-d8 (78-121%)	100 %					05/24/06 01:18	SW846 8260B	6054855
Surr: 4-Bromofluorobenzene (78-126%)	106 %					05/24/06 01:18	SW846 8260B	6054855
Extractable Petroleum Hydrocarbons								
Diesel	7940	QSG	ug/L	190	2	05/19/06 04:12	NWTPH-Dx	6052880
Motor Oil	544	QSG	ug/L	190	2	05/19/06 04:12	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	109 %					05/19/06 04:12	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	197		ug/L	100	1	05/20/06 02:00	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	109 %					05/20/06 02:00	NWTPH-Gx	6053952
Sample ID: NPE1930-13 (KMW29-051006 - Ground Water) Sampled: 05/10/06 12:50								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	2.78		ug/L	1.00	1	05/24/06 05:30	SW846 8260B	6054855
Ethylbenzene	1.64		ug/L	1.00	1	05/24/06 05:30	SW846 8260B	6054855
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/24/06 05:30	SW846 8260B	6054855
Naphthalene	ND		ug/L	5.00	1	05/24/06 05:30	SW846 8260B	6054855
Toluene	2.24		ug/L	1.00	1	05/24/06 05:30	SW846 8260B	6054855

Client Acton Mickelson Environmental, Inc. (13785)
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Work Order: NPE1930
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Received: 05/12/06 08:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPE1930-13 (KMW29-051006 - Ground Water) - cont. Sampled: 05/10/06 12:50								
Selected Volatile Organic Compounds by EPA Method 8260B - cont.								
Xylenes, total	3.17		ug/L	3.00	1	05/24/06 05:30	SW846 8260B	6054855
Surr: 1,2-Dichloroethane-d4 (70-130%)	103 %					05/24/06 05:30	SW846 8260B	6054855
Surr: Dibromofluoromethane (79-122%)	98 %					05/24/06 05:30	SW846 8260B	6054855
Surr: Toluene-d8 (78-121%)	98 %					05/24/06 05:30	SW846 8260B	6054855
Surr: 4-Bromofluorobenzene (78-126%)	106 %					05/24/06 05:30	SW846 8260B	6054855
Extractable Petroleum Hydrocarbons								
Diesel	6840	QSG	ug/L	190	2	05/19/06 03:56	NWTPH-Dx	6052880
Motor Oil	483	QSG	ug/L	190	2	05/19/06 03:56	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	97 %					05/19/06 03:56	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	1840		ug/L	100	1	05/20/06 02:34	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	272 %	ZX				05/20/06 02:34	NWTPH-Gx	6053952
Sample ID: NPE1930-14 (KMW30-051006 - Ground Water) Sampled: 05/10/06 13:10								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	05/24/06 05:55	SW846 8260B	6054855
Ethylbenzene	ND		ug/L	1.00	1	05/24/06 05:55	SW846 8260B	6054855
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/24/06 05:55	SW846 8260B	6054855
Naphthalene	ND		ug/L	5.00	1	05/24/06 05:55	SW846 8260B	6054855
Toluene	ND		ug/L	1.00	1	05/24/06 05:55	SW846 8260B	6054855
Xylenes, total	ND		ug/L	3.00	1	05/24/06 05:55	SW846 8260B	6054855
Surr: 1,2-Dichloroethane-d4 (70-130%)	103 %					05/24/06 05:55	SW846 8260B	6054855
Surr: Dibromofluoromethane (79-122%)	99 %					05/24/06 05:55	SW846 8260B	6054855
Surr: Toluene-d8 (78-121%)	100 %					05/24/06 05:55	SW846 8260B	6054855
Surr: 4-Bromofluorobenzene (78-126%)	106 %					05/24/06 05:55	SW846 8260B	6054855
Extractable Petroleum Hydrocarbons								
Diesel	467	QSG	ug/L	96.2	1	05/17/06 20:33	NWTPH-Dx	6052880
Motor Oil	178	QSG	ug/L	96.2	1	05/17/06 20:33	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	83 %					05/17/06 20:33	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	05/20/06 03:08	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	78 %					05/20/06 03:08	NWTPH-Gx	6053952
Sample ID: NPE1930-15 (KMW31-051006 - Ground Water) Sampled: 05/10/06 14:20								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	7.19		ug/L	1.00	1	05/23/06 06:51	SW846 8260B	6054621
Ethylbenzene	2.01		ug/L	1.00	1	05/23/06 06:51	SW846 8260B	6054621
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/23/06 06:51	SW846 8260B	6054621
Naphthalene	ND		ug/L	5.00	1	05/23/06 06:51	SW846 8260B	6054621
Toluene	ND		ug/L	1.00	1	05/23/06 06:51	SW846 8260B	6054621
Xylenes, total	3.09		ug/L	3.00	1	05/23/06 06:51	SW846 8260B	6054621
Surr: 1,2-Dichloroethane-d4 (70-130%)	96 %					05/23/06 06:51	SW846 8260B	6054621
Surr: Dibromofluoromethane (79-122%)	103 %					05/23/06 06:51	SW846 8260B	6054621

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillside Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPE1930-15 (KMW31-051006 - Ground Water) - cont. Sampled: 05/10/06 14:20								
Selected Volatile Organic Compounds by EPA Method 8260B - cont.								
Surr: Toluene-d8 (78-121%)	91 %					05/23/06 06:51	SW846 8260B	6054621
Surr: 4-Bromofluorobenzene (78-126%)	95 %					05/23/06 06:51	SW846 8260B	6054621
Extractable Petroleum Hydrocarbons								
Diesel	5700	QSG	ug/L	192	2	05/19/06 03:39	NWTPH-Dx	6052880
Motor Oil	416	QSG	ug/L	192	2	05/19/06 03:39	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	93 %					05/19/06 03:39	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	1430		ug/L	100	1	05/20/06 03:42	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	314 %	ZX				05/20/06 03:42	NWTPH-Gx	6053952
Sample ID: NPE1930-16 (KMW33-051006 - Ground Water) Sampled: 05/10/06 14:45								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	05/23/06 07:18	SW846 8260B	6054621
Ethylbenzene	ND		ug/L	1.00	1	05/23/06 07:18	SW846 8260B	6054621
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/23/06 07:18	SW846 8260B	6054621
Naphthalene	ND		ug/L	5.00	1	05/23/06 07:18	SW846 8260B	6054621
Toluene	ND		ug/L	1.00	1	05/23/06 07:18	SW846 8260B	6054621
Xylenes, total	ND		ug/L	3.00	1	05/23/06 07:18	SW846 8260B	6054621
Surr: 1,2-Dichloroethane-d4 (70-130%)	95 %					05/23/06 07:18	SW846 8260B	6054621
Surr: Dibromofluoromethane (79-122%)	102 %					05/23/06 07:18	SW846 8260B	6054621
Surr: Toluene-d8 (78-121%)	92 %					05/23/06 07:18	SW846 8260B	6054621
Surr: 4-Bromofluorobenzene (78-126%)	96 %					05/23/06 07:18	SW846 8260B	6054621
Extractable Petroleum Hydrocarbons								
Diesel	5250	QSG	ug/L	190	2	05/19/06 03:23	NWTPH-Dx	6052880
Motor Oil	543	QSG	ug/L	190	2	05/19/06 03:23	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	91 %					05/19/06 03:23	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	05/20/06 04:16	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	77 %					05/20/06 04:16	NWTPH-Gx	6053952
Sample ID: NPE1930-17 (KMW34-051006 - Ground Water) Sampled: 05/10/06 15:20								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	ND		ug/L	1.00	1	05/23/06 07:44	SW846 8260B	6054621
Ethylbenzene	ND		ug/L	1.00	1	05/23/06 07:44	SW846 8260B	6054621
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/23/06 07:44	SW846 8260B	6054621
Naphthalene	ND		ug/L	5.00	1	05/23/06 07:44	SW846 8260B	6054621
Toluene	ND		ug/L	1.00	1	05/23/06 07:44	SW846 8260B	6054621
Xylenes, total	ND		ug/L	3.00	1	05/23/06 07:44	SW846 8260B	6054621
Surr: 1,2-Dichloroethane-d4 (70-130%)	93 %					05/23/06 07:44	SW846 8260B	6054621
Surr: Dibromofluoromethane (79-122%)	102 %					05/23/06 07:44	SW846 8260B	6054621
Surr: Toluene-d8 (78-121%)	97 %					05/23/06 07:44	SW846 8260B	6054621
Surr: 4-Bromofluorobenzene (78-126%)	96 %					05/23/06 07:44	SW846 8260B	6054621

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NPE1930-17 (KMW34-051006 - Ground Water) - cont. Sampled: 05/10/06 15:20								
Extractable Petroleum Hydrocarbons								
Diesel	1000	QSG	ug/L	95.7	1	05/17/06 21:22	NWTPH-Dx	6052880
Motor Oil	585	QSG	ug/L	95.7	1	05/17/06 21:22	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	80 %					05/17/06 21:22	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	ND		ug/L	100	1	05/20/06 04:50	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	82 %					05/20/06 04:50	NWTPH-Gx	6053952
Sample ID: NPE1930-18 (W-16-051006 - Ground Water) Sampled: 05/10/06 15:45								
Selected Volatile Organic Compounds by EPA Method 8260B								
Benzene	2.97		ug/L	1.00	1	05/23/06 08:11	SW846 8260B	6054621
Ethylbenzene	ND		ug/L	1.00	1	05/23/06 08:11	SW846 8260B	6054621
Methyl tert-Butyl Ether	ND		ug/L	1.00	1	05/23/06 08:11	SW846 8260B	6054621
Naphthalene	ND		ug/L	5.00	1	05/23/06 08:11	SW846 8260B	6054621
Toluene	ND		ug/L	1.00	1	05/23/06 08:11	SW846 8260B	6054621
Xylenes, total	ND		ug/L	3.00	1	05/23/06 08:11	SW846 8260B	6054621
Surr: 1,2-Dichloroethane-d4 (70-130%)	94 %					05/23/06 08:11	SW846 8260B	6054621
Surr: Dibromofluoromethane (79-122%)	101 %					05/23/06 08:11	SW846 8260B	6054621
Surr: Toluene-d8 (78-121%)	93 %					05/23/06 08:11	SW846 8260B	6054621
Surr: 4-Bromofluorobenzene (78-126%)	105 %					05/23/06 08:11	SW846 8260B	6054621
Extractable Petroleum Hydrocarbons								
Diesel	11700	QSG	ug/L	481	5	05/19/06 03:07	NWTPH-Dx	6052880
Motor Oil	1460	QSG	ug/L	481	5	05/19/06 03:07	NWTPH-Dx	6052880
Surr: o-Terphenyl (51-142%)	96 %					05/19/06 03:07	NWTPH-Dx	6052880
Purgeable Petroleum Hydrocarbons								
GRO as Gasoline	588		ug/L	100	1	05/20/06 05:24	NWTPH-Gx	6053952
Surr: a,a,a-Trifluorotoluene (63-134%)	97 %					05/20/06 05:24	NWTPH-Gx	6053952

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Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
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Received: 05/12/06 08:15

SAMPLE EXTRACTION DATA

Parameter	Batch	Lab Number	Wt/Vol Extracted	Extracted Vol	Date	Analyst	Extraction Method
Extractable Petroleum Hydrocarbons							
NWTPH-Dx	6052881	NPE1930-01	1050.00	1.00	05/16/06 15:20	CEC	EPA 3510C
NWTPH-Dx	6052881	NPE1930-02	1050.00	1.00	05/16/06 15:20	CEC	EPA 3510C
NWTPH-Dx	6052881	NPE1930-03	1050.00	1.00	05/16/06 15:20	CEC	EPA 3510C
NWTPH-Dx	6052881	NPE1930-03RE1	1050.00	1.00	05/16/06 15:20	CEC	EPA 3510C
NWTPH-Dx	6052881	NPE1930-04	1000.00	1.00	05/16/06 15:20	CEC	EPA 3510C
NWTPH-Dx	6052881	NPE1930-05	1000.00	1.00	05/16/06 15:20	CEC	EPA 3510C
NWTPH-Dx	6052881	NPE1930-06	1010.00	1.00	05/16/06 15:20	CEC	EPA 3510C
NWTPH-Dx	6052881	NPE1930-07	1000.00	1.00	05/16/06 15:20	CEC	EPA 3510C
NWTPH-Dx	6052880	NPE1930-08	1050.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-10	500.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-11	1050.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-11RE1	1050.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-12	1050.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-12RE1	1050.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-13	1050.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-13RE1	1050.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-14	1040.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-15	1040.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-15RE1	1040.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-16	1050.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-16RE1	1050.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-17	1045.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-18	1040.00	1.00	05/16/06 08:05	KLK	EPA 3510C
NWTPH-Dx	6052880	NPE1930-18RE1	1040.00	1.00	05/16/06 08:05	KLK	EPA 3510C

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Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

PROJECT QUALITY CONTROL DATA

Blank

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B						
6054612-BLK1						
Benzene	<0.290		ug/L	6054612	6054612-BLK1	05/22/06 17:24
Ethylbenzene	<0.340		ug/L	6054612	6054612-BLK1	05/22/06 17:24
Methyl tert-Butyl Ether	<0.320		ug/L	6054612	6054612-BLK1	05/22/06 17:24
Naphthalene	<1.13		ug/L	6054612	6054612-BLK1	05/22/06 17:24
Toluene	<0.280		ug/L	6054612	6054612-BLK1	05/22/06 17:24
Xylenes, total	<0.820		ug/L	6054612	6054612-BLK1	05/22/06 17:24
Surrogate: 1,2-Dichloroethane-d4	104%			6054612	6054612-BLK1	05/22/06 17:24
Surrogate: Dibromofluoromethane	100%			6054612	6054612-BLK1	05/22/06 17:24
Surrogate: Toluene-d8	95%			6054612	6054612-BLK1	05/22/06 17:24
Surrogate: 4-Bromofluorobenzene	106%			6054612	6054612-BLK1	05/22/06 17:24
6054621-BLK1						
Benzene	<0.290		ug/L	6054621	6054621-BLK1	05/23/06 00:12
Ethylbenzene	<0.340		ug/L	6054621	6054621-BLK1	05/23/06 00:12
Methyl tert-Butyl Ether	<0.320		ug/L	6054621	6054621-BLK1	05/23/06 00:12
Naphthalene	<1.13		ug/L	6054621	6054621-BLK1	05/23/06 00:12
Toluene	<0.280		ug/L	6054621	6054621-BLK1	05/23/06 00:12
Xylenes, total	<0.820		ug/L	6054621	6054621-BLK1	05/23/06 00:12
Surrogate: 1,2-Dichloroethane-d4	95%			6054621	6054621-BLK1	05/23/06 00:12
Surrogate: Dibromofluoromethane	102%			6054621	6054621-BLK1	05/23/06 00:12
Surrogate: Toluene-d8	98%			6054621	6054621-BLK1	05/23/06 00:12
Surrogate: 4-Bromofluorobenzene	97%			6054621	6054621-BLK1	05/23/06 00:12
6054850-BLK1						
Benzene	<0.290		ug/L	6054850	6054850-BLK1	05/23/06 12:41
Ethylbenzene	<0.340		ug/L	6054850	6054850-BLK1	05/23/06 12:41
Methyl tert-Butyl Ether	<0.320		ug/L	6054850	6054850-BLK1	05/23/06 12:41
Naphthalene	<1.13		ug/L	6054850	6054850-BLK1	05/23/06 12:41
Toluene	<0.280		ug/L	6054850	6054850-BLK1	05/23/06 12:41
Xylenes, total	<0.820		ug/L	6054850	6054850-BLK1	05/23/06 12:41
Surrogate: 1,2-Dichloroethane-d4	104%			6054850	6054850-BLK1	05/23/06 12:41
Surrogate: Dibromofluoromethane	98%			6054850	6054850-BLK1	05/23/06 12:41
Surrogate: Toluene-d8	101%			6054850	6054850-BLK1	05/23/06 12:41
Surrogate: 4-Bromofluorobenzene	108%			6054850	6054850-BLK1	05/23/06 12:41
6054855-BLK1						
Benzene	<0.290		ug/L	6054855	6054855-BLK1	05/24/06 00:28
Ethylbenzene	<0.340		ug/L	6054855	6054855-BLK1	05/24/06 00:28
Methyl tert-Butyl Ether	<0.320		ug/L	6054855	6054855-BLK1	05/24/06 00:28
Naphthalene	<1.13		ug/L	6054855	6054855-BLK1	05/24/06 00:28
Toluene	<0.280		ug/L	6054855	6054855-BLK1	05/24/06 00:28
Xylenes, total	<0.820		ug/L	6054855	6054855-BLK1	05/24/06 00:28

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Blank Value	Q	Units	Q.C. Batch	Lab Number	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B						
6054855-BLK1						
Surrogate: 1,2-Dichloroethane-d4	104%			6054855	6054855-BLK1	05/24/06 00:28
Surrogate: Dibromofluoromethane	101%			6054855	6054855-BLK1	05/24/06 00:28
Surrogate: Toluene-d8	100%			6054855	6054855-BLK1	05/24/06 00:28
Surrogate: 4-Bromofluorobenzene	106%			6054855	6054855-BLK1	05/24/06 00:28
6055066-BLK1						
Benzene	<0.290		ug/L	6055066	6055066-BLK1	05/24/06 14:01
Ethylbenzene	<0.340		ug/L	6055066	6055066-BLK1	05/24/06 14:01
Methyl tert-Butyl Ether	<0.320		ug/L	6055066	6055066-BLK1	05/24/06 14:01
Naphthalene	<1.13		ug/L	6055066	6055066-BLK1	05/24/06 14:01
Toluene	<0.280		ug/L	6055066	6055066-BLK1	05/24/06 14:01
Xylenes, total	<0.820		ug/L	6055066	6055066-BLK1	05/24/06 14:01
Surrogate: 1,2-Dichloroethane-d4	104%			6055066	6055066-BLK1	05/24/06 14:01
Surrogate: Dibromofluoromethane	100%			6055066	6055066-BLK1	05/24/06 14:01
Surrogate: Toluene-d8	100%			6055066	6055066-BLK1	05/24/06 14:01
Surrogate: 4-Bromofluorobenzene	107%			6055066	6055066-BLK1	05/24/06 14:01
Extractable Petroleum Hydrocarbons						
6052880-BLK1						
Diesel	74.2		ug/L	6052880	6052880-BLK1	05/17/06 18:07
Motor Oil	<38.0		ug/L	6052880	6052880-BLK1	05/17/06 18:07
Surrogate: o-Terphenyl	80%			6052880	6052880-BLK1	05/17/06 18:07
6052881-BLK1						
Diesel	75.1		ug/L	6052881	6052881-BLK1	05/20/06 04:39
Motor Oil	<38.0		ug/L	6052881	6052881-BLK1	05/20/06 04:39
Surrogate: o-Terphenyl	70%			6052881	6052881-BLK1	05/20/06 04:39
Purgeable Petroleum Hydrocarbons						
6053952-BLK1						
GRO as Gasoline	<40.0		ug/L	6053952	6053952-BLK1	05/19/06 19:12
Surrogate: a,a,a-Trifluorotoluene	80%			6053952	6053952-BLK1	05/19/06 19:12
6054393-BLK1						
GRO as Gasoline	<40.0		ug/L	6054393	6054393-BLK1	05/22/06 09:06
Surrogate: a,a,a-Trifluorotoluene	79%			6054393	6054393-BLK1	05/22/06 09:06

Client Acton Mickelson Environmental, Inc. (13785)
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Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
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Received: 05/12/06 08:15

PROJECT QUALITY CONTROL DATA

LCS

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B								
6054612-BS1								
Benzene	50.0	54.1		ug/L	108%	78 - 122	6054612	05/22/06 16:08
Ethylbenzene	50.0	55.6		ug/L	111%	82 - 122	6054612	05/22/06 16:08
Methyl tert-Butyl Ether	50.0	50.7		ug/L	101%	65 - 144	6054612	05/22/06 16:08
Naphthalene	50.0	54.1		ug/L	108%	64 - 144	6054612	05/22/06 16:08
Toluene	50.0	51.4		ug/L	103%	80 - 120	6054612	05/22/06 16:08
Xylenes, total	150	165		ug/L	110%	81 - 125	6054612	05/22/06 16:08
Surrogate: 1,2-Dichloroethane-d4	50.0	49.8			100%	70 - 130	6054612	05/22/06 16:08
Surrogate: Dibromofluoromethane	50.0	50.9			102%	79 - 122	6054612	05/22/06 16:08
Surrogate: Toluene-d8	50.0	47.6			95%	78 - 121	6054612	05/22/06 16:08
Surrogate: 4-Bromofluorobenzene	50.0	52.0			104%	78 - 126	6054612	05/22/06 16:08
6054621-BS1								
Benzene	50.0	58.0		ug/L	116%	78 - 122	6054621	05/22/06 22:53
Ethylbenzene	50.0	55.2		ug/L	110%	82 - 122	6054621	05/22/06 22:53
Methyl tert-Butyl Ether	50.0	47.8		ug/L	96%	65 - 144	6054621	05/22/06 22:53
Naphthalene	50.0	45.7		ug/L	91%	64 - 144	6054621	05/22/06 22:53
Toluene	50.0	56.4		ug/L	113%	80 - 120	6054621	05/22/06 22:53
Xylenes, total	150	162		ug/L	108%	81 - 125	6054621	05/22/06 22:53
Surrogate: 1,2-Dichloroethane-d4	50.0	46.7			93%	70 - 130	6054621	05/22/06 22:53
Surrogate: Dibromofluoromethane	50.0	49.7			99%	79 - 122	6054621	05/22/06 22:53
Surrogate: Toluene-d8	50.0	48.0			96%	78 - 121	6054621	05/22/06 22:53
Surrogate: 4-Bromofluorobenzene	50.0	46.6			93%	78 - 126	6054621	05/22/06 22:53
6054850-BS1								
Benzene	50.0	54.2		ug/L	108%	78 - 122	6054850	05/23/06 11:15
Ethylbenzene	50.0	54.3		ug/L	109%	82 - 122	6054850	05/23/06 11:15
Methyl tert-Butyl Ether	50.0	54.3		ug/L	109%	65 - 144	6054850	05/23/06 11:15
Naphthalene	50.0	57.5		ug/L	115%	64 - 144	6054850	05/23/06 11:15
Toluene	50.0	50.4		ug/L	101%	80 - 120	6054850	05/23/06 11:15
Xylenes, total	150	162		ug/L	108%	81 - 125	6054850	05/23/06 11:15
Surrogate: 1,2-Dichloroethane-d4	50.0	52.0			104%	70 - 130	6054850	05/23/06 11:15
Surrogate: Dibromofluoromethane	50.0	49.9			100%	79 - 122	6054850	05/23/06 11:15
Surrogate: Toluene-d8	50.0	47.4			95%	78 - 121	6054850	05/23/06 11:15
Surrogate: 4-Bromofluorobenzene	50.0	53.0			106%	78 - 126	6054850	05/23/06 11:15
6054855-BS1								
Benzene	50.0	56.5		ug/L	113%	78 - 122	6054855	05/23/06 23:12
Ethylbenzene	50.0	58.6		ug/L	117%	82 - 122	6054855	05/23/06 23:12
Methyl tert-Butyl Ether	50.0	53.6		ug/L	107%	65 - 144	6054855	05/23/06 23:12
Naphthalene	50.0	57.6		ug/L	115%	64 - 144	6054855	05/23/06 23:12
Toluene	50.0	54.8		ug/L	110%	80 - 120	6054855	05/23/06 23:12
Xylenes, total	150	175		ug/L	117%	81 - 125	6054855	05/23/06 23:12

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

PROJECT QUALITY CONTROL DATA
LCS - Cont.

Analyte	Known Val.	Analyzed Val	Q	Units	% Rec.	Target Range	Batch	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B								
6054855-BS1								
Surrogate: 1,2-Dichloroethane-d4	50.0	51.9			104%	70 - 130	6054855	05/23/06 23:12
Surrogate: Dibromofluoromethane	50.0	51.3			103%	79 - 122	6054855	05/23/06 23:12
Surrogate: Toluene-d8	50.0	49.3			99%	78 - 121	6054855	05/23/06 23:12
Surrogate: 4-Bromofluorobenzene	50.0	52.5			105%	78 - 126	6054855	05/23/06 23:12
6055066-BS1								
Benzene	50.0	56.6		ug/L	113%	78 - 122	6055066	05/24/06 12:45
Ethylbenzene	50.0	56.0		ug/L	112%	82 - 122	6055066	05/24/06 12:45
Methyl tert-Butyl Ether	50.0	52.3		ug/L	105%	65 - 144	6055066	05/24/06 12:45
Naphthalene	50.0	53.4		ug/L	107%	64 - 144	6055066	05/24/06 12:45
Toluene	50.0	54.7		ug/L	109%	80 - 120	6055066	05/24/06 12:45
Xylenes, total	150	171		ug/L	114%	81 - 125	6055066	05/24/06 12:45
Surrogate: 1,2-Dichloroethane-d4	50.0	51.5			103%	70 - 130	6055066	05/24/06 12:45
Surrogate: Dibromofluoromethane	50.0	50.9			102%	79 - 122	6055066	05/24/06 12:45
Surrogate: Toluene-d8	50.0	49.7			99%	78 - 121	6055066	05/24/06 12:45
Surrogate: 4-Bromofluorobenzene	50.0	52.7			105%	78 - 126	6055066	05/24/06 12:45
Extractable Petroleum Hydrocarbons								
6052880-BS1								
Diesel	1000	820		ug/L	82%	56 - 116	6052880	05/17/06 18:24
Surrogate: o-Terphenyl	20.0	16.5			82%	51 - 142	6052880	05/17/06 18:24
6052881-BS1								
Diesel	1000	751		ug/L	75%	56 - 116	6052881	05/20/06 04:55
Surrogate: o-Terphenyl	20.0	17.4			87%	51 - 142	6052881	05/20/06 04:55
Purgeable Petroleum Hydrocarbons								
6053952-BS1								
GRO as Gasoline	1000	1070		ug/L	107%	66 - 132	6053952	05/20/06 07:07
Surrogate: a,a,a-Trifluorotoluene	30.0	26.6			89%	63 - 134	6053952	05/20/06 07:07
6054393-BS1								
GRO as Gasoline	1000	1040	MNR1	ug/L	104%	66 - 132	6054393	05/22/06 08:32
Surrogate: a,a,a-Trifluorotoluene	30.0	26.1			87%	63 - 134	6054393	05/22/06 08:32

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

PROJECT QUALITY CONTROL DATA

Matrix Spike

Analyte	Orig. Val.	MS Val	Q	Units	Spike Conc	% Rec.	Target Range	Batch	Sample Spiked	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B										
6054850-MS1										
Benzene	ND	55.8		ug/L	50.0	112%	74 - 133	6054850	NPE1930-05	05/23/06 21:31
Ethylbenzene	ND	54.0		ug/L	50.0	108%	74 - 134	6054850	NPE1930-05	05/23/06 21:31
Methyl tert-Butyl Ether	ND	52.7		ug/L	50.0	105%	58 - 151	6054850	NPE1930-05	05/23/06 21:31
Naphthalene	ND	54.7		ug/L	50.0	109%	47 - 154	6054850	NPE1930-05	05/23/06 21:31
Toluene	ND	50.2		ug/L	50.0	100%	73 - 133	6054850	NPE1930-05	05/23/06 21:31
Xylenes, total	ND	160		ug/L	150	107%	68 - 139	6054850	NPE1930-05	05/23/06 21:31
Surrogate: 1,2-Dichloroethane-d4		51.8		ug/L	50.0	104%	70 - 130	6054850	NPE1930-05	05/23/06 21:31
Surrogate: Dibromofluoromethane		50.2		ug/L	50.0	100%	79 - 122	6054850	NPE1930-05	05/23/06 21:31
Surrogate: Toluene-d8		48.1		ug/L	50.0	96%	78 - 121	6054850	NPE1930-05	05/23/06 21:31
Surrogate: 4-Bromofluorobenzene		52.5		ug/L	50.0	105%	78 - 126	6054850	NPE1930-05	05/23/06 21:31
6054855-MS1										
Benzene	ND	57.6		ug/L	50.0	115%	74 - 133	6054855	NPE1980-03	05/24/06 09:47
Ethylbenzene	ND	56.0		ug/L	50.0	112%	74 - 134	6054855	NPE1980-03	05/24/06 09:47
Methyl tert-Butyl Ether	6.44	65.4		ug/L	50.0	118%	58 - 151	6054855	NPE1980-03	05/24/06 09:47
Naphthalene	ND	60.3		ug/L	50.0	121%	47 - 154	6054855	NPE1980-03	05/24/06 09:47
Toluene	ND	52.2		ug/L	50.0	104%	73 - 133	6054855	NPE1980-03	05/24/06 09:47
Xylenes, total	ND	166		ug/L	150	111%	68 - 139	6054855	NPE1980-03	05/24/06 09:47
Surrogate: 1,2-Dichloroethane-d4		52.2		ug/L	50.0	104%	70 - 130	6054855	NPE1980-03	05/24/06 09:47
Surrogate: Dibromofluoromethane		49.8		ug/L	50.0	100%	79 - 122	6054855	NPE1980-03	05/24/06 09:47
Surrogate: Toluene-d8		46.9		ug/L	50.0	94%	78 - 121	6054855	NPE1980-03	05/24/06 09:47
Surrogate: 4-Bromofluorobenzene		52.4		ug/L	50.0	105%	78 - 126	6054855	NPE1980-03	05/24/06 09:47
Purgeable Petroleum Hydrocarbons										
6053952-MS1										
GRO as Gasoline	4590	5520		ug/L	1000	93%	48 - 138	6053952	NPE1930-02	05/20/06 05:59
Surrogate: a,a,a-Trifluorotoluene		79.0	ZX	ug/L	30.0	263%	63 - 134	6053952	NPE1930-02	05/20/06 05:59

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

PROJECT QUALITY CONTROL DATA

Matrix Spike Dup

Analyte	Orig. Val.	Duplicate	Q	Units	Spike Conc	% Rec.	Target Range	RPD	Limit	Batch	Sample Duplicated	Analyzed Date/Time
Selected Volatile Organic Compounds by EPA Method 8260B												
6054850-MSD1												
Benzene	ND	52.9		ug/L	50.0	106%	74 - 133	5	19	6054850	NPE1930-05	05/23/06 21:56
Ethylbenzene	ND	53.0		ug/L	50.0	106%	74 - 134	2	21	6054850	NPE1930-05	05/23/06 21:56
Methyl tert-Butyl Ether	ND	50.5		ug/L	50.0	101%	58 - 151	4	28	6054850	NPE1930-05	05/23/06 21:56
Naphthalene	ND	52.6		ug/L	50.0	105%	47 - 154	4	43	6054850	NPE1930-05	05/23/06 21:56
Toluene	ND	50.3		ug/L	50.0	101%	73 - 133	0.2	20	6054850	NPE1930-05	05/23/06 21:56
Xylenes, total	ND	158		ug/L	150	105%	68 - 139	1	23	6054850	NPE1930-05	05/23/06 21:56
Surrogate: 1,2-Dichloroethane-d4		52.1		ug/L	50.0	104%	70 - 130			6054850	NPE1930-05	05/23/06 21:56
Surrogate: Dibromofluoromethane		50.7		ug/L	50.0	101%	79 - 122			6054850	NPE1930-05	05/23/06 21:56
Surrogate: Toluene-d8		49.6		ug/L	50.0	99%	78 - 121			6054850	NPE1930-05	05/23/06 21:56
Surrogate: 4-Bromofluorobenzene		52.6		ug/L	50.0	105%	78 - 126			6054850	NPE1930-05	05/23/06 21:56
6054855-MSD1												
Benzene	ND	57.6		ug/L	50.0	115%	74 - 133	0	19	6054855	NPE1980-03	05/24/06 10:12
Ethylbenzene	ND	56.0		ug/L	50.0	112%	74 - 134	0	21	6054855	NPE1980-03	05/24/06 10:12
Methyl tert-Butyl Ether	6.44	66.5		ug/L	50.0	120%	58 - 151	2	28	6054855	NPE1980-03	05/24/06 10:12
Naphthalene	ND	62.8		ug/L	50.0	126%	47 - 154	4	43	6054855	NPE1980-03	05/24/06 10:12
Toluene	ND	55.6		ug/L	50.0	111%	73 - 133	6	20	6054855	NPE1980-03	05/24/06 10:12
Xylenes, total	ND	169		ug/L	150	113%	68 - 139	2	23	6054855	NPE1980-03	05/24/06 10:12
Surrogate: 1,2-Dichloroethane-d4		52.8		ug/L	50.0	106%	70 - 130			6054855	NPE1980-03	05/24/06 10:12
Surrogate: Dibromofluoromethane		50.4		ug/L	50.0	101%	79 - 122			6054855	NPE1980-03	05/24/06 10:12
Surrogate: Toluene-d8		49.7		ug/L	50.0	99%	78 - 121			6054855	NPE1980-03	05/24/06 10:12
Surrogate: 4-Bromofluorobenzene		51.6		ug/L	50.0	103%	78 - 126			6054855	NPE1980-03	05/24/06 10:12
Purgeable Petroleum Hydrocarbons												
6053952-MSD1												
GRO as Gasoline	4590	5420		ug/L	1000	83%	48 - 138	2	36	6053952	NPE1930-02	05/20/06 06:33
Surrogate: a,a,a-Trifluorotoluene		79.3	ZX	ug/L	30.0	264%	63 - 134			6053952	NPE1930-02	05/20/06 06:33

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville

Method	Matrix	AIHA	Nelac	Oregon
NWTPH-Dx	Water	N/A	X	X
NWTPH-Gx	Water	N/A	X	X
subcontract	Water			
SW846 8260B	Water	N/A	X	X

Subcontracted Laboratories

North Creek Analytical - Beaverton (11664)

9405 SW Nimbus Avenue - Beaverton, OR 97008

Analysis Performed: Subcontract - Outside

Samples: NPE1930-01, NPE1930-02, NPE1930-03, NPE1930-04, NPE1930-05, NPE1930-06, NPE1930-07,
NPE1930-08, NPE1930-10, NPE1930-11, NPE1930-12, NPE1930-13, NPE1930-14, NPE1930-15,
NPE1930-16, NPE1930-17, NPE1930-18

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

NELAC CERTIFICATION SUMMARY

TestAmerica Analytical - Nashville does not hold NELAC certifications for the following analytes included in this report

Method

Matrix

Analyte

Client Acton Mickelson Environmental, Inc. (13785)
5175 Hillsdale Circle, Suite 100
El Dorado Hills, CA 95762
Attn John Shaal

Work Order: NPE1930
Project Name: Former Portland Terminal #36-001
Project Number: 13041.05
Received: 05/12/06 08:15

DATA QUALIFIERS AND DEFINITIONS

H Sample analysis performed past method-specified holding time.
H2 Initial analysis within holding time. Reanalysis for the required dilution or confirmation was past holding time.
MNR1 There was no MS/MSD analyzed with this batch due to insufficient sample volume. See Blank Spike.
QSG Silica Gel clean-up performed on extracts.
RL1 Reporting limit raised due to sample matrix effects.
RL2 Reporting limit raised due to high concentrations of hydrocarbons.
Z3 The sample required a dilution due to the nature of the sample matrix. Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information.
ZX Due to sample matrix effects, the surrogate recovery was outside the acceptance limits.

METHOD MODIFICATION NOTES



Nashville Division
COOLER RECEIPT FORM

BC#



NPE1930

Cooler Received/Opened On 05/12/06 0815

1. Indicate the Airbill Tracking Number (last 4 digits for Fedex only) and Name of Courier below: 3050

☒ Fed-EX

☐ UPS

☐ Velocity

☐ DHL

☐ Route

☐ Off-street

☐ Misc.

2. Temperature of representative sample or temperature blank when opened: 4.4 Degrees Celsius
(indicate IR Gun ID#)

NA A00466 A00750 A01124 100190 101282 Raynger ST

3. Were custody seals on outside of cooler? ☒ YES ☐ NO ☐ NA

a. If yes, how many and where: 1 From

4. Were the seals intact, signed, and dated correctly? ☒ YES ☐ NO ☐ NA

5. Were custody papers inside cooler? ☒ YES ☐ NO ☐ NA

I certify that I opened the cooler and answered questions 1-5 (initial) DZ DZ

6. Were custody seals on containers: YES NO and Intact YES NO ☒ NA
were these signed, and dated correctly? YES ☒ NO ☒ NA

7. What kind of packing material used? ☒ Bubblewrap ☐ Peanuts ☐ Vermiculite ☒ Foam Insert

Plastic bag Paper Other None

8. Cooling process: ☒ Ice ☐ Ice-pack ☐ Ice (direct contact) ☐ Dry ice ☐ Other ☐ None

9. Did all containers arrive in good condition (unbroken)? ☒ YES ☐ NO ☐ NA

10. Were all container labels complete (#, date, signed, pres., etc)? ☒ YES ☐ NO ☐ NA

11. Did all container labels and tags agree with custody papers? ☒ YES ☐ NO ☐ NA

12. a. Were VOA vials received? ☒ YES ☐ NO ☐ NA

b. Was there any observable head space present in any VOA vial? ☒ YES ☐ NO ☐ NA

I certify that I unloaded the cooler and answered questions 6-12 (initial) [Signature]

13. a. On preserved bottles did the pH test strips suggest that preservation reached the correct pH level? ☒ YES ☐ NO ☐ NA

b. Did the bottle labels indicate that the correct preservatives were used? ☒ YES ☐ NO ☐ NA

If preservation in-house was needed, record standard ID of preservative used here

14. Was residual chlorine present? ☒ YES ☐ NO ☐ NA

I certify that I checked for chlorine and pH as per SOP and answered questions 13-14 (initial) [Signature]

15. Were custody papers properly filled out (ink, signed, etc)? ☒ YES ☐ NO ☐ NA

16. Did you sign the custody papers in the appropriate place? ☒ YES ☐ NO ☐ NA

17. Were correct containers used for the analysis requested? ☒ YES ☐ NO ☐ NA

18. Was sufficient amount of sample sent in each container? ☒ YES ☐ NO ☐ NA

I certify that I entered this project into LIMS and answered questions 15-18 (initial) [Signature]

I certify that I attached a label with the unique LIMS number to each container (initial) [Signature]

19. Were there Non-Conformance issues at login YES NO Was a PIPE generated YES NO #

BIS = Broken in shipment
Cooler Receipt Form

LF-1
End of Form

Revised 3/9/06



Nashville Division
COOLER RECEIPT FORM

BC#

Cooler Received/Opened On: 5/12/06@8:15

1. Indicate the Airbill Tracking Number (last 4 digits for Fedex only) and Name of Courier below: 9964

Fed-Ex

Temperature of representative sample or temperature blank when opened: 4.6 Degrees Celsius
(indicate IR Gun ID#)

101282

3. Were custody seals on outside of cooler?..... (YES) NO NA
a. If yes, how many and where: 1 Front

4. Were the seals intact, signed, and dated correctly?..... (YES) NO NA

5. Were custody papers inside cooler?..... (YES) NO NA

I certify that I opened the cooler and answered questions 1-5 (initial).....

6. Were custody seals on containers: YES NO and Intact YES NO NA
were these signed, and dated correctly?..... YES...NO...NA

7. What kind of packing material used? Bubblewrap Peanuts Vermiculite Foam Insert
Plastic bag Paper Other _____ None

8. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

9. Did all containers arrive in good condition (unbroken)?..... YES...NO...NA

10. Were all container labels complete (#, date, signed, pres., etc)?..... YES...NO...NA

11. Did all container labels and tags agree with custody papers?..... YES...NO...NA

12. a. Were VOA vials received?..... YES...NO...NA

b. Was there any observable head space present in any VOA vial?..... YES...NO...NA

I certify that I unloaded the cooler and answered questions 6-12 (initial).....

13. a. On preserved bottles did the pH test strips suggest that preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used..... YES...NO...NA

If preservation in-house was needed, record standard ID of preservative used here _____

14. Was residual chlorine present?..... YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 13-14 (initial).....

15. Were custody papers properly filled out (ink, signed, etc)?..... YES...NO...NA

16. Did you sign the custody papers in the appropriate place?..... YES...NO...NA

17. Were correct containers used for the analysis requested?..... YES...NO...NA

18. Was sufficient amount of sample sent in each container?..... YES...NO...NA

I certify that I entered this project into LIMS and answered questions 15-18 (initial).....

I certify that I attached a label with the unique LIMS number to each container (initial).....

19. Were there Non-Conformance issues at login YES NO Was a PIPE generated YES NO # _____

BIS = Broken in shipment
Cooler Receipt Form

LF-1
End of Form

Revised 3/9/06

264(3 coolers)

NPE1930

05/26/06 23:59

Acton • Mickelson • Environmental, Inc.

Standard TAT

Page 1 of 2

Chain of Custody

4868

Chain of Custody and Analysis Request Form



RUSH TAT



24 hr. TAT



48 hr. TAT



72 hr. TAT



5 day TAT

Geotracker Global ID.

Send Results to:

5175 Hillsdale Circle, Suite 100
 El Dorado Hills, CA 95762
 (916) 939-7550, FAX (916) 939-7570

Attn.: John R Shaal

Preliminary Fax Result

Sample Receipt/ Log-In Confirmation

Electronic Data Deliverables email

Geotracker EDF jshaal@ameinc.net

Raw Data Deliverables

Call with Verbal Results

Lab ID (LAB USE ONLY)	Field Point ID	Sample ID	Date Collected	Time Collected	Matrix	Container	Number of Containers	Preservative	Requested Analysis										Comments
	KMW14	KMW14-05906	5/9/06	1555	GW	GB	6	HC	X	X	X	X							Dx = diesel # motor oil
	MW38	MW38-05906	5/9/06	1615	GW	GB	6	HC	X	X	X	X							2
	MW39	MW39-05906	5/9/06	1645	GW	GB	6	HC	X	X	X	X							3
	W-22	W-22-051006	5/10/06	0850	GW	GB	6	HC	X	X	X	X							4
	W-20	W-20-051006	5/10/06	0920	GW	GB	6	HC	X	X	X	X							5
	W-19	W-19-051006	5/10/06	0950	GW	GB	6	HC	X	X	X	X							6
	MW40	MW40-051006	5/10/06	1025	GW	GB	6	HC	X	X	X	X							7
	KMW35	KMW35-051006	5/10/06	1045	GW	GB	6	HC	X	X	X	X							8
		TB-2-05906	5/9/06	1545	RW	V	3	HC	X	X	X								9
	QAQC	DuPE-2-05906	5/9/06	—	GW	GB	6	HC	X	X	X	X							10

Signature	Date	Time	Signature	Date	Time
Relinquished by: John R Shaal	5/10/06	1700	Relinquished by:		
Received by: [Signature]	5/10/06	17:00	Received by: [Signature]	5/12/06	8:00
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Matrix: W - Water; DW - Drinking Water; SW - Surface Water; GW - Ground Water; WW - Waste Water;
 RW - Reagent Water; S - Soil; SE - Sediment; SV - Soil Vapor; AA - Ambient Air; WS - Waste (Solid); O - Other
Container: GB - Glass Bottle (Amber); V - 40 ml VOA Vial; BT, ST, PT - Brass, Steel, and Plastic Tube;
 P - Polyethylene; GJ - Glass Jar, SC - Summa Canister; TD - Tedlar
Preservative: C - Cold; HS - Sulfuric Acid; HC - Hydrochloric Acid; HN - Nitric Acid; Na - Sodium Hydroxide; O - Other

Project Name and Location: Former Portland Terminal # 36-001

Project Number: 13041.05

Receiving Lab: Test America

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	KMW36	KMW36-051006	5/10/06	1130	GW	V GB	6 1	HC	X	X	X	X							UPE 1936-11 Dx - diesel & motor oil
	KMW37	KMW37-051006	5/10/06	1225	GW	V GB	6 1	HC	X	X	X	X							12
	KMW29	KMW29-051006	5/10/06	1250	GW	V GB	6 1	HC	X	X	X	X							13
	KMW30	KMW30-051006	5/10/06	1310	GW	V GB	6 1	HC	X	X	X	X							14
	KMW31	KMW31-051006	5/10/06	1420	GW	V GB	6 1	HC	X	X	X	X							15
	KMW33	KMW33-051006	5/10/06	1445	GW	V GB	6 1	HC	X	X	X	X							16
	KMW34	KMW34-051006	5/10/06	1520	GW	V GB	6 1	HC	X	X	X	X							17
	W-16	W-16-051006	5/10/06	1545	GW	V GB	6 1	HC	X	X	X	X							18 Temp BLK in ea cooler

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Project Number: 13041.05 Receiving Lab: Test America
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ATTACHMENT D

AME, 2009. Updated Focused Feasibility Study.

NuStar Portland Terminal, Oregon

May 28, 2009



AME
Engineers and Earth Scientists

May 28, 2009

Mr. Tom Gainer, P.E.
Oregon Department of Environmental Quality
Northwest Region
2020 SW 4th Avenue, Suite 400
Portland, Oregon 97201

13041.15/7

**Subject: *Updated Focused Feasibility Study*
NuStar Portland Terminal
9420 NW. St. Helens Road, Portland, Oregon**

Dear Mr. Gainer:

Enclosed herewith is the subject document submitted on behalf of ExxonMobil Environmental Services (ExxonMobil). Please call Joe Abel of ExxonMobil at (401) 434-7356 or Jim Twiford at (916) 939-7550 or if you have any questions regarding this report.

Very truly yours,

ACTON • MICKELSON • ENVIRONMENTAL, INC.

James C. Twiford, P.E.
Senior Project Manager

Enclosures

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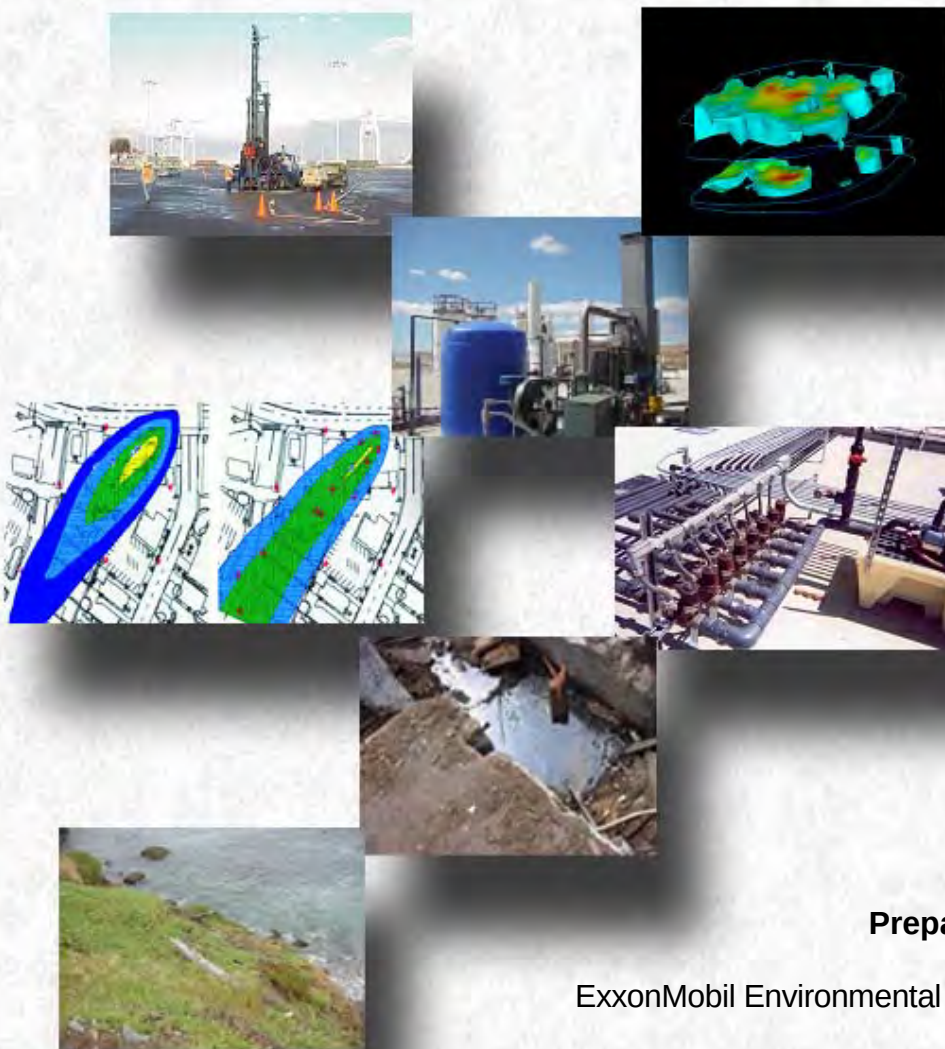
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Updated Focused Feasibility Study

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9420 NW St. Helens Road, Portland, Oregon



Prepared For

ExxonMobil Environmental Services

Prepared By



AME

Engineers and Earth Scientists

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MAY 28, 2009

UPDATED FOCUSED FEASIBILITY STUDY

PREPARED FOR

ExxonMobil Environmental Services
NuStar (Former ExxonMobil) Portland Terminal
9420 NW St. Helens Road
Portland, Oregon

PREPARED BY

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5/28/09

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MAY 28, 2009

TABLE OF CONTENTS

1.	INTRODUCTION	1
1.1	Site History	2
1.2	Physical Setting.....	4
1.2.1	Hydrology	4
1.2.2	Geology.....	4
1.2.3	Regional Hydrogeology	6
1.2.4	Site Hydrogeology	6
1.3	Nature and Extent of Chemicals of Concern	11
1.3.1	Liquid Phase Hydrocarbons.....	11
1.3.2	Chemicals of Concern.....	11
1.3.3	North Tank Farm Area.....	12
1.3.4	Air Sparging Curtain Area	15
1.3.5	Area of Subsurface Slurry Wall.....	17
1.3.6	Loading Rack Area	17
1.3.7	Sewers.....	18
1.4	Conceptual Site Model.....	20
1.4.1	Organic COCs.....	20
1.4.2	Inorganic COCs	20
1.4.3	Background Presence of Arsenic	21
1.5	Human Health Risk Assessment.....	21
1.6	Ecological Risk Assessment	22
2.	IDENTIFICATION OF REMEDIAL AREAS OF CONCERN	23
2.1	North Tank Farm Area.....	23
2.1.1	Liquid Phase Hydrocarbons.....	23
2.1.2	Dissolved COCs.....	23
2.1.3	Soil	23
2.2	Air Sparging Curtain Area	23
2.2.1	Liquid Phase Hydrocarbons.....	23
2.2.2	Dissolved COCs.....	23
2.2.3	Soil	24
2.3	Area of Subsurface Slurry Wall.....	24
2.4	Loading Rack Area	24
2.5	Sewers.....	24
3.	IDENTIFICATION OF MEDIA REQUIRING REMEDIAL ACTION.....	25
4.	DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES.....	26
4.1	Narrative Remedial Action Objectives	26
4.2	Numerical Cleanup Objectives	26
4.2.1	Chemicals of Concern.....	26
4.2.2	Arsenic	26

5.	IDENTIFICATION AND SCREENING OF TECHNOLOGIES FOR ADDITIONAL REMEDIAL ACTION.....	28
5.1	General Response Actions	28
5.2	Containment and/or Hydraulic Control	28
5.3	In-Situ Treatment	29
5.4	Removal	30
5.5	Preliminary Remedial Alternatives Retained for Further Analysis	31
6.	DEVELOPMENT AND SCREENING OF PRELIMINARY REMEDIAL ACTION ALTERNATIVES.....	32
6.1	No Action.....	33
6.2	Containment and/or Hydraulic Control	33
6.2.1	Ground Water Extraction.....	33
6.2.2	Dual Phase Extraction.....	33
6.2.3	Combined Ground Water Extraction and Dual Phase Extraction.....	34
6.2.4	Subsurface Slurry Wall behind the Concrete Revetment with Ground Water Extraction	34
6.2.5	Sheet Pile Wall outside the Concrete Revetment with Ground Water Extraction.....	35
6.2.6	Concrete Sealant Applied to the Revetment with Ground Water Extraction	35
6.2.7	Concrete Sealant Applied to the Revetment with Dual Phase Extraction	36
6.3	In-Situ Treatment.....	36
6.3.1	Ozone Sparging with Dual Phase Extraction.....	36
6.3.2	Ozone Sparging and Dual Phase Extraction with Concrete Sealant Applied to the Revetment	37
6.3.3	In-Situ Chemical Oxidation with Subsurface Slurry Wall behind the Revetment and Ground Water Extraction.....	37
6.4	Summary of Remedial Alternatives Retained for Detailed Analysis	37
7.	DETAILED ANALYSIS OF REMEDIAL ACTION ALTERNATIVES	38
7.1	Dual Phase Extraction (Alternative 1)	38
7.2	Combined Ground Water Extraction and Dual Phase Extraction (Alternative 2)	39
7.3	Concrete Sealant Applied to the Revetment with Dual Phase Extraction (Alternative 3).....	40
8.	COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES	42
9.	RECOMMENDED REMEDIAL ACTION ALTERNATIVE.....	43
10.	REMARKS	44
11.	REFERENCES	45

Appendices

A	Visualizations
B	Tables of Ground Water Monitoring and Remediation Data through 2004 (on compact disc)
C	Piezometer Installation
D	Pumping Test Analysis, Loading Rack Area
E	Pumping Test Analysis, Air Sparging Curtain Area
F	Analysis of Slug Tests
G	Analysis of River-Aquifer Coupling
H	First Quarter 2009 Ground Water Sample Laboratory Analytical Reports and Data Validation
I	Laboratory Analytical Reports and Data Validation for 2008 and 2009 Sewer Sampling
J	Flow Modeling
K	Remedial Alternative Cost Estimates

Tables

1	Ground Water Elevation Data
2	Ground Water Analytical Data, Total Petroleum Hydrocarbons as Gasoline, Diesel, and Motor Oil, Benzene, Toluene, Ethylbenzene, Xylenes, Methyl Tertiary Butyl Ether, Naphthalene, and Ethanol
3	Ground Water Analytical Data, Total and Dissolved Metals
4	Ground Water Analytical Data, Polynuclear Aromatic Hydrocarbons
5	Storm Sewer Sampling Analytical Results
6	Comparative Analysis of Remedial Alternatives

Figures

1	Site Location Map
2	Site Map
3	Site Map Detail, North Tank Farm Area
4	Stratigraphic Cross Section
5	Stratigraphic Visualization
6	Ground Water Elevation Map, November 17, 2008
7	Monitoring Well KMW07 Dissolved Hydrocarbons Concentration Trends 1999 to 2009
8	Monitoring Well KMW11 Dissolved Hydrocarbons Concentration Trends 1999 to 2009
9	Monitoring Well KMW18 Dissolved Hydrocarbons Concentration Trends 1999 to 2009
10	Monitoring Well KMW19 Dissolved Hydrocarbons Concentration Trends 1999 to 2009
11	Monitoring Well KMW35 Dissolved Hydrocarbons Concentration Trends 2005 to 2009
12	Monitoring Well W-16 Dissolved Hydrocarbons Concentration Trends 1999 to 2009

13	Monitoring Well KMW07 Dissolved Metals Concentration Trends 1999 to 2009
14	Monitoring Well KMW11 Dissolved Metals Concentration Trends 1999 to 2009
15	Monitoring Well KMW18 Dissolved Metals Concentration Trends 1999 to 2009
16	Monitoring Well KMW19 Dissolved Metals Concentration Trends 1999 to 2009
17	Monitoring Well KMW35 Dissolved Metals Concentration Trends 2005 to 2009
18	Monitoring Well W-16 Dissolved Metals Concentration Trends 1999 to 2009
19	Soil Vapor Concentrations of Total Petroleum Hydrocarbons as Gasoline (TPHg), 2000 through 2008
20	Annual Mass Extraction of Hydrocarbons, 2000 through 2009
21	Monitoring Well KMW29 Dissolved Hydrocarbons Concentration Trends 2005 to 2009
22	Monitoring Well KMW30 Dissolved Hydrocarbons Concentration Trends 2005 to 2009
23	Monitoring Well KMW31 Dissolved Hydrocarbons Concentration Trends 2005 to 2009
24	Monitoring Well KMW32 Dissolved Hydrocarbons Concentration Trends 2005 to 2009
25	Monitoring Well KMW33 Dissolved Hydrocarbons Concentration Trends 2005 to 2009
26	Monitoring Well KMW37 Dissolved Hydrocarbons Concentration Trends 2005 to 2009
27	Monitoring Well KMW29 Dissolved Metals Concentration Trends 2005 to 2009
28	Monitoring Well KMW30 Dissolved Metals Concentration Trends 2005 to 2009
29	Monitoring Well KMW31 Dissolved Metals Concentration Trends 2005 to 2009
30	Monitoring Well KMW32 Dissolved Metals Concentration Trends 2005 to 2009
31	Monitoring Well KMW37 Dissolved Metals Concentration Trends 2005 to 2009
32	3-Dimensional Map of Process Sewers and Sanitary/Storm Sewers
33	3-Dimensional Map of Process Sewers and Sanitary/Storm Sewers at High Ground Water Elevation
34	Dry Season Sewer Sampling Analytical Results, October 2008
35	Wet Season Sewer Sampling Analytical Results, January to April 2009
36	Conceptual Alternative with Two Sets of Wells for Extraction at Low and High Water Conditions
37	Ground Water Flow Model Results for Operation of Extraction Wells at the Riverfront during Low River Stages
38	Ground Water Flow Model Results for Operation of Extraction Wells Set Back from the River at High River Stages
39	Conceptual Riverfront Extraction Well Installation
40	Conceptual Concrete Sealant Applied to the Revetment with Dual Phase Extraction

1. INTRODUCTION

This *Updated Focused Feasibility Study* (report) was prepared for ExxonMobil Environmental Services (EMES) on behalf of ExxonMobil Oil Corporation (ExxonMobil), for the NuStar Energy, L.P. (NuStar) Terminal in Portland, Oregon, which was previously owned and operated by ExxonMobil and its predecessors (site; **Figures 1** and **2**). The site includes the NuStar Terminal, an ExxonMobil lubricant distribution facility, and an Olympic Pipe Line Company (Olympic) delivery facility. ExxonMobil conducts ground water monitoring and remediation at the site in accordance with the Voluntary Cleanup Agreement No. ECVC-NWR-01015 (Voluntary Cleanup Agreement) between ExxonMobil and the State of Oregon, Department of Environmental Quality (DEQ).

Remediation activities at the site include operation of an air sparging (AS) and vapor extraction (VE) remediation system in the area of the north tank farm (**Figure 3**). Installation of the AS/VE remediation system was in accordance with a 1997 Record of Decision (ROD) by the DEQ, which was based on the findings of remedial investigation and feasibility analysis work conducted in the 1990s. The ROD included project cleanup goals. Developments subsequent to issuance of the ROD led to the Voluntary Cleanup Agreement in 2002. The Voluntary Cleanup Agreement required additional feasibility analysis and a supplemental remedial action work plan to address potential migration of petroleum constituents and metals in ground water to the Willamette River through the portion of the site now referred to as the air sparging curtain area (**Figure 3**). The focused feasibility study was submitted to the DEQ in 2003 (Integral Consulting 2003), and the remedial action resulting from the 2003 focused feasibility study was implemented beginning in 2005.

Subsequent to the Voluntary Cleanup Agreement, the DEQ and the US Environmental Protection Agency (EPA) issued the Portland Harbor Joint Source Control Strategy (JSCS), pertaining to the Portland Harbor National Priority List (NPL) site and upland sites potentially impacting the NPL site (DEQ and EPA 2005). A remedial investigation and feasibility study is currently underway for the NPL site, which will result in establishment of numeric cleanup goals for Portland Harbor. Based on the JSCS, in correspondence dated March 20 and April 24, 2008, the DEQ requested ExxonMobil provide a conceptual proposed alternative approach for expedited treatment or containment of petroleum constituents and metals potentially migrating to the Willamette River through the air sparging curtain area. The DEQ March 2008 correspondence indicated that by the time of the in-water EPA Record of Decision for Portland Harbor, remediation in the air sparging curtain area should achieve either a) hydraulic control, or b) Portland Harbor numeric cleanup goals at the river. The EPA Record of Decision is scheduled for 2010.

In response to the DEQ, ExxonMobil conducted remedial investigation as described in work plans submitted to the DEQ in September 2008 (Acton • Mickelson • Environmental, Inc. [AME] 2008a, 2008b). The remedial investigation was necessary to obtain hydrogeologic data to support updated ground water modeling for analysis of additional remedial alternatives. The remedial investigation also included assessment of process and storm sewers at the site for potential impacts to ground water and surface water. As requested by the DEQ, ExxonMobil has been providing monthly progress updates on the remedial investigation activities. The remedial

investigation work proposed in the September 2008 work plans has been mostly completed, the results from which support the updated focused feasibility study presented herein.

The purpose of the updated feasibility study is as follows:

- Summarize the nature, extent, and concentration trends of COCs in ground water
- Summarize the nature and extent of COCs in sewers
- Assess additional remedial alternatives for the air sparging curtain area
- Assess if additional remedial alternatives should be considered for other areas of the site
- Identify additional data needs for analysis and/or design of remedial alternatives at the air sparging curtain area or other areas of the site

This report follows the format of DEQ guidance for preparation of feasibility study reports (DEQ 2002a), and is organized as follows:

- Section 1 – Introduction
- Section 2 – Identification of Remedial Areas of Concern
- Section 3 – Identification of Media Requiring Remedial Action
- Section 4 – Development of Remedial Action Objectives
- Section 5 – Identification and Screening of Remedial Technologies
- Section 6 – Development and Screening of Preliminary Remedial Action Alternatives
- Section 7 – Detailed Analysis of Remedial Action Alternatives
- Section 8 – Comparative Analysis of Remedial Action Alternatives
- Section 9 – Recommended Remedial Action Alternative

1.1 Site History

The site is an approximately 29-acre petroleum terminal on the western bank of the Willamette River. ExxonMobil and its predecessors owned and operated the site from approximately 1928 until September 2001 when the product storage and transfer facilities were sold to ST Services, Shore Terminals, LLC (Shore Terminals). Valero, LP (Valero) purchased Shore Terminals in July 2005. Valero separated from its parent company (Valero Energy Corporation) in April 2007 and was renamed NuStar Energy, L.P. (NuStar). ExxonMobil maintains ownership of a lubricant distribution facility in the northwest portion of the site. Olympic owns and operates a delivery facility in the southern portion of the site approximately 500 feet southeast of the loading rack area.

Historical remedial actions for soil and ground water include:

- Installation of extraction wells during the late 1970s and operation to the early 1990s for recovery of hydrocarbon-impacted ground water and liquid phase hydrocarbons (LPH)

- Installation of a subsurface slurry wall (**Figure 2**) and upgradient ground water extraction wells during the 1980s to act as a barrier to migration of petroleum-impacted ground water to the Willamette River (ground water extraction discontinued in the 1990s)
- Construction and operation of an AS/VE remediation system in the north tank farm area beginning in the third quarter of 2000. Expansion of the AS/VE system in 2005 to address the area downgradient of the north tank farm area and along the river north of the subsurface slurry wall, the area now referred to as the air sparging curtain area

Installation of the AS/VE remediation system in the area of the north tank farm (**Figure 3**) was in accordance with the 1997 ROD by the DEQ, which was based on the findings of remedial investigation and feasibility analysis work conducted by ExxonMobil in the 1990s, including a 1996 feasibility study report (Kleinfelder 1996). The ROD included project cleanup goals. Developments subsequent to issuance of the ROD led to the Voluntary Cleanup Agreement in 2002. The Voluntary Cleanup Agreement required additional feasibility analysis and a supplemental remedial action work plan to address potential migration of petroleum constituents and metals in ground water toward the Willamette River through the air sparging curtain area. The additional feasibility analysis was presented in the *Focused Feasibility Study* (Integral Consulting 2003) submitted to the DEQ in May 2003, which recommended expansion of the AS/VE system.

The supplemental remedial action work plan (Kleinfelder 2004a) for expansion of the AS/VE remediation system was submitted to the DEQ in May 2004. The DEQ approved the proposed remediation system expansion in correspondence dated July 23, 2004. The remediation system expansion was constructed from January to March 2005 and included 13 AS wells, 3 VE wells, 3 vapor monitoring wells, and the construction of approximately 400 feet of underground piping and 400 feet of aboveground piping to connect the new AS and VE wells to the existing remediation equipment. As part of the remediation system expansion, nine ground water monitoring wells were installed for assessment of remediation effectiveness. The VE portion of the expanded remediation system was started on March 30, 2005. The AS portion of the expanded remediation system was started on May 4, 2005. A report documenting the construction and startup of the remediation system expansion was submitted to the DEQ in August 2005 (AME 2005).

The 13 AS wells (AS-11 through AS-23, **Figure 3**) installed for the AS/VE remedial expansion constitute an air sparging curtain for remediation north of the subsurface slurry wall and east (downgradient) of the north tank farm. Remedial performance in the air sparging curtain area is characterized by the results from monitoring wells KMW29 through KMW33 and KMW37 (**Figure 3**).

As discussed later in this report, initial ground water monitoring results following startup of the AS/VE expansion indicated success in reducing concentrations of petroleum hydrocarbons and metals in the air sparging curtain area. More recently, the decreasing concentration trends in the air sparging curtain area have reversed; hence, the DEQ requested an alternative approach for expedited treatment or containment of ground water in the air sparging curtain area and the preparation of this updated focused feasibility study.

1.2 Physical Setting

1.2.1 Hydrology

Hydrologic conditions at the site are influenced by the Willamette River, and to a lesser degree, the Columbia River. The Willamette River is a major tributary to the Columbia River, and similarly to the Columbia River, experiences the lowest river flow during the months of September through November, prior to the onset of winter storms (Lower Willamette Group, 2004). River flow in the Willamette River can increase rapidly due to regional storms. The highest river flow is typically observed in the late spring when snow melt takes place. Between the months of May and June, river flow from the Willamette into the Columbia River is slowed due to the high water stage of the Columbia River.

Water elevations in the Willamette River are also tidally influenced. Real time and historical water level data are available from the United States Geological Survey (USGS) automated gauging station 14211720 located at the Morrison Bridge in Portland, Oregon, approximately 7.8 miles upstream of the site. The tidal cycle is a mixed semidiurnal type (i.e., two high tides and two low tides per day, where both the two high and two low tides have different heights). Exclusive of other changes in the river stage, the typical daily range between high and low tide levels is approximately 1 foot.

1.2.2 Geology

1.2.2.1 Regional Geology

The site is located within the Portland Basin, which is a bowl-like structure bounded by folds and faults. The structural zones are characterized as dextral wrench faults that have a northwest trend in the pull-apart basin (Beeson et al., 1985; Yelen and Patton, 1991). The basin contains approximately 1,400 feet of alluvial flood deposits that range in age from the middle Miocene to the Quaternary. The site is underlain by the Columbia River Basalt Group (CRBG), Waverly Heights basalt and marine sediments. The geologic units in the region are described below:

- **Recent Fill:** The lowland area near the river is predominantly composed of fill and dredged sediments, consisting of fine sand and silty sand. The thickness of this unit ranges between approximately 0 to 20 feet.
- **Fine-Grained Pleistocene Flood Deposits and Recent Alluvium:** This unit includes fine-grained facies of the Pleistocene Flood Deposits along with recent alluvium. It generally consists of silt, clay, silty sand, and fine to medium grained sand (Beeson et al, 1991). This unit ranges from approximately 20 to 100 feet below ground surface (bgs) and has variable permeability due to the mixture and alternation of sands and clay/silt.

- **Coarse Grained Pleistocene Flood Deposits:** This unit is composed of fluvial deposits from floods that occurred during the Pleistocene. The unit is made up of sand, gravel, cobbles (Lower Willamette Group, 2004). This unit is located approximately 10 to 200 feet bgs.
- **Upper Troutdale Formation:** This formation is made up of alluvial sands, gravel, and cobbles and extends as deep as 200 feet bgs (Swanson et al, 1993).

Columbia River Basalt Group: The CRBG is present at relatively shallow depths and in certain locations comes into direct contact with the Willamette River. The CRBG is a thick sequence of basalt flows that underlie the Portland Basin and can extend to as deep as approximately 600 feet bgs (Beeson et al, 1991).

1.2.2.2 Local Geology

As part of the analysis of the site conditions, existing boring logs from the site and from the adjoining Arco and Time Oil sites were used to develop a 3-dimensional model of the site stratigraphy. Elevations of the boundaries between stratigraphic units were obtained from the logs, and the elevations were interpolated using 3-dimensional geostatistical kriging. Kriging and visualization of the results were accomplished using the Mining Visualization Software (MVS) by C Tech Development Corporation (Appendix A).

The CRBG is dominant in the steeply-sloping western portion of the site (i.e., the upland portions and St. Helen's Road, **Figure 4**). Previous investigations have documented the CRBG at approximately 5 to 25 feet bgs in the western region of the site and at approximately 70 feet bgs near the riverfront in the eastern portion of the Arco site to the north.

The stratigraphic units in the eastern area of the site (i.e., between the loading rack area and the river and between the railroad tracks and the river to the north and south) include an upper sand fill, a silty-clay aquitard, and a lower sand unit overlying the regional basalt. The **Figure 4** cross section illustrates the stratigraphic units. The upper sand fill occurs from the surface to approximately 25 feet bgs at the riverfront. Because the aquitard beneath the upper sand fill dips northeast toward the river, the upper sand fill pinches out west of the railroad tracks and is not present in the higher, western portion of the site. The texture and composition of the upper sand fill is consistent with dredge material derived from the riverbed.

Site data indicates the aquitard is continuous across the site (**Figure 5**, Appendix A). The aquitard thickness is relatively uniform along a line that parallels the river, decreasing to the west away from the river. More specifically, at the river the aquitard is approximately 30 feet thick and thins to the west to approximately 10 feet where it outcrops at the surface. The aquitard surface in the area of the air sparging curtain intersects the Willamette River at an elevation of approximately 2 to 6 feet City of Portland Datum (CPD).

The lower sand unit beneath the silt-clay aquitard overlies the CRBG beneath the site and extends to below the river. At the upper portion of the site, the lower sand unit pinches out at some locations and thus is not exposed at the surface (**Figure 5**).

1.2.3 Regional Hydrogeology

Characteristics that are important to groundwater flow include the physical relationship between the hydrogeologic units and the river and physical characteristics of each hydrogeologic unit (Lower Willamette Group, 2004). The hydrogeologic units described below are listed in the order of the uppermost unit to the lowermost unit:

- **Fill, Fine Grained Flood Deposits, and Recent Alluvium (FFA):** The FFA unit is composed of the fill, recent alluvium, and the fine-grained facies of the Pleistocene flood deposits. The fill consists of fine sand and silty sand dredge material that was placed over silt and clay overbank deposits. The fine sediments are interbedded with lenses and layers of fine to coarse sand (Lower Willamette Group). The thickness of this unit is variable and typically ranges from 30 to 100 feet bgs.
- **Coarse Grained Flood Deposits and Upper Troutdale Formation:** This unit consists of unconsolidated coarse grained flood deposits and cemented and non-cemented cobbles and gravels from the Troutdale Formation.
- **Lower Troutdale Formation/Sandy River Mudstone:** Silt and clay compose the majority of this unit. The permeability of the unit is low and, as such, does not contribute significantly to surface/groundwater interactions (Lower Willamette Group, 2004).
- **Columbia River Basalt Group:** Ground water flow in the CRBG occurs along faults. In these areas the permeability of the unit is high (Lower Willamette Group, 2004).

1.2.4 Site Hydrogeology

1.2.4.1 Ground Water Occurrence

The hydrogeologic units at the site correspond to the site stratigraphic units. The units, from top to bottom, are the upper sand fill, the aquitard, the lower sand unit, and the basalt bedrock (CRBG). The upper sand fill and the aquitard on the site include the dredge fill and the silt and clay portions of the regional FFA hydrogeologic unit.

Ground water within the upper sand fill is unconfined and is present at a depth of approximately 10 to 20 feet bgs (**Figure 4**). Adjacent to the river, the shallow water table fluctuates seasonally more than 4 feet, from approximately 18 to 22 bgs, which is equivalent to elevations ranging from 9 to 13 feet CPD. Ground water elevation data from 2005 through 2008 is documented in **Table 1**, and ground water elevation data prior to 2005 is provided in Appendix B.

In the vicinity of the loading rack, the ground water in the lower sand unit is also unconfined. The water table occurs at approximately 15 to 18 feet bgs, which is equivalent to approximately 26 to 28 feet CPD. In the eastern area of the site, the ground water in lower sand unit becomes confined beneath the aquitard.

In the upland portion of the site near Saint Helens Road, ground water elevations range from approximately 40 to 70 feet CPD based on monitoring wells screened within the weathered basalt bedrock and overlying clay and sand (**Figure 6**).

1.2.4.2 Ground Water Movement

The potentiometric gradient of the underlying ground water system is generally northeast toward the river (**Figure 6**). As such, ground water movement across the site is to the river. In the center and south tank farms the ground water gradient is relatively flat due to the permeability of the upper sand fill and the effect of the subsurface slurry wall adjacent to the river. In the area of the air sparging curtain, the ground water gradient is approximately 0.06. The ground water gradient is steep in the southwestern portion of the site in response to lower permeability of the basalt and the increase in topography.

Ground water discharges to the Willamette River. The majority of the discharge occurs in the area of the air sparging curtain. However, small gaps in the slurry wall may also be producing ground water seeps to the river. In particular, a ground water low at monitoring well W-20 may result from ground water flow through a gap in the slurry wall. At this location the storm drain WP-209 intersects the slurry wall. In addition, a ground water seep has also been observed near the location of the former City of Portland combined sewer outfall OF-23, just upstream of Shop Building #5 (Kleinfelder, 1991). This seep may also correspond with a gap in the slurry wall. (The original outfall OF-23 was in use until 1989, seven years after construction of the slurry wall ([AME 2008a])).

1.2.4.3 2008 Piezometer Installation and Soil Sampling

In advance of the pumping tests performed at monitoring wells KMW31 and MW39, a total of five piezometers were installed at the site (P-1 through P-5) in October 2008. Piezometers P-1 and P-2 are located in the AS curtain area approximately 10 and 20 feet from monitoring well KMW31, along a line parallel to the revetment along the Willamette River. Piezometer P-3 is approximately 4 feet from monitoring well KMW31, between the monitoring well and the revetment, along a line perpendicular to the revetment. Piezometers P-4 and P-5 are in the loading rack area approximately 7 and 19 feet from monitoring well MW39. Information regarding details of the piezometer installation and the boring logs is in Appendix C.

The fine grained sediments of the aquitard were sampled during the installation of the piezometers. The soil samples were collected in Shelby tubes at 27 feet bgs in piezometers P-1 and P-2 and analyzed for physical properties. The reported vertical permeabilities of the aquitard soils are 5.1 and 2.7 millidarcy from P-1 and P-2, respectively. The equivalent hydraulic conductivities are 4.97E-06 cm/s and 2.56E-06 cm/s. Total porosity measurements from the samples are 60.7% and 57.1% from P-1 and P-2, respectively.

1.2.4.4 October 2008 Pumping Test, Loading Rack Area

A constant rate pumping test was performed on monitoring well MW39 on October 28, 2008. The purpose of the pumping test was to provide estimates of the aquifer parameters of the poorly-graded sand unit in the western (upland) portion of the site. This same sand unit underlies the aquitard in the eastern portion of the site.

Based on a step test performed on October 24, 2008, a pumping rate of 0.5 gallon per minute (gpm), or 0.067 cubic feet per minute (ft³/min), was selected for the 8-hour pumping test. The maximum observed drawdown in the pumped well was 3.9 feet.

The pumping test data for piezometers P-4 and P-5 were analyzed using the Neumann method for delayed yield in a partially-penetrating well in an unconfined aquifer. The type curves were matched to both the drawdown and recovery data to properly constrain the solution parameters. Data from the pumped well was not analyzed because short-term deviations from the average pumping rate during the test affected the drawdown data.

Results from the pumping test indicate the poorly-graded sand unit in this location of the site is characterized by moderately low permeability. The transmissivity and hydraulic conductivity of the sand unit were measured at 0.053 feet²/minute and 3.9 feet/ day (1.4EE-03 centimeters per second), respectively. The parameter beta and thus Kv/Kh at P-4 was judged to be poorly constrained, and thus was not used in the average calculations. Additional details of the pumping test are provided in Appendix D.

Well	r (feet)	s max (feet)	T (ft ² /min)	K (ft/day)	Sy	S	Beta	Kv/Kh
P-4	6.5	0.16	0.055	4.0	0.35	0.01	0.09	0.83
P-5	18.6	0.11	0.05	3.7	0.06	0.001	0.2	0.22
AVERAGE FOR TEST			0.053	3.9	0.21	0.006	0.2	0.22

Notes

Beta = Neumann solution parameter based on Kv/Kh and well geometry.

Data from P-4 not used to calculate the parameter Beta and thus Kv/Kh because of poor constraint of these parameters.

ft² = square feet

K = hydraulic conductivity.

Kv/Kh = Ratio of vertical to horizontal hydraulic conductivity.

min= minute

r = radial distance from pumped well.

S = storativity.

s max = maximum drawdown.

Sy = specific yield.

T = transmissivity.

1.2.4.5 January 2009 Pumping Test, Air Sparging Curtain Area

A constant-rate pumping test was performed on monitoring well KMW31 on January 20, 2009. The purpose of the pumping test was to provide estimates of the aquifer parameters of the shallow poorly-graded sand unit (fill) present above the aquitard in the eastern portion of the site.

Based on a step test performed on January 19, 2009, a pumping rate of 2.5 gpm, or 0.33 ft³/min, was selected for the 12-hour pumping test. At 282 minutes into the test, the pumping rate was lowered to 2.0 gpm (0.27 ft³/min) because of drawdown attributable to well losses. The maximum observed drawdown in the pumped well was approximately 4.8 feet.

The pumping test data for monitoring well KMW31 and piezometers P-1 through P-3 were analyzed using the Neumann method for delayed yield in an unconfined aquifer. The analysis incorporated the effects of the change in pumping rate. The type curves were matched to both the drawdown and recovery data to properly constrain the solution parameters. The analysis included superposition of a recharge boundary to match the recovery data.

The analysis of the pump data indicated a delayed yield response and the effect of a recharge boundary in the late time drawdown data (after approximately 300 minutes) and the recovery data. In order to match the data, the analysis included a recharge boundary located between 8 and

11 feet from the pumped well KMW31 and the respective observation well. This recharge boundary may correspond to a zone of higher hydraulic conductivity adjacent to the retaining wall and revetment along the river, such as coarser backfill material.

Results from the pumping test indicate the poorly-graded sand unit in this location of the site is permeable. The transmissivity and hydraulic conductivity of the shallow sand unit (fill) were measured at 0.076 feet²/minute and 18 feet/ day (6.4EE-03 centimeters per second), respectively. At KMW31, the data exhibit the effect of well losses due to drawdown over 2 feet; therefore, specific yield and storativity were not estimated from these data. Data from P-2 were not used to calculate average aquifer parameters, given the small drawdown relative to the correction and poor constraint of parameters. Additional details of the pumping test are provided in Appendix E.

Well	r (feet)	s max (ft)	Distance to Recharge Boundary (ft)	T (ft ² /min)	K (ft/day)	Sy	S	Beta	Kv/Kh
KMW31	0	4.81	10	0.06	15				
P-1	10	0.30	8	0.093	21	0.08	0.02	0.9	0.37
P-2	21	0.12	9	0.075	17	0.07	0.001	7	0.61
P-3	4	0.87	11	0.076	18	0.13	0.03	0.1	0.23
AVERAGE FOR TEST				0.076	18	0.11	0.025	0	0.30

Notes:

At KMW31, drawdown data after $t=30$ min shows well losses due to drawdown over 2 feet.

Beta = Neumann solution parameter based on Kv/Kh and well geometry.

Data from P-2 not used to calculate average aquifer parameters, given small drawdown relative to correction and poor constraint of parameters.

ft² = square feet

K = hydraulic conductivity.

Kv/Kh = Ratio of vertical to horizontal hydraulic conductivity.

Late time drawdown ($t > 300$ min) and recovery data show evidence of recharge boundary 8 to 11 feet away from KMW31 toward river.

min = minute

r = radial distance from pumped well.

S = storativity.

s max = maximum drawdown.

Sy = specific yield.

T = transmissivity.

1.2.4.6 January 2009 Slug Tests

Slug tests were performed from monitoring wells KMW06, KMW10, KMW31, KMW33, KMW35, and KMW37 on January 21 and 22, 2009. The purpose of the slug tests was to provide estimates of the aquifer parameters to compare with results of the aquifer tests and to characterize the variability in hydraulic conductivity across the site.

With the exception of monitoring well KMW10, the wells selected for slug testing were screened across the water table within the shallow poorly-graded sand (SP) that is present below the ground surface. The ground water at these locations is unconfined. Monitoring well KMW10 is completed from approximately 12 to 21 feet below ground surface (bgs), which is beneath the aquitard. At this location the ground water is confined.

Data for the slug tests in unconfined conditions (monitoring wells KMW06, KMW31, KMW33, KMW35, and KMW37) were analyzed using the Bauer-Rice method. The analysis incorporated a correction for the effective casing radius, since the water level change occurred across the screened interval. Data for the slug test at monitoring well KMW10 (confined conditions) were analyzed using the Cooper-Jacob-Papadapoulos method.

Results of the slug test analysis are summarized below. The hydraulic conductivity of the upper sand fill was estimated to be between approximately 3 and 80 feet/day, with an average of approximately 28 feet/day (9.9EE-03 centimeters per second). The average is comparable to the result of the aquifer test at KMW31 (hydraulic conductivity average of 18 feet/day).

Well	Sand Unit	Slug Test Number	Method (Note 2)	H0 max (feet)	K (feet/min)	K (feet/day)
KMW06	Fill	1	Bauer-Rice	6.13	0.06	86
"	"	2	Bauer-Rice	6.13	0.05	72
KMW10	Deep	1	Cooper et al.	6.13	0.0026	3.7
KMW31	Fill	1	Bauer-Rice	3.06	0.0024	3.5
"	"	2	Bauer-Rice	3.06	0.0037	5.3
KMW33	Fill	1	Bauer-Rice	4.59	0.018	26
"	"	2	Bauer-Rice	4.59	0.016	23
KMW35	Fill	1	Bauer-Rice	4.59	0.0017	2.0
"	"	2	Bauer-Rice	4.59	0.0028	4.0
KMW37	Fill	1	Bauer-Rice	1.53	0.023	33
"	"	2	Bauer-Rice	1.53	0.02	29
AVERAGE FOR FILL				0.00	0.02	28

Notes

H0 max = estimated theoretical maximum head change, assuming initial head change within well casing only.

K = hydraulic conductivity.

1. At KMW10 B is water column height. KMW10 is confined aquifer with thickness of 9 feet from CL unit above to base of screen.

2. For Bauer-Rice method, correction applied for effective casing radius, since well screens extend above the water table.

The hydraulic conductivity measured from monitoring well KMW31, a value of 4 feet/day, is less than the aquifer test result of 18 feet/day. This difference may be attributable to small-scale variations of hydraulic conductivity and to the smaller spatial scale of a slug test versus a pump test. At the other slug test locations in the air sparging curtain area, monitoring wells KMW33 and KMW37, the respective estimates of hydraulic conductivity were approximately 20 and 30 feet/day.

At monitoring well KMW10, the measured hydraulic conductivity is 3.7 feet/day, (1.3EE-03 centimeters per second), which agrees with the value obtained from aquifer test performed at KMW39. Additional details of the slug tests are provided in Appendix F.

1.2.4.7 January 2009 Monitoring of Ground Water Coupling to River Elevation

From January 15 to 19, 2009, concurrent measurements of ground water levels in the vicinity of the air sparging curtain and water levels in the Willamette River nearby were performed. The purpose of the monitoring was to characterize the degree of hydraulic communication between the Willamette River and the adjacent upper sand fill present above the aquitard in the eastern portion of the site. In particular, the investigation focused on the influence of a concrete revetment that separates the shallow sand unit from the river in the area of the air sparging curtain (**Figure 4**).

At the time of the monitoring, the elevation of ground water in the monitoring wells and piezometers ranged from approximately 11.5 to 12.5 feet CPD. Average water elevations in the Willamette River ranged from about 8.5 to 11 feet CPD.

During the 3-day monitoring period, the average river level declined approximately 2.5 feet. Ground water elevations in the monitoring wells and piezometers during the corresponding time period declined approximately 1 foot.

Water elevations in the Willamette River are tidally influenced, and follow a mixed semidiurnal tidal cycle. During the monitoring period, the daily range between high and low tide levels was approximately 1 foot. The tidal signature in the ground water monitoring level data was discernable but small, with semidiurnal fluctuations being less than 0.1 foot, or approximately 10 percent of the river fluctuations. The time lag between the river and the monitoring wells was approximately 4 hours. As water elevations declined during the 3-day monitoring period, the semidiurnal fluctuations diminished and were not evident in the ground water levels. The observed tidal fluctuations in the ground water monitoring wells suggest that the revetment is a partial flow barrier. Additional details of the water level monitoring are provided in Appendix G.

1.3 Nature and Extent of Chemicals of Concern

1.3.1 Liquid Phase Hydrocarbons

Historical observations of LPH in the north tank farm area have included the following monitoring wells: KMW11 (one occurrence), KMW17, KMW19 (one occurrence), W-15, and W-16 (one occurrence). In the air sparging curtain area, LPH has historically been observed in monitoring wells KMW32 (one occurrence), and W-1 through W-14, Inland of the subsurface slurry wall, LPH has historically been observed in monitoring wells W-17 through W-20 (**Table 1** and Appendix B). Historical remediation activities have reduced the presence of LPH, so that current ground water monitoring reports the presence of LPH only in monitoring wells KMW17 and W-15. The largest LPH thickness measurements during 2008 occurred in monitoring wells KMW17 and W-15 and were 0.20 and 0.02 foot, respectively.

1.3.2 Chemicals of Concern

Both organic and inorganic COCs were identified in the 1997 ROD. The organic COCs include benzene, total petroleum hydrocarbons (TPH), and naphthalene, and the inorganic COCs include arsenic, copper, and lead. No direct sources of arsenic and copper detected in ground water have been identified at the site. These dissolved inorganic constituents occur as a result of reduced

ground water conditions induced by the presence of petroleum hydrocarbons. The chemically reduced ground water conditions cause transformation of the naturally-occurring arsenic and copper compounds in soil from their oxidized insoluble forms to the reduced soluble forms, with resulting dissolution of the reduced arsenic and copper compounds into the ground water. Further discussion of the naturally occurring presence of arsenic in ground water is in Section 1.4.3.

Ground water cleanup goals from the ROD are as follows:

- Benzene – 0.040 milligram per liter (mg/L), equivalent to 40 micrograms per liter (µg/L)
- TPH – 1 mg/L (assumed 1 mg/L TPH as gasoline [TPHg] and 1 mg/L TPH as diesel [TPHd])
- Naphthalene – 0.347 mg/L
- Arsenic – 0.005 mg/L
- Copper – 0.012 mg/L
- Lead – 0.0032 mg/L

In addition to the COCs specified in the ROD, the March 2008 DEQ correspondence directed that evaluation of polynuclear aromatic hydrocarbons (PAHs) be included in assessment activities. Of the 18 PAHs reported by U.S. Environmental Protection Agency Method 8270C, assessment focuses on the eight two- and three-ring PAHs considered related to petroleum operations; namely, acenaphthene, acenaphthylene, anthracene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and phenanthrene. The 10 four- and five-ring PAHs are related to combustion sources (Van Metre et al. 2000).

The discussion herein on chemicals of concern (COCs) focuses on ground water data. Soil and sediment sampling data can be found in previous reports (Kleinfelder 1990, 1991a, 1993). As discussed later in Section 1.5, soil cleanup goals for the site are based on protection of ground water, so ground water quality data are used to assess relevant COC impacts to soil as well.

Ground water sample analytical results for organic COCs from 2005 through first quarter 2009 are in **Table 2**. Ground water sample analytical results from 2005 through first quarter 2009 for inorganic COCs are in **Table 3**. Ground water sample analytical results reported prior to 2005 are in Appendix B. Laboratory analytical reports for first quarter 2009 ground water samples are in Appendix H.

1.3.3 North Tank Farm Area

The north tank farm is the area of the site where remedial action has been implemented in accordance with the initial site feasibility study (Kleinfelder 1996) and the 1997 ROD. Ground water in the north tank farm area is characterized by sampling results from monitoring wells KMW07, KMW11, KMW18, KMW19, KMW35, and W-16 (monitoring wells KMW17 and W-15 are also part of the north tank farm monitoring well network, but due to the limited analytical data set, these monitoring wells are not included in discussion of concentration trends).

1.3.3.1 *Third Quarter 1999 to First Quarter 2009 Ground Water Concentration Trends*

Following startup of the AS/VE in 2000, reported concentrations of COCs in samples from monitoring wells in the north tank farm area were generally decreasing (AME 2007c). The trends have reversed in many cases, with reported COC concentrations increasing since early 2007. **Figures 7 through 12** illustrate concentrations of benzene, TPHg, and TPHd reported in ground water samples from monitoring wells KMW07, KMW11, KMW18, KMW19, KMW35, and W-16. **Figures 13 through 18** illustrate concentrations of dissolved arsenic and dissolved lead reported in ground water samples from monitoring wells KMW07, KMW11, KMW18, KMW19, KMW35, and W-16. In general, the figures show concentration data from the third quarter 1999 (prior to AS/VE startup in the third quarter 2000) through the first quarter 2009 (after 9 years AS/VE operation in the north tank farm area). **Figures 11 and 17** illustrate data for monitoring well KMW35 data from first quarter 2005 through first quarter 2009, as this monitoring well was installed in January 2005.

A summary of the ground water concentration trends for benzene, TPHg, TPHd, dissolved arsenic, and dissolved lead from the third quarter 1999 through the first quarter 2009 is as follows:

- **Benzene.** Ground water samples from monitoring wells KMW07, KMW11, KMW18, KMW19, and W-16 have had benzene concentrations greater than the cleanup goal of 40 µg/L. As a result of the AS/VE operation, benzene concentrations in samples from monitoring wells KMW07, KMW19, and W-16 have decreased to less than the cleanup goal (**Figures 7, 10, and 12**). Benzene concentrations reported for samples from monitoring wells KMW11, KMW18, and KMW35 were less than the cleanup goal prior to 2007, but since the beginning of 2007 concentrations have increased to greater than the cleanup goal, reversing previous trends (**Figures 8, 9, and 11**).
- **TPHg.** Ground water samples from monitoring wells KMW07, KMW11, KMW18, KMW19, KMW35, and W-16 have had TPHg concentrations greater than the cleanup goal of 1 mg/L. Prior to 2007, the TPHg concentrations in samples from five of these monitoring wells (KMW07, KMW11, KMW18, KMW19, and W-16) had decreased to less than the cleanup goal as a result of AS/VE operation (**Figures 7, 8, 9, 10, and 12**). TPHg concentrations reported for samples from monitoring wells KMW19 and W-16 have generally remained less than the cleanup goal (**Figures 10 and 12**); however, the concentrations in samples from monitoring wells KMW07, KMW11, and KMW18 have increased since the beginning of 2007 to greater than the cleanup goal, reversing previous trends (**Figures 7 to 9**). A decreasing concentration trend for TPHg in samples from monitoring well KMW35 has also reversed, with a historical maximum concentration reported in the first quarter 2009 (**Figure 11**).
- **TPHd.** Ground water samples from monitoring wells KMW07, KMW11, KMW18, KMW19, KMW35, and W-16 have had TPHd concentrations greater than the cleanup goal of 1 mg/L. Samples from monitoring wells KMW07 and KMW19 have decreasing concentration trends as a result of AS/VE operation, with reported TPHd concentrations for monitoring well KMW19 now less than the cleanup goal (**Figures 7 and 10**). Estimated first-order degradation rates based on the decreasing trends for monitoring

wells KMW07 and KMW19 are 0.02 and 0.08 per year, respectively. Previously, TPHd concentrations in samples from monitoring wells KMW11, KMW18, and KMW35 were decreasing, but these trends have reversed since the beginning of 2007 (**Figures 8, 9 and 11**).

- Dissolved Arsenic. Filtered ground water samples from monitoring wells KMW07, KMW11, KMW18, KMW19, KMW35, and W-16 have had dissolved arsenic concentrations greater than the cleanup goal of 0.005 mg/L. Dissolved arsenic concentrations were decreasing in samples from monitoring wells KMW07, KMW11, KMW18, and KMW35 prior to 2007, but have since increased (**Figures 13, 14, 15, and 17**).

Dissolved Lead. Filtered ground water samples from monitoring wells KMW07, KMW11, KMW18, KMW19, KMW35, and W-16 have had dissolved lead concentrations greater than the cleanup goal of 0.0032 mg/L. Dissolved lead concentrations in samples from these monitoring wells have generally decreased to less than the cleanup goal as a result of AS/VE operation (**Figure 13 through 18**). In samples from monitoring wells KMW11 and KMW35, dissolved lead concentrations appear to be increasing since approximately the beginning of 2007 (**Figures 14 and 17**).

1.3.3.3 Polynuclear Aromatic Hydrocarbons in Ground Water

With regard to petroleum-related PAHs, the compounds listed below were reported in 2008 ground water samples in the north tank farm area:

- Acenaphthene – Reported concentrations ranged from less than the method detection limit (MDL) to 0.63 µg/L in monitoring well KMW35.
- Acenaphthylene – Reported concentrations ranged from less than the MDL to 0.25 µg/L in monitoring well KMW35.
- Anthracene – Reported concentrations ranged from less than the MDL to 2.16 µg/L in monitoring well KMW35.
- Fluorene – Reported concentrations ranged from less than the MDL to 1.85 µg/L in monitoring well KMW35.
- 1-methylnaphthalene – Reported concentrations ranged from less than the MDL to 55.4 µg/L in monitoring well KMW35.
- 2-methylnaphthalene – Reported concentrations ranged from less than the MDL to 31.1 µg/L in monitoring well KMW35.
- Naphthalene – Reported concentrations ranged from less than the MDL to 148 µg/L in monitoring well KMW07.

- Phenanthrene – Reported concentrations ranged from less than the MDL to 7.75 µg/L in monitoring well KMW35.

1.3.3.4 Remediation System Hydrocarbon Extraction Trends, 2000 to 2008

Figures 19 and 20 illustrate AS/VE system soil vapor hydrocarbon concentrations and annual hydrocarbon mass extraction from 2000 through 2008. The data indicate decreasing soil vapor concentrations and mass extraction from 2000 to 2006. An increase in mass extraction occurred in 2006 due to the effects from the reported NuStar gasoline release in February. During 2007 and 2008, soil vapor hydrocarbon concentrations and annual hydrocarbon mass extraction exhibit an increasing trend. The increased soil vapor hydrocarbon concentrations and hydrocarbon mass extraction during 2007 and 2008 correlate with the increased concentrations reported in ground water samples as described above.

1.3.4 Air Sparging Curtain Area

1.3.4.1 First Quarter 2005 to Fourth Quarter 2006 Ground Water Trends

Ground water in the air sparging curtain area is characterized by sampling results from monitoring wells KMW29 through KMW33 and KMW37. As discussed in Section 1.1, the AS/VE expansion implemented for remediation in the air sparging curtain area was based on the 2003 *Focused Feasibility Study* (Integral Consulting 2003).

Following startup of the expanded AS/VE in early 2005, reported concentrations of COCs in samples from monitoring wells in the air sparging curtain area were generally decreasing (AME 2007c). The trends have reversed in many cases, with reported COC concentrations increasing since the middle of 2007. **Figures 21 through 26** illustrate concentrations of benzene, TPHg, and TPHd reported in ground water samples from monitoring wells KMW29 through KMW33 and KMW37 from the first quarter 2005 (prior to startup of the expanded AS/VE later in the first quarter and in the second quarter of 2005) through the first quarter 2009. **Figures 27 through 31** illustrate concentrations of dissolved arsenic and dissolved lead reported in ground water samples from monitoring wells KMW29 through KMW32 and KMW37 from the first quarter 2005 through the first quarter 2009. Concentrations of dissolved arsenic and dissolved lead reported in ground water samples from monitoring well KMW33 have been less than cleanup goals.

A summary of the ground water concentration trends for benzene, TPHg, TPHd, dissolved arsenic, and dissolved lead since the 2005 startup of the AS/VE expansion is as follows:

- **Benzene.** Prior to 2008, only ground water samples from monitoring well KMW32 had reported benzene concentrations greater than the cleanup goal of 40 µg/L. During 2008, samples from monitoring wells KMW29, KMW30, KMW31, and KMW32 had reported benzene concentrations greater than the cleanup goal. Concentrations have been trending upward in samples from monitoring wells KMW29, KMW30, and KMW31 since approximately the middle of 2007. The concentrations in samples from monitoring well KMW32 are decreasing.

- TPHg. Ground water samples from five monitoring wells (KMW29, KMW30, KMW31, KMW32 and KMW37) have had TPHg concentrations greater than the cleanup goal of 1 mg/L. Prior to 2007, the TPHg concentrations in samples from these monitoring wells (were decreasing as a result of the expanded AS/VE operation, and the concentrations in ground water samples from three of the monitoring wells (KMW30, KMW32, and KMW37) were less than the cleanup goal of 1 mg/L (**Figures 21** through **24** and **26**). TPHg concentrations for ground water samples from monitoring well KMW32 remain generally less than the cleanup goal. Concentrations in samples from monitoring wells KMW29, KMW30, KMW31, and KMW37 have increased since approximately the middle of 2007.
- TPHd. Ground water samples from the six monitoring wells installed in the air sparging curtain area have had TPHd concentrations greater than the cleanup goal of 1 mg/L. In samples from monitoring wells KMW30 and KMW31, TPHd concentrations were stable or decreasing before 2007, but have since increased (**Figures 22** and **23**). Concentrations of TPHd in samples from monitoring wells KMW32, KMW33, and KMW37 are decreasing (**Figures 24** through **26**).
- Dissolved Arsenic. Filtered ground water samples from monitoring wells KMW29, KMW30, KMW31, KMW32, and KMW37 have had dissolved arsenic concentrations greater than the cleanup goal of 0.005 mg/L. Prior to 2008, the dissolved arsenic concentrations in samples from the five monitoring wells were trending downward as a result of the expanded AS/VE operation, but concentrations in samples from the five monitoring wells have since increased (**Figures 27** through **31**).
- Dissolved Lead. Filtered ground water samples from monitoring wells KMW29, KMW30, KMW31, KMW32, and KMW37 have had dissolved lead concentrations greater than the cleanup goal of 0.0032 mg/L. The dissolved lead concentrations reported in samples from monitoring well KMW32 are decreasing (**Figure 30**). In samples from monitoring wells KMW30, KMW31, and KMW37, earlier decreasing trends for dissolved lead concentrations have reversed.

1.3.4.3 Polynuclear Aromatic Hydrocarbons in Ground Water

With regard to petroleum-related PAHs, the compounds listed below were reported in 2008 ground water samples in the air sparging curtain area:

- Acenaphthene – Reported concentrations ranged from less than the MDL to 2.3 µg/L in monitoring well KMW33.
- Acenaphthylene – Reported concentrations ranged from less than the MDL to 0.9 µg/L in monitoring well KMW33.
- Anthracene – Reported concentrations ranged from less than the MDL to 0.47 µg/L in monitoring well KMW33.

- Fluorene – Reported concentrations ranged from less than the MDL to 6.22 µg/L in monitoring well KMW33.
- 1-methylnaphthalene – Reported concentrations ranged from less than the MDL to 45.7 µg/L in monitoring well KMW31.
- 2-methylnaphthalene – Reported concentrations ranged from less than the MDL to 36.8 µg/L in monitoring well KMW31.
- Naphthalene – Reported concentrations ranged from less than the MDL to 2.71 µg/L in monitoring well KMW37.
- Phenanthrene – Reported concentrations ranged from less than the MDL to 2.75 µg/L in monitoring well KMW31.

1.3.5 Area of Subsurface Slurry Wall

Ground water in the area of the subsurface slurry wall is characterized by sampling results from monitoring wells W-17 through W-22 (**Tables 2 and 3**, Appendix B). Historical reported concentrations of benzene and naphthalene in most ground water samples from monitoring wells W-17 through W-22 have been less than reporting limits, and reported concentrations of benzene and naphthalene have been less than the cleanup goals. Reported concentrations of TPHg in ground water samples have also been less than the cleanup goals, with the exception of two ground water samples from monitoring well W-17 (one in 1997 and one in 1998). Concentrations of TPHd in ground water samples from monitoring wells W-17 through W-22 have ranged from less than reporting limits to 14 mg/L (monitoring well W-17 in 2002).

Historical reported concentrations of total arsenic in ground water samples from monitoring wells W-17 through W-22 have ranged from less than reporting limits to 0.080 mg/L (monitoring well W-21 in 1990). Reported concentrations of total arsenic in monitoring wells W-20 through W-22 have been less than reporting limits since 1990. Historically reported concentrations of total copper and total lead in ground water samples from monitoring wells W-17 through W-22 have been less than reporting limits since 2000.

1.3.6 Loading Rack Area

Prior to 2006, ground water in the loading rack area was characterized by sampling results from monitoring wells KMW13 and KMW14. In 2006, monitoring wells MW38 and MW39 were installed to further investigate the distribution and magnitude of the COCs. The loading rack monitoring wells KMW13, KMW14, MW38, and MW39 are not within the AS/VE remedial area.

Reported benzene concentrations in samples from monitoring wells KMW13, MW38, and MW39 exceed the cleanup goal of 40 µg/L. In ground water samples obtained during the fourth quarter of 2008, reported benzene concentrations were 697, 127 J, and 26,600 µg/L, respectively. Reported TPHg concentrations in fourth quarter 2008 ground water samples from monitoring

wells KMW13 and KMW39 were 10.5 and 92.2 mg/L respectively, which are greater than the cleanup goal of 1 mg/L.

The origin and extent of COCs in loading rack area ground water are not fully understood. Additional ground water investigation has been proposed for the loading rack area (AME 2009b).

1.3.7 Sewers

Sewers at the site include storm sewers, process sewers, sanitary sewers, and combined sewers (**Figure 32**). The process sewers include one system related to NuStar operations and another system related to ExxonMobil operations. Combined sewers OF-23-Abandoned and OF-23 have been abandoned or disconnected; presently, only storm sewers WP-202 and WP-209 actively discharge to the Willamette River (not including discharge from the NuStar process sewer system and oil/water separator [WP-78]).

Figure 33 shows the relation of the sewers at the site to the water table surface during a period of high ground water elevation (May 9 to 11, 2006). For example, the City of Portland sanitary sewer that bisects the site north to south (purple line on **Figure 33**) is partially under the water table in northern and southern areas of the site during high ground water conditions. Other than the lower section of storm sewer WP-209, sewers are located between 1 to 9 feet above the water table during the highest ground water conditions observed. The lower section of storm sewer WP-209 possibly intersects ground water near the Olympic facility and railroad tracks during the highest ground water conditions.

Previous reports have described analytical results from water samples collected in the storm sewers. In accordance with a September 2008 sewer investigation work plan (AME 2008a), additional sewer sampling and flow data were obtained for this report. The investigation was comprised of dry season sampling performed in October 2008 and wet season sampling performed from January through April 2009. The investigation consisted of sampling storm sewers WP-202 and WP-209 and process sewers throughout the site, including both the ExxonMobil and NuStar process sewer systems. Sanitary sewers and combined sewers were not sampled. The October 2008 dry season and January through April 2009 wet season sewer investigation work also included flow measurements from selected storm, process, and sanitary sewers for the estimation of sewer outflow (leakage) or inflow (infiltration of ground water), but the measurements were inconclusive as to possible sewer leakage rates.

1.3.7.1 Storm Sewer Sampling

Storm sewers WP-202 and WP-209 were previously sampled in 2001 through 2003 and 2006 (Kleinfelder 2003, 2004b; AME 2007b). **Table 5** summarizes historical analytical results for storm sewers WP-202 and WP-209, along with the results of the recent dry season and wet season sampling at these locations. **Figure 34** shows results from the October 2008 dry season sampling, and **Figure 35** shows results from the January through April 2009 wet season sampling. Appendix I contains the laboratory reports for the sewer sampling conducted from October 2008 through April 2009.

WP-202: Storm sewer WP-202 originates off site to the west and extends along the northern boundary (**Figure 32**), conveying drainage from west of the site and discharging to the river. On site, the ExxonMobil sewer system connects to storm sewer WP-202 at the location identified as LUBEPLANT-OF on **Figures 34** and **35**. In addition, surface runoff from the NuStar facility enters the WP-202 sewer at the five manhole/catch basins identified as WP-202A through WP-202D and CB2 on **Figures 34** and **35**.

In samples obtained from the storm sewer WP-202 outfall (and from the manhole identified as WP-202A located immediately upstream of the outfall), reported concentrations of benzene and TPHg have been less than the respective reporting limits. Naphthalene and TPHd have been reported in outfall samples at concentrations up to 0.0686 J µg/L and 0.0549 J mg/L, respectively. In samples from sewer manholes AAC505 and AAC506, representing sewer flow originating off site, concentrations of benzene, TPHg, and naphthalene have been less than the respective reporting limits, and TPHd has been reported at concentrations up to 0.141 mg/L (**Figures 34** and **35**, Appendix I).

WP-209: Storm sewer WP-209 consists of an upper section and a lower section. The upper section conveys and discharges drainage from off site to an area south and west of the Olympic facility. Storm water then flows overland to the inlet of the lower section of storm sewer WP-209 located adjacent to the railroad tracks. The lower section conveys surface flow to the river. The location of storm sewer WP-209 is shown on **Figures 34** and **35**. Subsurface utility locating methods employed during January 2009 resolved the routing of the lower section of storm sewer WP-209. Attempts previously (Kleinfelder 2003, AME 2007) to document the construction and state of storm sewer WP-209 by in-sewer video camera were unsuccessful because of obstructions inside of and sediment deposited on the bottom of the sewer line.

At the storm sewer WP-209 outfall, reported benzene and TPHg concentrations have declined since 2002 (**Table 5**). In samples collected at the outfall in August 2002, reported concentrations in the samples were 430 µg/L benzene and 17 mg/L TPHg. Reported benzene concentrations in the October 2008 and April 2009 outfall samples were 0.840 J (estimated) and less than the reporting limit of 0.270 µg/L, respectively. Reported TPHg concentrations in the October 2008 and April 2009 outfall samples were 0.096 J and less than reporting limit of 0.043 mg/L, respectively. Historical analytical results for storm sewer WP-209 lower section inlet samples from May and August 2003, March 2006, October 2008, and April 2009 have been less than reporting limits for benzene and TPHg.

1.3.7.2 Process Sewer Sampling

NuStar Process Sewers: In the October 2008 dry season sampling, benzene, TPHg, TPHd, and ethanol were reported in samples obtained from process sewer manholes and catch basins identified as PS12o, PS16o, PS29s, and PS33s, with reported benzene concentrations up to 1,090 µg/L (PS33s), TPHg concentrations up to 44.0 mg/L (PS33s), TPHd concentrations up to 22.1 mg/L (PS29s), and ethanol concentrations up to 3,020,000 µg/L (PS29s) (**Figure 34**). In the March 2009 wet season sampling, benzene, TPHg, TPHd, and ethanol were reported in samples obtained from process sewer manholes and catch basins identified as PS01Ao, PS12o, PS16o, PS29o, PS33s, and LRAtank, with reported benzene concentrations up to 3,920 µg/L (LRATANK), TPHg concentrations up to 139 mg/L (LRATANK), TPHd concentrations up to

244 mg/L (LRATANK), and ethanol concentrations up to 6,640,000 µg/L (LRATANK) (**Figure 35**).

ExxonMobil Process Sewers: Analytical results for October 2008 and April 2009 samples were less than reporting limits for benzene and TPHg, with reported concentrations for TPHd ranging from 0.0569 µg/L (less than the estimated detection limit) to 9.87 mg/L (**Figures 34 and 35**) .

1.4 Conceptual Site Model

The following describes the fate and transport for organic and inorganic COCs.

1.4.1 Organic COCs

Organic COCs are comprised of petroleum hydrocarbons and ethanol. Organic COCs are released to the environment as LPH. Upon release, the LPH migrates vertically downward from the surface or near surface source(s). If sufficient product is released, LPH will migrate to the water table. If not, the migration of LPH will be terminated in the vadose zone. In the vadose zone, COCs contained in residual LPH will dissolve in infiltrating water and migrate downward to the water table. Given the presence of LPH on the water table (more significant historically) and given that dissolved sources are generally shallow, COCs will occur near the water table surface. Dissolved COCs will migrate laterally with the ground water flow. As a result of the ground water movement, both laterally and vertically, COCs are adsorbed to the soil and are also present as immobile LPH within the zone of water table fluctuation. Biodegradation of COCs will lead to reduced ground water conditions outside of the influence of the AS system.

Organic volatile COCs may migrate within the vadose zone. Inside the zone of influence of the VE system, vapors are captured and extracted from the subsurface. Outside the VE system, the vapors will diffuse through the pore structure of the sediments where the compounds may be adsorbed to the soil or degrade via natural processes. In the vicinity of the air sparging system, biodegradation is enhanced by the addition of oxygen to the subsurface environment.

1.4.2 Inorganic COCs

Inorganic COCs include arsenic, copper, and lead. With the possible exception of lead (from historical use of alkyl lead additives in motor fuels), inorganic COCs are naturally occurring components of subsurface sediments. Biodegradation of organic COCs (petroleum hydrocarbons) in ground water consumes oxygen, nitrate, and other electron acceptors, and ground water conditions become more reducing. The reduced forms of inorganic COCs are generally more soluble than the oxidized forms. Consequently, inorganic COCs become dissolved in ground water as a result of modified (reduced) ground water conditions created by biodegradation of organic COCs; thus, elevated concentrations of inorganic COCs are observed in ground water in the same areas as organic COCs are present. The dissolved inorganic COCs generally migrate laterally downgradient with the ground water. Dissolved inorganic COCs will revert back to oxidized insoluble forms upon encountering oxygenated ground water conditions (e.g., as created by AS operation).

1.4.3 Background Presence of Arsenic

Naturally occurring arsenic has been reported in ground water samples from site background monitoring wells KMW24 through KMW27. Reported concentrations of total arsenic in unfiltered ground water samples from the background monitoring wells have ranged up to 0.0084 mg/L, and reported concentrations of dissolved arsenic in filtered ground water samples from the background monitoring wells have ranged up to 0.00856 mg/L. Averaging the concentration of total arsenic from background ground water samples documenting a reported value, the mean total arsenic concentration is 0.0043 mg/L. Including values at concentrations less than the reporting limits, the mean background total arsenic concentration is 0.0022 mg/L.

Research of arsenic concentrations in ground water within a 15-mile radius of the site indicated that approximately 15 percent of total arsenic concentrations exceed 0.005 mg/l, with concentrations ranging up to 0.033 mg/L, and approximately 43 percent of dissolved arsenic concentrations exceed 0.005 mg/l, with concentrations ranging up to 0.077 mg/L (Integral Consulting 2003). The pervasive presence of naturally occurring arsenic in regional sediments and ground water is documented in a U.S. Geological Survey report (Hinkle and Polette 1999). This report documents that natural arsenic sources in the area include volcanic rocks, metal oxides, clay minerals, sulfide minerals, and organic carbon.

1.5 Human Health Risk Assessment

A baseline human health risk assessment (HHRA) was previously conducted for the site (Kleinfelder 1991b). The HHRA identified complete exposure pathways for ground water, soil, and soil vapor.

The complete ground water exposure pathways involved migration of ground water to the Willamette River. The identified complete pathways were consumption of fish containing COCs and recreational exposure through skin contact or ingestion of river water. Based on this analysis, the initial site feasibility study proposed ground water cleanup goals for benzene, naphthalene, and arsenic equal to the Federal Water Quality Criteria for surface water (Kleinfelder 1996). These cleanup goals were incorporated into the ROD. Changes in land or water use have not occurred since issuance of the ROD, and thus the exposure analysis upon which cleanup goals are based remains valid. However, as discussed in Section 2, modified cleanup goals for the site will be specified in the future based on the Portland Harbor site final cleanup goals.

Exposure pathways for soil and soil vapor involved potential ingestion, dermal contact, and inhalation hazards for workers as a result of disturbance of soils during on-site construction activities. Changes in land use have not occurred since issuance of the ROD, and thus the exposure analysis in the HHRA remains valid. Soil cleanup goals specified in the ROD were deemed to be protective of ground water, so ground water sampling results are the current basis for assessment of remedial progress regarding soil and soil vapor. During the remedial period, disturbance of soil (e.g., for repair of underground piping) requires appropriate health and safety precautions to preclude worker exposure to COC concentrations greater than permissible exposure levels (PELs) of the United States Occupational Health and Safety Administration or other applicable PELs.

1.6 Ecological Risk Assessment

An ecological risk assessment was previously conducted for the site (Pentec 1991). The exposure pathway incorporating ground water migration to the river was evaluated in the study. The results from the ERA were the basis for the copper and lead cleanup goals for ground water specified in the ROD. As discussed in Section 2, modified cleanup goals for the site will be specified in the future based on the Portland Harbor site final cleanup goals.

2. IDENTIFICATION OF REMEDIAL AREAS OF CONCERN

2.1 North Tank Farm Area

2.1.1 Liquid Phase Hydrocarbons

LPH has historically been observed in north tank farm area monitoring wells KMW11 (one occurrence), KMW17, KMW19 (one occurrence), W-15, and W-16 (one occurrence). In 2008, LPH was reported in monitoring wells KMW17 and W-15 at maximum thicknesses of 0.20 and 0.02 foot, respectively. Based on the reduced extent and limited thicknesses of LPH, the remedial actions have removed LPH to the extent practicable. Ongoing remediation efforts for LPH consist of installing absorbent socks in the monitoring wells where LPH is observed. Additional remedial action for LPH removal would have minimal effectiveness and is not considered herein.

2.1.2 Dissolved COCs

In some areas of the north tank farm, remedial progress of the existing AS/VE appears to have been reversed, as discussed in Section 1.3.3. However, the success of the north tank farm area AS/VE from approximately 2000 to 2006 has proven the long-term effectiveness of this remedial alternative at remediating both organic and inorganic COCs. Operation of the existing AS/VE will continue, but alternative remedial action for ground water in the north tank farm area beyond operation of the existing AS/VE is not considered herein.

2.1.3 Soil

In the north tank farm area, the AS/VE remedial action implemented is a cleanup alternative for both ground water and soil. The AS/VE remedial effectiveness demonstrated for ground water from 2000 to 2006 is indicative of similar remedial effectiveness for COCs in soil impacting the ground water. Alternative remedial action for soil in the north tank farm area beyond operation of the existing AS/VE is not considered herein.

2.2 Air Sparging Curtain Area

2.2.1 Liquid Phase Hydrocarbons

LPH has historically been observed in air sparging curtain area monitoring wells KMW32 (one occurrence) and W-1 through W-14. The presence of LPH was last observed in the air sparging curtain area during February 2006, in monitoring well KMW32 at 0.15 foot. The historical remedial actions have effectively remediated measurable levels of LPH.

2.2.2 Dissolved COCs

Ground water sampling data from 2005 and 2006 indicated remedial progress by the expanded AS/VE in the air sparging curtain area, which was consistent with the progress observed for the AS/VE implemented in the north tank farm area. This trend has reversed since approximately the beginning of 2007 with reported COC concentrations generally increasing in 2008. The expanded AS//VE in the air sparging curtain area will continue to be operated, but does not

appear likely to achieve sufficient remedial progress by the time of the EPA Record of Decision for Portland Harbor. This updated focused feasibility study evaluates additional remedial alternatives for ground water in the air sparging curtain area in addition to continued operation of the existing AS/VE.

2.2.3 Soil

COCs downgradient of the north tank farm area are believed to predominantly reside near the water table surface. Alternative remedial action for soil in the air sparging curtain area beyond operation of the existing AS/VE is not warranted.

2.3 Area of Subsurface Slurry Wall

The subsurface slurry wall is an effective remedial action to mitigate ground water seeps to the river. As a result of the slurry wall construction, sheens, which were present prior to the wall installation, have been eliminated. With the exception of ground water seepage to the river currently observed or inferred where storm sewers OF-23-Abandoned and WP-209 pass through the wall as discussed in Section 1.2.3, historical ground water monitoring data indicate the wall provides a competent hydraulic barrier for migration of COCs to the river. Analytical results for ground water samples from monitoring wells adjacent to the subsurface slurry wall include reported concentrations of TPHd and total arsenic greater than ROD cleanup goals. The two apparent leakage areas will be repaired to maintain the integrity of the hydraulic control provided by the subsurface slurry wall. Based on the anticipated restored effectiveness of the subsurface slurry wall, additional remedial action in this area is not warranted.

2.4 Loading Rack Area

As discussed above in Section 1.3.5, the origin and extent of COCs in the loading rack area is not fully characterized. ExxonMobil has submitted a work plan for additional investigation downgradient of the loading rack area (AME 2009b). Analysis of remedial alternatives for the loading rack area is not included in this updated focused feasibility study and will be presented separately at a future date.

2.5 Sewers

Results from sampling of storm sewer WP-202 indicate concentrations of COCs at the outfall are similar to concentrations in the upstream sewer flow that originates off site. Results from sampling of storm sewer WP-209 in 2002 and 2003 indicated elevated concentrations of COCs (primarily gasoline constituents) present at the outfall, with no detected COCs in upstream samples. Analytical results since 2003 indicate a decreasing trend of COCs, with reported concentrations in dry season 2008 and wet season 2009 outfall samples less than cleanup goals for organic COCs. For the storm sewers, remedial action is not considered at this time but continued monitoring and sampling is warranted.

Process sewers do not discharge directly to surface water, but additional investigation is warranted. This effort will be conducted separately.

3. IDENTIFICATION OF MEDIA REQUIRING REMEDIAL ACTION

Based on the rationale presented in Section 2, the media requiring analysis of remedial action alternatives in this updated focused feasibility study is ground water in the air sparging curtain area.

4. DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

4.1 Narrative Remedial Action Objectives

In accordance with Oregon Administrative Rule (OAR) 340-122-0040, remedial action for ground water in the air sparging curtain area should achieve one of the following:

- Acceptable risk levels, or
- Numeric cleanup standards, or
- Background levels

Applicable or Relevant and Appropriate Requirements (ARARs) were presented in the initial site feasibility study (Kleinfelder 1996), and formed the basis for development of the remedial action objectives specified in the ROD. The ROD specified general remedial action objectives as follows:

- Prevent migration of LPH in the shallow aquifer
- Reduce the potential for LPH to act as a continuing source for COCs in ground water by removing LPH to the extent practicable
- Reduce concentrations of COCs in ground water and thereby reduce the potential for migration of COCs to the Willamette River

With the reduction of LPH in the air sparging curtain area as discussed in Section 2.3.1, limiting the potential migration of COCs to the river is now the principal remedial action objective.

4.2 Numerical Cleanup Objectives

4.2.1 Chemicals of Concern

The ROD specified numeric cleanup standards (cleanup goals) as discussed in Section 1.3.2 for benzene, TPH, naphthalene, arsenic, lead, and copper. Communication from the DEQ (DEQ 2008a) indicates that ROD cleanup goals will be supplanted by cleanup goals established for the Portland Harbor site, and that the Portland Harbor cleanup goals will be applied to a point of compliance at the hydraulic boundary between the site and the Willamette River (i.e., the air sparging curtain area).

4.2.2 Arsenic

The lowest dissolved arsenic concentration achievable with current best available ground water treatment technologies is approximately 0.001 to 0.005 mg/L (Adedge Technologies 2008, EPA 2000, Graver Technologies 2008). The ROD included an arsenic cleanup goal of 0.00014 mg/L based on surface water quality criteria, but set the cleanup goal at 0.005 mg/L to correspond to then-current laboratory quantification limits. Besides analytical capabilities, the ROD cleanup goal of 0.005 mg/L is consistent with background concentrations of arsenic in ground water as

discussed in Section 1.4.3, and consistent with capabilities of current treatment technologies. Cleanup to concentrations less than 0.001 to 0.005 mg/L would be less than background concentrations and not considered feasible with current technologies.

5. IDENTIFICATION AND SCREENING OF TECHNOLOGIES FOR ADDITIONAL REMEDIAL ACTION

As discussed in Section 2, operation of the existing AS/VE will continue. Identification and screening of remedial technologies for ground water in the air sparging curtain area pertains to remedial action in addition to continued operation of the existing AS/VE system.

5.1 General Response Actions

In accordance with DEQ guidance (DEQ 2002a), evaluation of additional remedial actions include alternatives involving containment (or engineering controls), treatment, and removal. Within each of these general response action categories, potential alternatives to address impacted ground water in the air sparging curtain area include the following:

- Containment (including hydraulic control)
 - a. ground water extraction
 - b. dual phase extraction
 - c. subsurface slurry wall behind the revetment
 - d. sheet pile wall outside the revetment
 - e. concrete sealant applied to the revetment
- Treatment
 - a. AS/VE (expansion of existing system)
 - b. ozone sparging
 - c. in-situ chemical oxidation
 - d. subsurface permeable reactive barrier
- Removal
 - a. excavation

Under the containment category, the last three alternatives listed would also require implementation of ground water extraction in the upper sand fill to limit migration of COC-impacted ground water.

5.2 Containment and/or Hydraulic Control

Ground water extraction (GWE) and dual phase extraction (DPE) involve removal of ground water from the subsurface to achieve hydraulic control. The alternatives of subsurface slurry wall behind the revetment, sheet pile wall outside the revetment, and concrete sealant applied to the revetment include installation of a physical barrier to ground water migration in addition to the removal of ground water. Since the principal remedial action objective is limiting potential migration of COCs to the Willamette River (Section 4), these five alternatives for containment and/or hydraulic control technology are retained for further analysis in Section 6.

The five alternatives discussed in the preceding paragraph achieve hydraulic control with varying effectiveness and efficiency. For example, GWE is more efficient to remove water than DPE, but DPE achieves superior hydraulic control through application of vacuum, as discussed in Section 6. A combined system of GWE and DPE, although more costly to implement than either of the individual technologies, combines the respective water removal efficiency and superior hydraulic control of the individual technologies. The alternative of combined GWE and DPE for containment and/or hydraulic control is also retained for further analysis in Section 6.

The alternatives of subsurface slurry wall behind the revetment and concrete sealant applied to the revetment have limitations when combined with the GWE component, as discussed in Section 6. For improved hydraulic control, the alternative of concrete sealant applied to the revetment with DPE instead of GWE is retained for further analysis in Section 6. For the subsurface slurry wall alternative, the set back from the revetment would cause diminished DPE influence near the river; a combination with in-situ treatment instead of DPE is considered for the subsurface slurry wall alternative in Section 5.3 below.

The preliminary remedial alternatives involving containment and/or hydraulic control technology retained for further analysis in Section 6 are as follows:

- Ground Water Extraction
- Dual Phase Extraction
- Combined Ground Water Extraction And Dual Phase Extraction
- Subsurface Slurry Wall Behind The Revetment With Ground Water Extraction
- Sheet Pile Wall Outside The Revetment With Ground Water Extraction
- Concrete Sealant Applied To The Revetment With Ground Water Extraction
- Concrete Sealant Applied To The Revetment With Dual Phase Extraction

5.3 In-Situ Treatment

The in-situ treatment technology alternatives of AS/VE, ozone sparging, in-situ chemical oxidation (ISCO), and subsurface permeable reactive barrier (PRB) involve injection or placement of treatment agents into the subsurface. The AS/VE, ozone sparging, and ISCO alternatives direct the treatment agents into or toward COC-impacted ground water, whereas the PRB is placed in a fixed location in the subsurface for treatment of ground water as it migrates through the PRB.

In-situ treatment is favorable compared to containment technology for removal and/or destruction of COCs; however, none of the in-situ treatment alternatives provide hydraulic control. In theory, the PRB does not require hydraulic control if properly located, because migrating ground water is treated as it passes through the PRB. Lack of hydraulic control for other in-situ treatment technologies is problematic because of the potential time required for the in-situ alternatives to achieve numeric cleanup goals relative to the schedule for the EPA Record of Decision for Portland Harbor.

Expansion of the AS/VE system is more efficient than other alternatives, and has been shown to be effective in reducing concentrations of COCs at the site. However, current ground water sampling data (Section 1.3) indicate that AS/VE would have difficulty achieving remedial

objectives in a timely manner. Expansion of the AS/VE as a stand-alone alternative is not retained for further analysis.

Ozone sparging along with expansion of the AS/VE system could potentially expedite remedial progress relative to AS/VE without ozone sparging. However, the ability of ozone sparging to achieve cleanup goals in a timely manner is uncertain. This technology as a stand-alone alternative is not retained for further analysis.

ISCO is generally implemented where sources of COCs are controlled. Although ISCO can be implemented to operate long-term pending completion of upgradient remediation, long-term operation of a treatment system utilizing a strong oxidant is not favorable considering site operations and potential effects to infrastructure. This technology as a stand-alone alternative is not retained for further analysis.

According to vendors, PRB technology is mature for chlorinated solvents but not for petroleum hydrocarbons and metals. Construction of a subsurface PRB faces significant challenges with site infrastructure. Even if deemed feasible and effective, PRB installation and operation costs are estimated to be similar to or greater than the other alternatives considered in this analysis (Powell et al. 2002). The PRB alternative is not retained for further analysis.

Ozone sparging with DPE comprises an alternative that incorporates both in-situ treatment and hydraulic control. A combined system of ozone sparging with DPE is retained for further analysis. Similarly, ozone sparging added to the combination of concrete sealant applied to the revetment with DPE provides treatment with hydraulic control, and this alternative is also retained for further analysis.

The combination of ISCO with a subsurface slurry wall provides both in-situ treatment and hydraulic control. The alternative of ISCO with a subsurface slurry wall and GWE is retained for further analysis.

The preliminary remedial alternatives involving in-situ treatment technology retained for further analysis in Section 6 are as follows:

- Ozone Sparging With Dual Phase Extraction
- Ozone Sparging And Dual Phase Extraction With Concrete Sealant Applied To The Revetment
- In-Situ Chemical Oxidation With Subsurface Slurry Wall And Ground Water Extraction

5.4 Removal

For remediation of ground water, excavation involves the removal of residual COCs within the soil matrix from the upper part of the saturated zone at depths of approximately 15 to 20 feet bgs. The excavation alternative involves greater technical challenges than discussed for subsurface slurry wall excavation in Section 6. The excavation alternative is not retained for further analysis.

5.5 Preliminary Remedial Alternatives Retained for Further Analysis

The preliminary remedial alternatives retained for further analysis are as follows:

- Ground Water Extraction
- Dual Phase Extraction
- Combined Ground Water Extraction And Dual Phase Extraction
- Subsurface Slurry Wall Behind The Revetment With Ground Water Extraction
- Sheet Pile Wall Outside The Revetment With Ground Water Extraction
- Concrete Sealant Applied To The Revetment With Ground Water Extraction
- Concrete Sealant Applied To The Revetment With Dual Phase Extraction
- Ozone Sparging With Dual Phase Extraction
- Ozone Sparging And Dual Phase Extraction With Concrete Sealant Applied To The Revetment
- In-Situ Chemical Oxidation With Subsurface Slurry Wall And Ground Water Extraction

6. DEVELOPMENT AND SCREENING OF PRELIMINARY REMEDIAL ACTION ALTERNATIVES

In addition to the remedial alternatives retained for further development and screening as discussed in Section 5 above, the no additional action alternative is included in the following analysis in accordance with DEQ guidance (DEQ 2002a). In this case, the no additional action alternative means continued operation of the AS/VE system in the air sparging curtain area without implementation of the additional remedial action alternatives described herein. Operation of the existing AS/VE system will continue based on past effectiveness.

Furthermore, the institutional controls of site security and prohibition of ground water use to limit human and ecological exposure to COCs have been implemented in accordance with the ROD and Voluntary Cleanup Agreement. The institutional controls will remain in place during implementation of existing and potential additional remedial action.

In accordance with DEQ guidance (DEQ 2002a), development and screening of additional remedial alternatives for the air sparging curtain area considers effectiveness, implementability, and cost.

Effectiveness

Evaluation of effectiveness considers whether the remedial alternative is protective of human health and the environment and protective of the ground water and surface water resources. Protection of the surface water resource is achieved by limiting potential migration of COCs to the river.

Additional considerations include the ability of the proposed alternative to reduce the toxicity, mobility, and/or mass of the COCs present, long-term effectiveness and permanence, and short-term effectiveness. Reduction of COC mass would be demonstrated by achieving the numeric cleanup goals to be determined from final cleanup goals for the Portland Harbor site (Section 4). Other factors considered include demonstrated performance and operational reliability, with mature technologies given preference. Preference is also weighted toward short-term effectiveness (expediency) in this analysis.

Remedial actions must also comply with local, State, and Federal laws and regulations.

Implementability

This criterion involves the technical and administrative feasibility of accomplishing an alternative. Potential impacts to the river during construction and installation activities are a concern. Regulatory acceptance is also necessary.

In general, the alternatives that include physical barriers would be more difficult to implement than alternatives without physical barriers.

Costs

Both installation and ongoing operation and maintenance costs are considered.

For installation, the containment alternatives with a physical barrier generally have greater installation costs than alternatives without a physical barrier. Containment alternatives with physical barrier may cost slightly less to operate and maintain than alternatives without a physical barrier. GWE costs are less than DPE costs.

6.1 No Action

The alternative of no action other than continued operation of the existing AS/VE system is not likely to achieve cleanup goals in the desired time frame based on current COC concentration trends in ground water; therefore, regulatory acceptance is considered unlikely.

The no action alternative is not retained for further analysis.

6.2 Containment and/or Hydraulic Control

6.2.1 Ground Water Extraction

GWE consists of the pumping of ground water and treatment of the extracted water before discharge to surface water or sewer. GWE can be effective for hydraulic control with properly located and operated extraction wells. Although this alternative theoretically removes COCs from the subsurface, the removal process is generally not efficient.

The hydraulic conductivity in the upper sand fill above the aquitard is favorable for GWE; however, proximity to the river complicates the design and operation of a GWE system. At relatively high river stages, previous systems utilizing the W-series extraction wells with fixed pump set points reportedly would induce inflow from the river, and a significant fraction of the pumped water would be from the river (Kleinfelder, 1991). At relatively low river stages and the corresponding low water table, hydraulic control could not be maintained because of the minimal thickness of the saturated portion of the upper sand fill above the aquitard and the relatively steep downward slope of the aquitard at the riverfront (**Figure 4**).

Based on the limited hydraulic control at low water table and river stages, the GWE alternative is not retained for further analysis.

6.2.2 Dual Phase Extraction

Through application of relatively high vacuum to an extraction well (i.e., up to 28 inches of mercury or 32 feet of water), DPE removes both soil vapor and ground water from the subsurface. In comparison to GWE, DPE is not an efficient method for removal of ground water from the subsurface; however, the DPE vacuum potentially affords greater hydraulic control for the site conditions than GWE. In addition, dewatering in the vicinity of the extraction well exposes the capillary fringe soils to the effects of the vapor extraction component of the DPE for remediation of residual COCs that may be present in the soil. The combined mechanisms would expedite the achievement of numeric cleanup goals.

Historical vapor extraction operation indicates subsurface soil permeability is favorable for DPE. Technically, DPE has the same issues as GWE: inflow from the river during high river stages, and limited saturated thickness of the upper sand fill at low water table and river stages. An approach to address these challenges is a DPE design with two sets of extraction wells: one set of extraction wells immediately adjacent to the river for operation during periods of relatively low river stages, and a second set of extraction wells set back from the river to be operated during periods of relatively high river stages. Operation of the wells adjacent to the river would achieve more optimal hydraulic control during periods of relatively low river stages. Sufficient vacuum could be applied to maintain hydraulic control during the period of lowest river elevation (approximately 4 feet CPD). Operation of the set of wells set back from the river during periods of relatively high river stages would achieve hydraulic control while limiting the amount of flow induced from the river.

The vapor treatment requirement generally makes DPE more costly to operate than the other containment remedial alternatives. In addition, the DPE use of a vacuum pump is less efficient for ground water extraction compared to use of submersible pumps in GWE. However, installation costs for DPE are considerably less than the containment technologies with subsurface barriers. The conceptual DPE alternative with two sets of extraction wells is retained for detailed analysis in Section 7.

6.2.3 Combined Ground Water Extraction and Dual Phase Extraction

An optimized extraction alternative would use DPE at a set of extraction wells adjacent to the river during periods of relatively low river stages and GWE at a set of extraction wells set back from the river during periods of relatively high river stages. Compared to the individual GWE and DPE alternatives, the combination would provide more optimal hydraulic control at low river stages and the most efficient ground water extraction at high river stages. The tradeoff for the combined GWE/DPE combination would be the greater installation cost compared to the individual alternatives. Based on the estimated technical effectiveness and relative efficiency, the combined GWE/DPE alternative is retained for detailed analysis in Section 7.

6.2.4 Subsurface Slurry Wall behind the Concrete Revetment with Ground Water Extraction

Installation of a subsurface slurry wall around or downgradient of impacted soil and ground water, combined with GWE to lower the hydraulic head behind the slurry wall, is a proven method for hydraulic control. Compared to stand-alone GWE, the physical barrier provided by the slurry wall improves operating efficiency by limiting flow of river water inward to the GWE system during high river stages. As discussed in Section 6.2.1, GWE cannot maintain hydraulic control at low water table and river stages; however, hydraulic control at low water table and river elevations is of less concern with the slurry wall because of the physical barrier limiting migration of COCs from behind the slurry wall toward the river. The potential migration of residual COCs located between the slurry wall and the revetment would need to be addressed.

Traditional installation of a subsurface slurry wall by excavation involves major technical challenges at this site. Underground sewers and product pipelines cross the conceptual location for the subsurface slurry wall. As discussed in Section 1.2.3, the existing subsurface slurry wall

appears to have leakage where sewer lines pass through the wall. The in-ground oil/water separator that handles wastewater from most of the NuStar process sewer system also lies in the conceptual location, as does a storage building. The excavation would require demolition and replacement of the oil/water separator and the building, unless an alternative installation method such as jet grouting is feasible in these areas. (Jet grouting is also a potential solution for installation around underground piping.) Stability of the concrete revetment during excavation is also a potential issue. The intrusive construction would require coordination with site operations. Finally, permitting issues for the project location within the Willamette Greenway would have to be addressed.

Besides the implementation problems discussed above, the estimated installation costs for this alternative are on the order of \$500,000 greater than the previously retained alternatives of DPE and combined GWE/DPE, primarily due to infrastructure demolition and replacement.

The alternative of subsurface slurry wall behind the revetment with GWE is not retained for further analysis.

6.2.5 Sheet Pile Wall outside the Concrete Revetment with Ground Water Extraction

A sheet pile wall could be installed in the river outside of the revetment to achieve hydraulic control. In this alternative, ground water is extracted from a trench drain installed between the sheet pile wall and the revetment. The sheet pile wall and drain would provide the most effective hydraulic control of the containment alternatives over the entire range of ground water elevations and river stages.

The installation of sheet pile outside the revetment also avoids many of the implementation challenges described for construction of the subsurface slurry wall, including demolition of infrastructure, issues with subsurface piping and utilities, stability of the revetment, and conflict with operations. The major installation challenge for the sheet pile wall alternative is the presence of the shipping dock, which would limit access for construction equipment on the water. In addition, permitting issues for the in-water construction would have to be addressed.

The estimated installation cost for the sheet pile alternative is more than \$2,000,000 greater than the previously retained alternatives of DPE and combined GWE/DPE.

The alternative of sheet pile wall outside the revetment with GWE is not retained for further analysis.

6.2.6 Concrete Sealant Applied to the Revetment with Ground Water Extraction

Another potential method for hydraulic control is GWE in conjunction with the application of a concrete sealant to the revetment to form a physical barrier. Concrete sealant materials have been successfully employed to prevent ground water intrusion through concrete into tunnels, subsurface utility vaults, and basements under buildings.

The sealant would be applied to the portions of the revetment structure that are accessible, which includes the portions above an elevation of approximately 7 to 8 feet CPD. At elevations below approximately 7 to 8 feet CPD, the concrete revetment structure is covered by rock riprap and

river sediments (**Figure 4**). The elevation of 7 to 8 feet CPD corresponds to the approximate lowest inferred ground water elevation at the riverfront. Assuming COCs are present near the water table surface, the sealant applied to the concrete revetment constitutes an effective barrier to migration of COCs in comparison to the subsurface slurry wall alternative, in which residual COCs located between the slurry wall and the revetment could potentially migrate to the river.

This alternative has the same potential limitation as the alternative of stand-alone GWE, in that hydraulic control could not be maintained at low water table and river stages.

Similar to the sheet pile alternative, the concrete sealant alternative avoids many of the implementation challenges described for construction of the subsurface slurry wall by excavation. A potential risk of this alternative would be the discharge of the sealant chemical(s) to the river during construction.

The sealant chemicals are relatively expensive, but the lack of intrusive construction makes the installation costs of this alternative relatively competitive with the previously retained alternatives of DPE and combined GWE/DPE. Estimated costs for the alternative of concrete sealant applied to the revetment with GWE are \$100,000 to \$200,000 greater than costs for the previously retained alternatives.

Despite relatively favorable implementability and costs, the limited hydraulic control at low water table and river stages eliminates this alternative from further analysis.

6.2.7 Concrete Sealant Applied to the Revetment with Dual Phase Extraction

This alternative is conceptually the same as the alternative of concrete sealant applied to the revetment with GWE, except that DPE is implemented for hydraulic control instead of GWE. The alternative with DPE has the advantage in the ability to maintain hydraulic control at low water table and river stages.

Implementability and costs for this alternative are similar to those described for the alternative of concrete sealant with GWE described in Section 6.2.6.

Based on the combination of relative favorable implementability, hydraulic control at low water table and river stages, and installation costs within \$100,000 to \$200,000 of previously retained alternatives, the alternative of concrete sealant applied to the revetment with DPE is retained for detailed analysis in Section 7.

6.3 In-Situ Treatment

6.3.1 Ozone Sparging with Dual Phase Extraction

This alternative includes injection of ozone into the ground water along with implementation of DPE for hydraulic control. The addition of ozone sparging to DPE could potentially expedite the achievement of numeric cleanup goals in the air sparging curtain area; however, the actual treatment benefit is uncertain given the currently observed ground water concentration trends.

The addition of ozone sparging to DPE requires installation of more than twice the number of wells compared to the stand-alone DPE alternative in order to appropriately distribute the ozone. Besides the implementation issues associated with more drilling, the installation of ozone sparging wells and equipment adds an estimated \$400,000 to the installation costs of DPE without ozone sparging. In addition, the ozone generation and injection equipment adds operating costs compared to the DPE alternative without ozone sparging.

Because of the uncertain benefit and the additional implementation issues and costs compared to stand-alone DPE, the alternative of ozone sparging with DPE is screened from further analysis.

6.3.2 Ozone Sparging and Dual Phase Extraction with Concrete Sealant Applied to the Revetment

This alternative adds ozone sparging to the previously retained alternative of concrete sealant applied to the revetment with DPE. As discussed in Section 6.3.1, the addition of ozone sparging to a remedial alternative adds implementation issues and costs with an uncertain effectiveness benefit.

The alternative of ozone sparging and DPE with concrete sealant applied to the revetment is screened from further analysis.

6.3.3 In-Situ Chemical Oxidation with Subsurface Slurry Wall behind the Revetment and Ground Water Extraction

An alternative that combines ISCO with a subsurface slurry wall and GWE addresses the potential residual COCs between the subsurface slurry wall and the revetment. In theory, ISCO would successfully treat residual COCs in the short term, and the subsurface slurry wall with GWE would provide long-term hydraulic control of upgradient COCs. The treatment of COCs at the riverfront by ISCO makes the GWE limitation for downgradient hydraulic control at low river stages less of an issue.

As discussed in Section 6.2.4, installation of a subsurface slurry wall would be difficult. In addition, the estimated installation costs for this alternative would be on the order of \$300,000 to \$500,000 greater than the previously retained alternatives of DPE, combined GWE/DPE, and concrete sealant applied to the revetment with DPE.

Based on the unfavorable implementability and costs, the alternative of subsurface slurry wall behind the revetment with GWE is not retained for further analysis.

6.4 Summary of Remedial Alternatives Retained for Detailed Analysis

Based on the screening analysis discussed above, the following alternatives for additional remedial action are retained for detailed analysis in Section 7:

- Dual Phase Extraction
- Combined Ground Water Extraction And Dual Phase Extraction
- Concrete Sealant Applied To The Revetment With Dual Phase Extraction

7. DETAILED ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

In accordance with DEQ guidance (DEQ 2002a), detailed analysis of remedial action alternatives considers effectiveness, long-term reliability, implementability, implementation risk, and reasonableness of cost.

7.1 Dual Phase Extraction (Alternative 1)

The conceptual DPE system includes two sets of extraction wells: one set of 15 extraction wells (EX-01L through EX-015L) at the riverfront for operation during periods of lowest river stages, and a second set of 14 extraction wells (EX-01H through EX-014H) set back from the riverfront for operation during periods of higher river stages (**Figure 36**). The operating scenario during periods of low water table and river stages is removal of ground water by the ground water extraction component of the DPE system to the extent feasible, and maintenance of hydraulic control by the vapor extraction component of the DPE system through the vacuum applied at the extraction wellheads. At higher river stages, operation of the extraction wells set back from the riverfront would lower the ground water table sufficiently to maintain hydraulic control.

Based on ground water flow modeling, the estimated ground water extraction rate for the system would range from approximately 6 gpm during periods of lowest water table and river stages (**Figure 37**), to approximately 10 gpm during periods of highest water table and river stages (**Figure 38**). The flow modeling assumes that the DPE system is operated to maintain an inward hydraulic gradient from the river (i.e. the head at the DPE wells is maintained approximately 1 foot below the average river stage). Appendix J provides details of the ground water flow modeling. The estimated soil vapor flow from the DPE system would be approximately 150 standard cubic feet per minute (scfm).

As shown on **Figure 36**, the set of extraction wells EX-01L through EX-015L along the riverfront would be installed in a line directly behind the revetment. The riverfront extraction wells would be installed by angle drilling for placement of extraction screens behind the revetment as close to the river as possible (**Figure 39**). **Figure 36** illustrates the extraction wells set back from the riverfront, EX-01H through EX-014H, installed not in a line parallel to the river but rather located in a pattern to achieve optimal ground water extraction efficiency. The extraction well locations are based on the aquitard surface elevation as determined from the 3-dimensional modeling and the results of the ground water flow modeling.

Scenarios considered for estimates of system operating costs assume the 6 gpm ground water extraction rate during periods of lower water conditions applies 6 months per year, and that a higher 12 gpm ground water extraction rate applies during the 6 months of higher water conditions. In theory, a ground water extraction rate of approximately 10 gpm could maintain hydraulic control during the periods of higher water table and river stages, but the calculations conservatively assume greater inward flow of river water to the extraction wells.

Treatment of ground water extracted by the DPE system would include removal of organic COCs by granular activated carbon (GAC) and removal of arsenic and other metals by granular ferrous hydroxide (GFH) or activated alumina. Treated ground water would be discharged to the

City of Portland sanitary sewer system or to the Willamette River under a National Pollutant Discharge Elimination System (NPDES) permit. Treatment of soil vapor extracted by the DPE system would be accomplished by the oxidizer processing soil vapor from the existing AS/VE system, which would discharge to atmosphere under a modification to the existing air discharge permit from the DEQ.

Effectiveness – The proposed DPE system would achieve hydraulic control over the range of river and water table elevations, thus accomplishing the objective of limiting migration of COCs to the river. The vapor extraction component of the DPE system would also provide treatment downgradient of the existing AS/VE system by removing volatile organic COCs, and adding oxygen to the subsurface to promote biodegradation of non-volatile organic COCs and chemical oxidation of inorganic COCs.

Long-term reliability – DPE is a mature technology, and DPE equipment is generally reliable. GAC and GFH/activated alumina are mature and reliable technologies for ground water treatment, and catalytic oxidation is a mature and reliable technology for soil vapor treatment.

Implementability – Installation of the DPE system would require coordination with operations and working around site infrastructure, but no foreseeable issues are considered unsolvable. Strategies to mitigate implementation problems include use of limited access drilling equipment for installing extraction wells inside a warehouse building, vacuum excavation for trenching near underground piping, and coordination of construction scheduling with NuStar operations.

Implementation risk – Adherence to construction Best Management Practices (BMPs) is necessary to prevent impacts to the river from installation activities. Following startup of the system, efficient operation would be necessary to maintain continuous hydraulic control.

Reasonableness of cost – Estimated installation cost is \$716,000, estimated annual O&M cost is \$302,000, and calculated net present value for 15 year operation using 3 percent inflation rate and 7 percent discount rate is \$4,002,000 (Appendix K). The estimated annual O&M costs include costs for the existing AS/VE system and the conceptual additional remediation system.

7.2 Combined Ground Water Extraction and Dual Phase Extraction (Alternative 2)

The conceptual combined GWE and DPE system includes two sets of extraction wells as discussed in Section 7.1 and illustrated on **Figure 36**. The set of 15 extraction wells EX-01L through EX-015L at the riverfront would be operated by DPE during periods of lowest water table and river stages, and the set of 14 extraction wells EX-01H through EX-014H set back from the riverfront would be operated by GWE during periods of higher water table and river stages. The GWE component would consist of submersible pumps installed in the extraction wells, which is more efficient than DPE for ground water extraction (approximately 5 horsepower total of submersible pumps versus approximately 30 to 40 horsepower liquid ring vacuum pump). The operational parameters for the combined GWE/DPE system are the same as for the DPE system described in Section 7.1, with hydraulic control during periods of lower water conditions achieved by the applied DPE vacuum (**Figure 37**), and hydraulic control during periods of higher water conditions achieved by the submersible pumps (**Figure 38**). Scenarios

for calculation of operating costs assume the DPE operating 6 months per year with a 6 gpm ground water extraction rate and the GWE operating 6 months per year with a 12 gpm ground water extraction rate. Estimated vapor flow from the DPE system would be 150 scfm.

Treatment of extracted ground water and soil vapor with the combined GWE/DPE system would be the same as described for the DPE system in Section 7.1, using GAC and GFH or activated alumina for the ground water and a catalytic oxidizer for the soil vapor.

Effectiveness – The combined GWE/DPE system would achieve hydraulic control over the range of river and water table elevations, thus accomplishing the objective of limiting migration of COCs to the river. The vapor extraction component of the DPE system would also provide treatment at the riverfront wells downgradient of the existing AS/VE system by removing volatile organic COCs, and adding oxygen to the subsurface to promote biodegradation and chemical oxidation remedial mechanisms.

Long-term reliability – Both GWE and DPE are mature technologies with generally reliable extraction equipment. The GAC and GFH/activated alumina are mature and reliable technologies for ground water treatment, and catalytic oxidation is a mature and reliable technology for soil vapor treatment.

Implementability – Installation of the combined GWE/DPE system would include the same problems with site infrastructure and operations as described in Section 7.1, but none that are considered unsolvable. Strategies to mitigate implementation problems include use of limited access drilling equipment for installing extraction wells inside a warehouse building, vacuum excavation for trenching near underground piping, and coordination of construction scheduling with NuStar operations.

Implementation risk – The same as described in Section 7.1, adherence to construction BMPs is necessary to prevent impacts to the river from installation activities. Following startup of the system, efficient operation would be necessary to maintain continuous hydraulic control.

Reasonableness of cost – Estimated installation cost \$829,000, estimated annual O&M cost is \$280,000, and calculated net present value for 15 year operation using 3 percent inflation rate and 7 percent discount rate is \$3,881,000 (Appendix K). The estimated annual O&M costs include costs for the existing AS/VE system and the conceptual additional remediation system.

7.3 Concrete Sealant Applied to the Revetment with Dual Phase Extraction (Alternative 3)

With concrete sealant applied to the revetment, this alternative adds a physical barrier to the DPE alternative described in Section 7.1 above. With the physical barrier limiting intrusion of river water at high river stages, the DPE system in this alternative would operate with only one set of 15 extraction wells (**Figure 40**) with an estimated average ground water extraction rate of 8 gpm during the year. The estimation of costs assumes a DPE vapor flow of 150 scfm.

In addition to limiting river water intrusion for improved operating efficiency, the physical barrier of this alternative provides additional protection for the river in limiting potential migration of COC-impacted ground water toward the river during periods of DPE non-operation (e.g., unplanned shutdowns such as equipment breakdown or planned shutdowns such as changeout of ground water treatment media).

Concrete sealing is considered a mature technology, as concrete sealant materials have been successfully employed to prevent ground water intrusion through concrete into tunnels, subsurface utility vaults, and basements under buildings. Numerous suitable concrete sealant products are commercially available; the product to be used would be selected in the design phase. Once applied, the sealant materials would be expected to be effective for decades.

The concrete revetment covers the riverfront from an elevation of approximately 31 feet CPD at the top to approximately 7 to 8 feet CPD at the toe (not including the assumed footing under the toe). The impervious coating applied to the concrete revetment would provide a physical barrier down to approximately the lowest historically inferred ground water elevation at the riverfront (approximately 7 to 8 feet CPD, **Figure 4**). During the periods of lowest ground water elevation (and corresponding lowest river stage), operation of the DPE system could maintain hydraulic control.

Effectiveness – Along with the hydraulic control and treatment aspects of DPE, the physical barrier provided by concrete sealant applied to the revetment adds the benefits of additional protection for the river and increased operating efficiency.

Long-term reliability – DPE is a mature technology, and DPE equipment is generally reliable. GAC and GFH/activated alumina are mature and reliable technologies for ground water treatment, and catalytic oxidation is a mature and reliable technology for soil vapor treatment. As discussed above, concrete sealing is considered a mature technology.

Implementability – Installation of the DPE component of this alternative would include the same problems with site infrastructure and operations as described in Section 7.1, but none that are considered unsolvable. Strategies to mitigate implementation problems include use of limited access drilling equipment for installing extraction wells inside a warehouse building, vacuum excavation for trenching near underground piping, and coordination of construction scheduling with NuStar operations. Special procedures would be necessary for application of the sealant chemicals to the concrete revetment to prevent release of chemicals to the river.

Implementation risk – In addition to the special procedures for applying the concrete sealant, adherence to construction BMPs is necessary to prevent impacts to the river from installation activities.

Reasonableness of cost – Estimated installation cost is \$905,000, estimated annual O&M cost is \$296,000, and calculated net present value for 15 year operation using 3 percent inflation rate and 7 percent discount rate is \$4,126,000 (Appendix K). The estimated annual O&M costs include costs for the existing AS/VE system and the conceptual additional remediation system.

8. COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

Table 6 summarizes the effectiveness, implementability, and cost differences between Alternatives 1 through 3.

Of the three alternatives, the alternative including the concrete sealant applied to the revetment (Alternative 3) is considered incrementally superior technically because of the physical barrier between ground water beneath the site and the river. The implementability of Alternative 3 is incrementally more difficult than the others because of the required protection measures for the river during chemical application to the revetment.

As shown in **Table 6**, Alternative 1 has the lowest installation cost and Alternative 2 has the lowest annual O&M cost. The net present value calculated for the three alternatives ranges from \$3,881,000 for Alternative 2 to \$4,126,000 for Alternative 3.

Each of the three alternatives can accomplish the principal remedial action objective of limiting the potential migration of COCs to the river. Alternative 3 has the highest installation cost and calculated net present value of the three alternatives. The installation cost for Alternative 1 is more than \$100,000 less than Alternative 2, and the calculated net present value of Alternative 1 over 15 years is within 3 percent of Alternative 2. Based on similar effectiveness with the least installation cost, Alternative 1 is the recommended additional remedial action for the air sparging curtain area.

9. RECOMMENDED REMEDIAL ACTION ALTERNATIVE

Based on the comparative analysis in Section 8, Alternative 1 (DPE) is recommended for additional remedial action in the air sparging curtain area. The DPE operating scenario includes two sets of extraction wells as shown on **Figure 36**, a set of 15 extraction wells adjacent to the revetment for operation during low water conditions and a set of 14 extraction wells set back from the river for operation during high water conditions.

Flow modeling provides estimates for ground water extraction rates of approximately 6 gpm at lowest water table and river stages to approximately 10 gpm at high water table and river stages. **Figure 37** shows the modeled ground water flow for the scenario of low water table and river stages, and **Figure 38** shows the modeled ground water flow for the scenario of high water table and river stages. The flow modeling for each scenario assumes operation with an inward hydraulic gradient from the river with a head difference of approximately 1 foot (i.e. the head at the DPE wells is maintained approximately 1 foot below the river stage). The inward gradient provides satisfactory hydraulic control throughout the year, and minimizes extraction and processing of ground water during relatively high river stages. The head difference would be monitored by pressure transducers in the river and in new monitoring wells (three assumed) installed immediately behind the revetment. Based on the pressure transducer readings, the applied DPE vacuum would be adjusted to extract more or less ground water and soil vapor to maintain the inward hydraulic gradient.

Pilot testing of the DPE and extended pump testing for refinement of aquifer parameters are necessary to complete a final design of the recommended remedial alternative. The spacing of the extraction wells and the location of each well relative to the revetment will be optimized during the final design.

In addition to implementation of the recommended remedial action alternative for the air sparging curtain area, the areas of the existing subsurface slurry wall where leakage is inferred (around sewers OF-23-Abandoned and WP-209) will be repaired by jet grouting of cement-bentonite slurry.

10. REMARKS

This document represents our professional opinions, which are based in part on client-supplied and currently available information and have been arrived at in accordance with accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended. This document has been prepared solely for the use of our client. Any reliance on the information contained in this document by third parties shall be at such parties' sole risk.

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TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW01	2/28/2005	35.48	20.48			15.00	
	5/23/2005	35.48	19.58			15.90	
	8/22/2005	35.48	21.88			13.60	
	11/29/2005	35.48	19.70			15.78	
	3/20/2006	35.48	18.52			16.96	
	5/9/2006	35.48	18.88			16.60	
	7/31/2006	35.48	21.54			13.94	
	12/4/2006	35.48	16.00			19.48	
	2/27/2007	35.48	18.59			16.89	
	5/21/2007	35.48	19.89			15.59	
	8/27/2007	35.48	22.27			13.21	
	12/3/2007	35.48	20.27			15.21	
	2/18/2008	35.48	16.89			18.59	
	5/5/2008	35.48	19.61			15.87	
	8/4/2008	35.48	21.31			14.17	
	11/17/2008	35.48	20.15			15.33	
	2/23/2009	35.48	20.29			15.19	
KMW02	2/28/2005	34.64	14.18			20.46	
	5/23/2005	34.64	14.21			20.43	
	8/22/2005	34.64	14.76			19.88	
	11/29/2005	34.64	14.00			20.64	
	3/20/2006	34.64	13.38			21.26	
	5/9/2006	34.64	14.12			20.52	
	7/31/2006	34.64	14.63			20.01	
	12/4/2006	34.64	12.40			22.24	
	2/27/2007	34.64	12.58			22.06	
	5/21/2007	34.64	14.23			20.41	
	8/27/2007	34.64	15.18			19.46	
	12/3/2007	34.64	13.66			20.98	
	2/18/2008	34.64	12.77			21.87	
	5/5/2008	34.64	14.17			20.47	
	8/4/2008	34.64	14.70			19.94	
	11/17/2008	34.64	13.52			21.12	
	2/23/2009	34.64	14.43			20.21	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW03	2/28/2005	38.24	5.54			32.70	
	5/23/2005	38.24	3.98			34.26	
	8/22/2005	38.24	6.86			31.38	
	11/29/2005	38.24	4.85			33.39	
	3/20/2006	38.24	4.18			34.06	
	5/9/2006	38.24	9.19			29.05	
	7/31/2006	38.24	5.50			32.74	
	12/4/2006	38.24	4.33			33.91	
	2/27/2007	38.24	3.22			35.02	
	5/21/2007	38.24	NM			--	
	8/27/2007	38.24	7.04			31.20	
	12/3/2007	38.24	4.78			33.46	
	2/18/2008	38.24	4.10			34.14	
	5/5/2008	38.24	4.74			33.50	
	8/4/2008	38.24	6.19			32.05	
	11/17/2008	38.24	4.47			33.77	
	2/23/2009	38.24	5.35			32.89	
KMW05	2/28/2005	33.68	14.29			19.39	
	5/23/2005	33.68	13.83			19.85	
	8/22/2005	33.68	14.76			18.92	
	11/29/2005	33.68	13.95			19.73	
	3/20/2006	33.68	11.56			22.12	
	5/9/2006	33.68	12.47			21.21	
	7/31/2006	33.68	14.33			19.35	
	12/4/2006	33.68	12.22			21.46	
	2/27/2007	33.68	11.69			21.99	
	5/21/2007	33.68	13.02			20.66	
	8/27/2007	33.68	15.38			18.30	
	12/3/2007	33.68	14.55			19.13	
	2/18/2008	33.68	10.93			22.75	
	5/5/2008	33.68	12.67			21.01	
	8/4/2008	33.68	14.25			19.43	
	11/17/2008	33.68	14.59			19.09	
	2/23/2009	33.68	13.49			20.19	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW06	2/28/2005	32.80	13.51			19.29	
	5/23/2005	32.80	12.78			20.02	
	8/22/2005	32.80	13.99			18.81	
	11/29/2005	32.80	13.18			19.62	
	3/20/2006	32.80	10.84			21.96	
	5/9/2006	32.80	11.75			21.05	
	7/31/2006	32.80	13.58			19.22	
	12/4/2006	32.80	11.41			21.39	
	2/27/2007	32.80	10.94			21.86	
	5/21/2007	32.80	12.30			20.50	
	8/27/2007	32.80	14.60			18.20	
	12/3/2007	32.80	13.78			19.02	
	2/18/2008	32.80	10.22			22.58	
	5/5/2008	32.80	NM			--	Access blocked by equipment
	8/4/2008	32.80	NM			--	
	11/17/2008	32.80	13.75			19.05	
	2/23/2009	32.80	12.76			20.04	
KMW07	2/28/2005	32.63	13.49			19.14	
	5/23/2005	32.63	12.34			20.29	
	8/22/2005	32.63	13.78			18.85	
	11/29/2005	32.63	13.19			19.44	
	3/20/2006	32.63	11.39			21.24	
	5/9/2006	32.63	11.89			20.74	
	7/31/2006	32.63	13.33			19.30	
	12/4/2006	32.63	11.83			20.80	
	2/27/2007	32.63	11.57			21.06	
	5/21/2007	32.63	12.17			20.46	
	8/27/2007	32.63	14.01			18.62	
	12/3/2007	32.63	13.42			19.21	
	2/18/2008	32.63	10.42			22.21	
	5/5/2008	32.63	11.70			20.93	
	8/4/2008	32.63	13.09			19.54	
	11/17/2008	32.63	13.71			18.92	
	2/23/2009	32.63	12.37			20.26	

TABLE 1

GROUND WATER ELEVATION DATA
NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW09	2/28/2005	31.39	17.67			13.72	
	5/23/2005	31.39	16.69			14.70	
	8/22/2005	31.39	18.07			13.32	
	11/29/2005	31.39	17.32			14.07	
	3/20/2006	31.39	17.17			14.22	
	5/9/2006	31.39	16.62			14.77	
	7/31/2006	31.39	17.97			13.42	
	12/4/2006	31.39	16.65			14.74	
	2/27/2007	31.39	17.03			14.36	
	5/21/2007	31.39	17.64			13.75	
	8/27/2007	31.39	18.17			13.22	
	12/3/2007	31.39	17.20			14.19	
	2/18/2008	31.39	16.64			14.75	
	5/5/2008	31.39	17.46			13.93	
	8/4/2008	31.39	18.05			13.34	
	11/17/2008	31.39	17.30			14.09	
	2/23/2009	31.39	17.82			13.57	
KMW10	2/28/2005	31.99	4.92			27.07	
	5/23/2005	31.99	4.71			27.28	
	8/22/2005	31.99	7.15			24.84	
	11/29/2005	31.99	4.77			27.22	
	3/20/2006	31.99	4.85			27.14	
	5/9/2006	31.99	5.64			26.35	
	7/31/2006	31.99	6.96			25.03	
	12/4/2006	31.99	4.72			27.27	
	2/27/2007	31.99	4.40			27.59	
	5/21/2007	31.99	5.73			26.26	
	8/27/2007	31.99	7.48			24.51	
	12/3/2007	31.99	4.02			27.97	
	2/18/2008	31.99	4.59			27.40	
	5/5/2008	31.99	5.74			26.25	
	8/4/2008	31.99	7.25			24.74	
	11/17/2008	31.99	5.48			26.51	
	2/23/2009	31.99	6.12			25.87	

TABLE 1

GROUND WATER ELEVATION DATA
NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW11	2/28/2005	30.57	15.94			14.63	
	5/23/2005	30.57	15.57			15.00	
	8/22/2005	30.57	16.22			14.35	
	11/29/2005	30.57	15.88			14.69	
	3/20/2006	30.57	15.70			14.87	
	5/9/2006	30.57	15.69			14.88	
	7/31/2006	30.57	16.22			14.35	
	12/4/2006	30.57	15.73			14.84	
	2/27/2007	30.57	15.95			14.62	
	5/21/2007	30.57	16.11			14.46	
	8/27/2007	30.57	16.38			14.19	
	12/3/2007	30.57	16.00			14.57	
	2/18/2008	30.57	15.19			15.38	
	5/5/2008	30.57	15.64			14.93	
	8/4/2008	30.57	15.95			14.62	
	11/17/2008	30.57	16.00			14.57	
	2/23/2009	30.57	15.60			14.97	
KMW13	2/28/2005	44.01	17.80			26.21	
	5/23/2005	44.01	16.95			27.06	
	8/22/2005	44.01	17.93			26.08	
	11/29/2005	44.01	17.61			26.40	
	3/20/2006	44.01	15.90			28.11	
	5/9/2006	44.01	16.28			27.73	
	7/31/2006	44.01	17.41			26.60	
	12/4/2006	44.01	17.33			26.68	
	2/27/2007	44.01	16.37			27.64	
	5/21/2007	44.01	16.68			27.33	
	8/27/2007	44.01	18.10			25.91	
	12/3/2007	44.01	18.06			25.95	
	2/18/2008	44.01	15.88			28.13	
	5/5/2008	44.01	16.25			27.76	
	8/4/2008	44.01	17.40			26.61	
	11/17/2008	44.01	17.69			26.32	
	2/23/2009	44.01	17.26			26.75	

TABLE 1**GROUND WATER ELEVATION DATA**

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW14	2/28/2005	43.00	16.71			26.29	
	5/23/2005	43.00	15.86			27.14	
	8/22/2005	43.00	16.79			26.21	
	11/29/2005	43.00	16.57			26.43	
	3/20/2006	43.00	14.64			28.36	
	5/9/2006	43.00	15.01			27.99	
	7/31/2006	43.00	16.26			26.74	
	12/4/2006	43.00	16.38			26.62	
	2/27/2007	43.00	15.15			27.85	
	5/21/2007	43.00	15.46			27.54	
	8/27/2007	43.00	16.97			26.03	
	12/3/2007	43.00	16.82			26.18	
	2/18/2008	43.00	14.70			28.30	
	5/5/2008	43.00	15.02			27.98	
	8/4/2008	43.00	16.31			26.69	
	11/17/2008	43.00	16.76			26.24	
	2/23/2009	43.00	16.13			26.87	
KMW15	2/28/2005	40.98	7.09			33.89	
	5/23/2005	40.98	5.69			35.29	
	8/22/2005	40.98	7.47			33.51	
	11/29/2005	40.98	5.95			35.03	
	3/20/2006	40.98	5.90			35.08	
	5/9/2006	40.98	6.62			34.36	
	7/31/2006	40.98	7.41			33.57	
	12/4/2006	40.98	6.12			34.86	
	2/27/2007	40.98	5.78			35.20	
	5/21/2007	40.98	6.92			34.06	
	8/27/2007	40.98	7.75			33.23	
	12/3/2007	40.98	5.96			35.02	
	2/18/2008	40.98	6.16			34.82	
	5/5/2008	40.98	6.71			34.27	
	8/4/2008	40.98	7.81			33.17	
	11/17/2008	40.98	6.65			34.33	
	2/23/2009	40.98	7.27			33.71	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW16	2/28/2005	41.87	15.14			26.73	
	5/23/2005	41.87	14.48			27.39	
	8/22/2005	41.87	15.14			26.73	
	11/29/2005	41.87	14.98			26.89	
	3/20/2006	41.87	13.21			28.66	
	5/9/2006	41.87	13.53			28.34	
	7/31/2006	41.87	14.64			27.23	
	12/4/2006	41.87	14.95			26.92	
	2/27/2007	41.87	13.82			28.05	
	5/21/2007	41.87	13.93			27.94	
	8/27/2007	41.87	15.35			26.52	
	12/3/2007	41.87	15.56			26.31	
	2/18/2008	41.87	13.45			28.42	
	5/5/2008	41.87	13.58			28.29	
	8/4/2008	41.87	14.72			27.15	
	11/17/2008	41.87	15.32			26.55	
	2/23/2009	41.87	14.63			27.24	
KMW17	2/28/2005	35.47	19.37	19.36	0.01	16.09	Used LPH density 0.81
	5/23/2005	35.47	17.51	17.50	0.01	17.96	Used LPH density 0.81
	8/22/2005	35.47	20.26	20.23	0.03	15.21	Used LPH density 0.81
	11/29/2005	35.47	17.74	17.63	0.11	17.73	Used LPH density 0.81
	3/20/2006	35.47	16.65	16.33	0.32	19.14	Used LPH density 0.81
	5/9/2006	35.47	16.96	16.70	0.26	18.72	Used LPH density 0.81
	7/31/2006	35.47	19.66	19.61	0.05	15.85	Used LPH density 0.81
	12/4/2006	35.47	16.32	16.30	0.02	19.16	Used LPH density 0.81
	2/27/2007	35.47	16.36	16.21	0.15	19.23	Used LPH density 0.81
	5/21/2007	35.47	15.88	15.63	0.25	19.79	Used LPH density 0.81
	8/27/2007	35.47	20.69	20.65	0.04	14.81	Used LPH density 0.81
	12/3/2007	35.47	19.84			15.63	
	2/18/2008	35.47	17.47	17.24	0.23	18.19	Used LPH density 0.81
	5/5/2008	35.47	16.53	16.51	0.02	18.96	Used LPH density 0.81
	8/4/2008	35.47	19.66	19.65	0.01	15.82	Used LPH density 0.81
	11/17/2008	35.47	20.41			15.06	
	2/23/2009	35.47	19.13			16.34	

TABLE 1

GROUND WATER ELEVATION DATA
NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW18	2/28/2005	34.49	15.77			18.72	
	5/23/2005	34.49	14.69			19.80	
	8/22/2005	34.49	16.13			18.36	
	11/29/2005	34.49	15.68			18.81	
	3/20/2006	34.49	14.11			20.38	
	5/9/2006	34.49	14.58			19.91	
	7/31/2006	34.49	15.87			18.62	
	12/4/2006	34.49	14.15			20.34	
	2/27/2007	34.49	14.28			20.21	
	5/21/2007	34.49	14.72			19.77	
	8/27/2007	34.49	16.28			18.21	
	12/3/2007	34.49	15.56			18.93	
	2/18/2008	34.49	13.07			21.42	
	5/5/2008	34.49	14.29			20.20	
	8/4/2008	34.49	15.51			18.98	
	11/17/2008	34.49	19.82			14.67	
	2/23/2009	34.49	14.80			19.69	
KMW19	2/28/2005	32.01	14.56			17.45	
	5/23/2005	32.01	14.14			17.87	
	8/22/2005	32.01	14.97			17.04	
	11/29/2005	32.01	13.42			18.59	
	3/20/2006	32.01	14.01			18.00	
	5/9/2006	32.01	14.19			17.82	
	7/31/2006	32.01	14.83			17.18	
	12/4/2006	32.01	13.95			18.06	
	2/27/2007	32.01	14.15			17.86	
	5/21/2007	32.01	14.30			17.71	
	8/27/2007	32.01	15.18			16.83	
	12/3/2007	32.01	14.75			17.26	
	2/18/2008	32.01	13.23			18.78	
	5/5/2008	32.01	13.97			18.04	
	8/4/2008	32.01	14.65			17.36	
	11/17/2008	32.01	14.96			17.05	
	2/23/2009	32.01	14.03			17.98	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW20	2/28/2005	34.24	13.03			21.21	
	5/23/2005	34.24	12.65			21.59	
	8/22/2005	34.24	13.43			20.81	
	11/29/2005	34.24	11.36			22.88	
	3/20/2006	34.24	11.44			22.80	
	5/9/2006	34.24	12.01			22.23	
	7/31/2006	34.24	13.22			21.02	
	12/4/2006	34.24	11.96			22.28	
	2/27/2007	34.24	11.44			22.80	
	5/21/2007	34.24	12.27			21.97	
	8/27/2007	34.24	13.39			20.85	
	12/3/2007	34.24	12.01			22.23	
	2/18/2008	34.24	11.19			23.05	
	5/5/2008	34.24	12.00			22.24	
	8/4/2008	34.24	13.02			21.22	
	11/17/2008	34.24	12.53			21.71	
	2/23/2009	34.24	12.50			21.74	
KMW21	2/28/2005	33.93	14.36			19.57	
	5/23/2005	33.93	13.72			20.21	
	8/22/2005	33.93	14.68			19.25	
	11/29/2005	33.93	13.64			20.29	
	3/20/2006	33.93	11.78			22.15	
	5/9/2006	33.93	12.45			21.48	
	7/31/2006	33.93	14.07			19.86	
	12/4/2006	33.93	12.33			21.60	
	2/27/2007	33.93	11.84			22.09	
	5/21/2007	33.93	12.80			21.13	
	8/27/2007	33.93	14.94			18.99	
	12/3/2007	33.93	13.96			19.97	
	2/18/2008	33.93	10.99			22.94	
	5/5/2008	33.93	12.40			21.53	
	8/4/2008	33.93	13.92			20.01	
	11/17/2008	33.93	14.35			19.58	
	2/23/2009	33.93	13.21			20.72	

TABLE 1

GROUND WATER ELEVATION DATA
NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW23	2/28/2005	42.57	9.59			32.98	
	5/23/2005	42.57	8.83			33.74	
	8/22/2005	42.57	9.49			33.08	
	11/29/2005	42.57	9.32			33.25	
	3/20/2006	42.57	7.75			34.82	
	5/9/2006	42.57	NM			--	
	7/31/2006	42.57	9.02			33.55	
	12/4/2006	42.57	9.04			33.53	
	2/27/2007	42.57	8.07			34.50	
	5/21/2007	42.57	8.28			34.29	
	8/27/2007	42.57	9.43			33.14	
	12/3/2007	42.57	9.49			33.08	
	2/18/2008	42.57	7.76			34.81	
	5/5/2008	42.57	8.07			34.50	
	8/4/2008	42.57	9.15			33.42	
	11/17/2008	42.57	9.38			33.19	
	2/23/2009	42.57	9.05			33.52	
KMW24	2/28/2005	62.00	4.48			57.52	
	5/23/2005	62.00	2.24			59.76	
	8/22/2005	62.00	6.13			55.87	
	11/29/2005	62.00	4.46			57.54	
	3/20/2006	62.00	1.59			60.41	
	5/9/2006	62.00	2.99			59.01	
	7/31/2006	62.00	4.97			57.03	
	12/4/2006	62.00	2.73			59.27	
	2/27/2007	62.00	1.26			60.74	
	5/21/2007	62.00	3.35			58.65	
	8/27/2007	62.00	5.73			56.27	
	12/3/2007	62.00	3.46			58.54	
	2/18/2008	62.00	1.60			60.40	
	5/5/2008	62.00	1.67			60.33	
	8/4/2008	62.00	4.62			57.38	
	11/17/2008	62.00	4.14			57.86	
	2/23/2009	62.00	3.60			58.40	

TABLE 1

GROUND WATER ELEVATION DATA
NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW25	2/28/2005	61.36	16.22			45.14	
	5/23/2005	61.36	14.66			46.70	
	8/22/2005	61.36	17.97			43.39	
	11/29/2005	61.36	16.20			45.16	
	3/20/2006	61.36	14.98			46.38	
	5/9/2006	61.36	15.02			46.34	
	7/31/2006	61.36	17.38			43.98	
	12/4/2006	61.36	15.30			46.06	
	2/27/2007	61.36	13.77			47.59	
	5/21/2007	61.36	15.45			45.91	
	8/27/2007	61.36	18.10			43.26	
	12/3/2007	61.36	15.92			45.44	
	2/18/2008	61.36	13.74			47.62	
	5/5/2008	61.36	14.09			47.27	
	8/4/2008	61.36	15.79			45.57	
	11/17/2008	61.36	14.98			46.38	
	2/23/2009	61.36	15.65			45.71	
KMW26	2/28/2005	74.48	4.79			69.69	
	5/23/2005	74.48	3.72			70.76	
	8/22/2005	74.48	9.23			65.25	
	11/29/2005	74.48	4.34			70.14	
	3/20/2006	74.48	3.28			71.20	
	5/9/2006	74.48	3.90			70.58	
	7/31/2006	74.48	8.49			65.99	
	12/4/2006	74.48	4.34			70.14	
	2/27/2007	74.48	3.91			70.57	
	5/21/2007	74.48	3.53			70.95	
	8/27/2007	74.48	9.25			65.23	
	12/3/2007	74.48	3.09			71.39	
	2/18/2008	74.48	3.11			71.37	
	5/5/2008	74.48	3.76			70.72	
	8/4/2008	74.48	9.24			65.24	
	11/17/2008	74.48	4.48			70.00	
	2/23/2009	74.48	3.97			70.51	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW27	2/28/2005	92.04	Dry			--	Dry
	5/23/2005	92.04	Dry			--	Dry
	8/22/2005	92.04	Dry			--	Dry
	11/29/2005	92.04	Dry			--	Dry
	3/20/2006	92.04	Dry			--	Dry
	5/9/2006	92.04	Dry			--	Dry
	7/31/2006	92.04	Dry			--	Dry
	12/4/2006	92.04	22.96			69.08	
	2/27/2007	92.04	Dry			--	Dry
	5/21/2007	92.04	22.95			69.09	
	8/27/2007	92.04	Dry			--	Dry
	12/3/2007	92.04	Dry			--	Dry
	2/18/2008	92.04	22.96			69.08	
	5/5/2008	92.04	22.95			69.09	
	8/4/2008	92.04	22.95			69.09	
	11/17/2008	92.04	23.27			68.77	
	2/23/2009	92.04	22.72			69.32	
KMW29	2/28/2005	30.74	21.28			9.46	
	5/23/2005	30.74	18.44			12.30	
	8/22/2005	30.74	21.34			9.40	
	11/29/2005	30.74	18.73			12.01	
	3/20/2006	30.74	19.99			10.75	
	5/9/2006	30.74	18.55			12.19	
	7/31/2006	30.74	21.31			9.43	
	12/4/2006	30.74	20.31			10.43	
	2/27/2007	30.74	20.37			10.37	
	5/21/2007	30.74	19.62			11.12	
	8/27/2007	30.74	21.54			9.20	
	12/3/2007	30.74	21.02			9.72	
	2/18/2008	30.74	20.12			10.62	
	5/5/2008	30.74	20.47			10.27	
	8/4/2008	30.74	21.12			9.62	
	11/17/2008	30.74	21.14			9.60	
	2/23/2009	30.74	20.57			10.17	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW30	3/14/2005	30.15	NM			--	
	5/23/2005	30.15	18.12			12.03	
	8/22/2005	30.15	21.69			8.46	
	11/29/2005	30.15	19.56			10.59	
	3/20/2006	30.15	20.22			9.93	
	5/9/2006	30.15	18.18			11.97	
	7/31/2006	30.15	21.56			8.59	
	12/4/2006	30.15	20.33			9.82	
	2/27/2007	30.15	20.37			9.78	
	5/21/2007	30.15	19.33			10.82	
	8/27/2007	30.15	21.97			8.18	
	12/3/2007	30.15	21.38			8.77	
	2/18/2008	30.15	20.39			9.76	
	5/5/2008	30.15	20.47			9.68	
	8/4/2008	30.15	21.37			8.78	
	11/17/2008	30.15	20.29			9.86	
	2/23/2009	30.15	20.79			9.36	
KMW31	2/28/2005	30.57	22.64			7.93	
	5/23/2005	30.57	18.57			12.00	
	8/22/2005	30.57	22.85			7.72	
	11/29/2005	30.57	20.14			10.43	
	3/20/2006	30.57	21.12			9.45	
	5/9/2006	30.57	18.62			11.95	
	7/31/2006	30.57	22.60			7.97	
	12/4/2006	30.57	20.89			9.68	
	2/27/2007	30.57	21.02			9.55	
	5/21/2007	30.57	19.80			10.77	
	8/27/2007	30.57	23.33			7.24	
	12/3/2007	30.57	22.26			8.31	
	2/18/2008	30.57	21.06			9.51	
	5/5/2008	30.57	21.11			9.46	
	8/4/2008	30.57	22.16			8.41	
	11/17/2008	30.57	21.55			9.02	
	2/23/2009	30.57	21.81			8.76	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW32	2/28/2005	30.27	21.19			9.08	
	5/23/2005	30.27	17.82			12.45	
	8/22/2005	30.27	22.30			7.97	
	11/29/2005	30.27	22.19	21.70	0.49	8.48	Used LPH density 0.81
	3/20/2006	30.27	19.86			10.41	
	5/9/2006	30.27	17.49			12.78	
	7/31/2006	30.27	21.55			8.72	
	12/4/2006	30.27	19.38			10.89	
	2/27/2007	30.27	19.86			10.41	
	5/21/2007	30.27	18.90			11.37	
	8/27/2007	30.27	22.71			7.56	
	12/3/2007	30.27	21.30			8.97	
	2/18/2008	30.27	19.22			11.05	
	5/5/2008	30.27	19.98			10.29	
	8/4/2008	30.27	21.11			9.16	
	11/17/2008	30.27	20.93			9.34	
	2/23/2009	30.27	20.91			9.36	
KMW33	2/28/2005	30.82	21.79			9.03	
	5/23/2005	30.82	17.91			12.91	
	8/22/2005	30.82	22.44			8.38	
	11/29/2005	30.82	21.28			9.54	
	3/20/2006	30.82	20.00			10.82	
	5/9/2006	30.82	17.53			13.29	
	7/31/2006	30.82	21.81			9.01	
	12/4/2006	30.82	19.04			11.78	
	2/27/2007	30.82	20.00			10.82	
	5/21/2007	30.82	19.32			11.50	
	8/27/2007	30.82	23.10			7.72	
	12/3/2007	30.82	21.39			9.43	
	2/18/2008	30.82	18.70			12.12	
	5/5/2008	30.82	20.25			10.57	
	8/4/2008	30.82	21.66			9.16	
	11/17/2008	30.82	21.16			9.66	
	2/23/2009	30.82	21.35			9.47	

TABLE 1

GROUND WATER ELEVATION DATA
NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW34	2/28/2005	32.37	7.00			25.37	
	5/23/2005	32.37	5.96			26.41	
	8/22/2005	32.37	7.12			25.25	
	11/29/2005	32.37	6.28			26.09	
	3/20/2006	32.37	5.28			27.09	
	5/9/2006	32.37	5.77			26.60	
	7/31/2006	32.37	6.89			25.48	
	12/4/2006	32.37	6.37			26.00	
	2/27/2007	32.37	5.38			26.99	
	5/21/2007	32.37	5.97			26.40	
	8/27/2007	32.37	7.37			25.00	
	12/3/2007	32.37	6.91			25.46	
	2/18/2008	32.37	5.31			27.06	
	5/5/2008	32.37	5.73			26.64	
	8/4/2008	32.37	6.81			25.56	
	11/17/2008	32.37	6.65			25.72	
	2/23/2009	32.37	6.51			25.86	
KMW35	2/28/2005	33.37	13.99			19.38	
	5/23/2005	33.37	12.78			20.59	
	8/22/2005	33.37	14.28			19.09	
	11/29/2005	33.37	13.64			19.73	
	3/20/2006	33.37	11.85			21.52	
	5/9/2006	33.37	12.38			20.99	
	7/31/2006	33.37	13.83			19.54	
	12/4/2006	33.37	12.09			21.28	
	2/27/2007	33.37	11.96			21.41	
	5/21/2007	33.37	12.62			20.75	
	8/27/2007	33.37	14.49			18.88	
	12/3/2007	33.37	14.29			19.08	
	2/18/2008	33.37	10.81			22.56	
	5/5/2008	33.37	12.18			21.19	
	8/4/2008	33.37	13.56			19.81	
	11/17/2008	33.37	13.97			19.40	
	2/23/2009	33.37	12.90			20.47	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
KMW36	2/28/2005	31.00	14.26			16.74	
	5/23/2005	31.00	14.32			16.68	
	8/22/2005	31.00	14.76			16.24	
	11/29/2005	31.00	14.09			16.91	
	3/20/2006	31.00	14.05			16.95	
	5/9/2006	31.00	14.15			16.85	
	7/31/2006	31.00	14.33			16.67	
	12/4/2006	31.00	14.18			16.82	
	2/27/2007	31.00	14.08			16.92	
	5/21/2007	31.00	14.95			16.05	
	8/27/2007	31.00	14.48			16.52	
	12/3/2007	31.00	14.11			16.89	
	2/18/2008	31.00	13.87			17.13	
	5/5/2008	31.00	14.00			17.00	
	8/4/2008	31.00	14.25			16.75	
	11/17/2008	31.00	14.20			16.80	
	2/23/2009	31.00	14.17			16.83	
KMW37	2/28/2005	30.55	19.93			10.62	
	5/23/2005	30.55	17.80			12.75	
	8/22/2005	30.55	20.01			10.54	
	11/29/2005	30.55	13.89			16.66	
	3/20/2006	30.55	18.63			11.92	
	5/9/2006	30.55	17.71			12.84	
	7/31/2006	30.55	19.92			10.63	
	12/4/2006	30.55	18.88			11.67	
	2/27/2007	30.55	18.98			11.57	
	5/21/2007	30.55	18.67			11.88	
	8/27/2007	30.55	20.28			10.27	
	12/3/2007	30.55	19.57			10.98	
	2/18/2008	30.55	18.56			11.99	
	5/5/2008	30.55	19.00			11.55	
	8/4/2008	30.55	19.74			10.81	
	11/17/2008	30.55	19.89			10.66	
	2/23/2009	30.55	19.14			11.41	

TABLE 1

GROUND WATER ELEVATION DATA
NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
MW38	8/22/2005	41.85	16.12			25.73	
	11/29/2005	41.85	15.70			26.15	
	3/20/2006	41.85	14.17			27.68	
	5/9/2006	41.85	14.61			27.24	
	7/31/2006	41.85	15.71			26.14	
	12/4/2006	41.85	15.50			26.35	
	2/27/2007	41.85	14.46			27.39	
	5/21/2007	41.85	14.95			26.90	
	8/27/2007	41.85	16.32			25.53	
	12/3/2007	41.85	15.97			25.88	
	2/18/2008	41.85	14.26			27.59	
	5/5/2008	41.85	14.59			27.26	
	8/4/2008	41.85	15.66			26.19	
	11/17/2008	41.85	15.83			26.02	
	2/23/2009	41.85	15.51			26.34	
MW39	8/22/2005	42.21	16.63			25.58	
	11/29/2005	42.21	16.16			26.05	
	3/20/2006	42.21	14.69			27.52	
	5/9/2006	42.21	15.13			27.08	
	7/31/2006	42.21	16.18			26.03	
	12/4/2006	42.21	15.92			26.29	
	2/27/2007	42.21	14.92			27.29	
	5/21/2007	42.21	15.46			26.75	
	8/27/2007	42.21	16.81			25.40	
	12/3/2007	42.21	16.40			25.81	
	2/18/2008	42.21	14.71			27.50	
	5/5/2008	42.21	15.10			27.11	
	8/4/2008	42.21	16.17			26.04	
	11/17/2008	42.21	16.21			26.00	
	2/23/2009	42.21	15.98			26.23	

TABLE 1

GROUND WATER ELEVATION DATA
NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
MW40	8/22/2005	34.12	15.01			19.11	
	11/29/2005	34.12	13.83			20.29	
	3/20/2006	34.12	11.60			22.52	
	5/9/2006	34.12	12.63			21.49	
	7/31/2006	34.12	14.58			19.54	
	12/4/2006	34.12	12.01			22.11	
	2/27/2007	34.12	11.23			22.89	
	5/21/2007	34.12	13.19			20.93	
	8/27/2007	34.12	15.63			18.49	
	12/3/2007	34.12	13.74			20.38	
	2/18/2008	34.12	11.03			23.09	
	5/5/2008	34.12	12.79			21.33	
	8/4/2008	34.12	14.49			19.63	
	11/17/2008	34.12	14.44			19.68	
	2/23/2009	34.12	13.67			20.45	
W-15	2/28/2005	29.17	12.31			16.86	
	5/23/2005	29.17	11.72			17.45	
	8/22/2005	29.17	12.70			16.47	
	11/29/2005	29.17	11.98	11.97	0.01	17.20	Used LPH density 0.81
	3/20/2006	29.17	11.29	11.27	0.02	17.90	Used LPH density 0.81
	5/9/2006	29.17	11.56			17.61	
	7/31/2006	29.17	12.50			16.67	
	12/4/2006	29.17	11.96			17.21	
	2/27/2007	29.17	11.34	11.33	0.01	17.83	Used LPH density 0.81
	5/21/2007	29.17	11.65			17.52	
	8/27/2007	29.17	12.66			16.51	
	12/3/2007	29.17	12.09			17.08	
	2/18/2008	29.17	10.11			19.06	
	5/5/2008	29.14	11.07			18.07	
	8/4/2008	29.14	11.90			17.24	
	11/17/2008	29.26	12.32			16.94	
	2/23/2009	29.26	11.34			17.92	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
W-16	3/14/2005	30.48	11.12			19.36	
	5/23/2005	30.48	10.07			20.41	
	8/22/2005	30.48	11.39			19.09	
	11/29/2005	30.48	11.49			18.99	
	3/20/2006	30.48	8.93			21.55	
	5/9/2006	30.48	9.48			21.00	
	7/31/2006	30.48	10.91			19.57	
	12/4/2006	30.48	9.33			21.15	
	2/27/2007	30.48	9.10			21.38	
	5/21/2007	30.48	9.81			20.67	
	8/27/2007	30.48	11.64			18.84	
	12/3/2007	30.48	11.07			19.41	
	2/18/2008	30.48	8.05			22.43	
	5/5/2008	30.48	9.35			21.13	
	8/4/2008	30.48	10.72			19.76	
	11/17/2008	30.30	11.47			18.83	
	2/23/2009	30.30	10.07			20.23	
W-17	2/28/2005	30.96	11.81			19.15	
	5/23/2005	30.96	10.44			20.52	
	8/22/2005	30.96	12.13			18.83	
	11/29/2005	30.96	10.86			20.10	
	3/20/2006	30.96	9.18			21.78	
	5/9/2006	30.96	9.92			21.04	
	7/31/2006	30.96	11.61			19.35	
	12/4/2006	30.96	9.76			21.20	
	2/27/2007	30.96	9.33			21.63	
	5/21/2007	30.96	10.32			20.64	
	8/27/2007	30.96	12.54			18.42	
	12/3/2007	30.96	11.30			19.66	
	2/18/2008	30.96	8.49			22.47	
	5/5/2008	30.96	9.97			20.99	
	8/4/2008	30.96	11.49			19.47	
	11/17/2008	31.15	17.21			13.94	
	2/23/2009	31.15	10.78			20.37	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
W-18	2/28/2005	30.13	10.78			19.35	
	5/23/2005	30.13	17.25			12.88	
	8/22/2005	30.13	11.14			18.99	
	11/29/2005	30.13	10.44			19.69	
	3/20/2006	30.13	8.11			22.02	
	5/9/2006	30.13	8.93			21.20	
	7/31/2006	30.13	10.70			19.43	
	12/4/2006	30.13	8.74			21.39	
	2/27/2007	30.13	8.42			21.71	
	5/21/2007	30.13	9.41			20.72	
	8/27/2007	30.13	11.75			18.38	
	12/3/2007	30.13	11.12			19.01	
	2/18/2008	30.13	7.46			22.67	
	5/5/2008	30.13	9.10			21.03	
	8/4/2008	30.13	10.62			19.51	
	11/17/2008	30.00	11.38			18.62	
	2/23/2009	30.00	9.89			20.11	
W-19	3/14/2005	29.57	12.41			17.16	
	5/23/2005	29.57	11.04			18.53	
	8/22/2005	29.57	12.71			16.86	
	11/29/2005	29.57	12.14			17.43	
	3/20/2006	29.57	10.08			19.49	
	5/9/2006	29.57	10.60			18.97	
	7/31/2006	29.57	12.32			17.25	
	12/4/2006	29.57	10.62			18.95	
	2/27/2007	29.57	10.47			19.10	
	5/21/2007	29.57	11.16			18.41	
	8/27/2007	29.57	13.37			16.20	
	12/3/2007	29.57	13.14			16.43	
	2/18/2008	29.57	9.50			20.07	
	5/5/2008	29.57	10.96			18.61	
	8/4/2008	29.57	12.24			17.33	
	11/17/2008	29.70	13.26			16.44	
	2/23/2009	29.70	11.70			18.00	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
W-20	3/14/2005	29.47	16.35			13.12	
	5/23/2005	29.47	14.76			14.71	
	8/22/2005	29.47	16.51			12.96	
	11/29/2005	29.47	16.46			13.01	
	3/20/2006	29.47	15.31			14.16	
	5/9/2006	29.47	14.84			14.63	
	7/31/2006	29.47	16.18			13.29	
	12/4/2006	29.47	15.02			14.45	
	2/27/2007	29.47	15.16			14.31	
	5/21/2007	29.47	15.22			14.25	
	8/27/2007	29.47	17.04			12.43	
	12/3/2007	29.47	16.50			12.97	
	2/18/2008	29.47	14.75			14.72	
	5/5/2008	29.47	15.37			14.10	
	8/4/2008	29.47	16.03			13.44	
	11/17/2008	29.32	16.43			12.89	
	2/23/2009	29.32	16.12			13.20	
W-21	2/28/2005	29.54	15.87			13.67	
	5/23/2005	29.54	13.92			15.62	
	8/22/2005	29.54	17.11			12.43	
	11/29/2005	29.54	11.77			17.77	
	3/20/2006	29.54	NM			--	
	5/9/2006	29.54	13.91			15.63	
	7/31/2006	29.54	16.42			13.12	
	12/4/2006	29.54	12.00			17.54	
	2/27/2007	29.54	14.07			15.47	
	5/21/2007	29.54	15.13			14.41	
	8/27/2007	29.54	17.80			11.74	
	12/3/2007	29.54	12.45			17.09	
	2/18/2008	29.54	12.52			17.02	
	5/5/2008	29.54	15.10			14.44	
	8/4/2008	29.54	13.15			16.39	
	11/17/2008	29.79	15.00			14.79	
	2/23/2009	29.79	15.43			14.36	

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes
W-22	2/28/2005	30.75	18.73			12.02	
	5/23/2005	30.75	16.92			13.83	
	8/22/2005	30.75	19.42			11.33	
	11/29/2005	30.75	18.06			12.69	
	3/20/2006	30.75	16.83			13.92	
	5/9/2006	30.75	16.83			13.92	
	7/31/2006	30.75	19.18			11.57	
	12/4/2006	30.75	14.76			15.99	
	2/27/2007	30.75	17.23			13.52	
	5/21/2007	30.75	17.94			12.81	
	8/27/2007	30.75	19.74			11.01	
	12/3/2007	30.75	19.16			11.59	
	2/18/2008	30.75	15.53			15.22	
	5/5/2008	30.75	17.83			12.92	
	8/4/2008	30.75	18.86			11.89	
	11/17/2008	31.40	18.83			12.57	
	2/23/2009	31.40	18.17			13.23	
Willamette River	2/28/2005	2.92	-0.85			3.77	Daily gage height
	5/23/2005	2.92	-6.14			9.06	Daily gage height
	8/22/2005	2.92	-0.65			3.57	Daily gage height
	11/29/2005	2.92	-1.31			4.23	Daily gage height
	3/20/2006	2.92	-1.65			4.57	Daily gage height
	5/9/2006	2.92	-5.50			8.42	Daily gage height
	7/31/2006	2.92	-0.42			3.34	Daily gage height
	12/4/2006	2.92	-2.21			5.13	Daily gage height
	2/27/2007	2.92	-2.67			5.59	Daily gage height
	5/21/2007	2.92	-4.00			6.92	Daily gage height
	8/27/2007	2.92	0.00			2.92	Daily gage height
	12/3/2007	2.92	-3.64			6.56	Daily gage height
	2/18/2008	2.92	-1.08			4.00	Daily gage height
	5/5/2008	2.92	-2.58			5.50	Daily gage height
	8/4/2008	2.92	-0.73			3.65	Daily gage height
	11/17/2008	2.92	-1.62			4.54	Daily gage height
	2/23/2009	2.92	-0.55			3.47	Daily gage height

TABLE 1

GROUND WATER ELEVATION DATA

NuStar Portland Terminal, Portland, Oregon

Location	Date	Reference Elevation (feet)	Depth To Water (feet)	Depth To LPH (feet)	LPH Thickness (feet)	Ground Water Elevation (feet)	Notes

Notes

Ground water elevation is corrected for the observed LPH thickness using the LPH density stated in the "Notes" column.

Reference elevation (i.e., top of casing) relative to City of Portland Datum, survey conducted in July 2005.

City of Portland Datum is 1.375 feet below NGVD 29 (sea level).

The Willamette River is data from USGS Sta. 14211720, in feet above river stage datum of 2.925 feet City of Portland Datum (1.55 feet NGVD 29).

USGS = United States Geological Survey

LPH = liquid phase hydrocarbon

NM = not measured

NGVD 29 = National Geodetic Vertical Datum of 1929

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naphthalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW01	Screen Elevation (feet, msl): 23.48 to 13.48												
2/28/2005	15.00	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	15.90	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	13.60	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/29/2005	15.78	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	5	<1	SNA
3/20/2006	16.96	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	16.60	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	13.94	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	19.48	NP	Primary	<0.1	<0.0948	<0.0948	<1	<1	<1	<3	<1	<5	SNA
12/4/2006	19.48	NP	Duplicate	<0.1	<0.0952	<0.0952	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	16.89	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	15.59	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/30/2007	13.21	NP	Primary	0.0461 J	0.0433 J	0.0627 J	<0.330	0.420 J	<0.420	<0.450	6.89	<0.650	SNA
12/3/2007	15.21	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	18.59	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	15.87	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/7/2008	14.17	NP	Primary	<0.0430	<0.0200	0.0225 J	<0.270	<0.280	<0.240uj	1.92 J	4.21	<0.0390	SNA
11/17/2008	15.33	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	15.19	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW02	Screen Elevation (feet, msl): 22.64 to 12.64												
2/28/2005	20.46	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	20.43	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	19.88	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/29/2005	20.64	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	21.26	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	20.52	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	20.01	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	22.24	NP	Primary	<0.1	<0.0948	<0.0948	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	22.06	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	20.41	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/30/2007	19.46	NP	Primary	<0.0430	<0.0194	0.0230 J	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	20.98	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	21.87	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	20.47	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/7/2008	19.94	NP	Primary	<0.0430	<0.0205	0.0292 J	0.280 Ju	0.530 J	<0.240uj	<0.860	<0.420	<0.0386	SNA
11/17/2008	21.12	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	20.21	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW03	Screen Elevation (feet, msl): 31.24 to 21.24												
2/28/2005	32.70	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	34.26	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	31.38	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/1/2005	33.39	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	34.06	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	29.05	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	32.74	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	33.91	NP	Primary	<0.1	<0.0943	<0.0943	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	35.02	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	NM	NM	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/28/2007	31.20	NP	Primary	0.0701 Ju	<0.0356	<0.0356	0.440 J	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	33.46	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	34.14	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	33.50	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/6/2008	32.05	NP	Primary	0.740 j	<0.0196	0.0209 Ju	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0382	SNA
11/17/2008	33.77	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	32.89	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW05	Screen Elevation (feet, msl): 22.68 to 12.68												
2/28/2005	19.39	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	19.85	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	18.92	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/30/2005	19.73	NP	Primary	0.38	2.3	0.43	0.6	<0.7	<0.8	<0.8	<0.5	3	SNA
3/20/2006	22.12	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	21.21	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	19.35	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	21.46	NP	Primary	0.211	1.99	0.245	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	21.99	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	20.66	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/28/2007	18.30	NP	Primary	0.349	1.47	0.118	0.930 J	<0.420	<0.420	0.580 J	<0.310	1.15 J	SNA
12/3/2007	19.13	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	22.75	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	21.01	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/7/2008	19.43	NP	Primary	0.493 j	1.17	0.0810 J	<0.270	<0.280	0.720 J	1.31 J	<0.420	<0.0390	SNA
11/17/2008	19.09	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	20.19	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW06	Screen Elevation (feet, msl): 21.8 to 11.8												
2/28/2005	19.29	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	20.02	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	18.81	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/30/2005	19.62	NP	Primary	<0.05	0.21	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
12/1/2005	19.62	NP	Duplicate	<0.05	0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	21.96	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	21.05	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	19.22	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	21.39	NP	Primary	<0.1	<0.0952	<0.0952	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	21.86	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	20.50	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/28/2007	18.20	NP	Primary	0.0736 Ju	0.368	<0.0363	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	19.02	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	22.58	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	NM	NM	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/7/2008	NM	NM	Primary	0.168 j	0.295	0.0351 J	<0.270	<0.280	0.500 J	0.890 J	<0.420	0.0971	SNA
11/17/2008	19.05	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	20.04	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW07 Screen Elevation (feet, msl): 21.63 to 11.63													
3/2/2005	19.14	NP	Primary	0.13	4.4	<1.1	<0.5	<0.7	<0.8	<0.8	0.5	4	SNA
5/25/2005	20.29	NP	Primary	0.17	5.5	0.98	3	<0.7	<0.8	<0.8	0.5	2	SNA
8/23/2005	18.85	NP	Primary	<0.05	6.9 j	<0.96	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
12/1/2005	19.44	NP	Primary	0.29	3.1	0.54	0.6	<0.7	3	0.8	1	12	SNA
3/21/2006	21.24	NP	Primary	<0.1	2.83 j	0.255 j	<1	<1	<1	<3	<1	<5	SNA
3/21/2006	21.24	NP	Duplicate	0.127	2.1 j	0.308 j	1.24 j	<1	<1	<3	<1	<5	SNA
5/11/2006	20.74	NP	Primary	<0.1r	3.36 j	0.171 j	<1j	<1r	<1r	<3r	<1r	<5uj	SNA
8/1/2006	19.30	NP	Primary	<0.1	5.11 j	0.875 j	<1	<1	<1	<3	<1	<5	<100
8/1/2006	19.30	NP	Duplicate	<0.1	5.13	<1.95uj	<1	<1	<1	<3	<1	<5	<100
12/5/2006	20.80	NP	Primary	0.785	3.99	0.148	<1	<1	10.6	5.86	<1	91.5	SNA
2/28/2007	21.06	NP	Primary	0.232	5.82	0.277	<0.330	<0.420	0.620 J	0.620 J	<0.310	10.4	SNA
5/22/2007	20.46	NP	Primary	0.143	2.66 j	1.69	<0.330	<0.420uj	<0.420	<0.450	<0.310	<0.650	SNA
8/28/2007	18.62	NP	Primary	0.123 u	4.34	1.46	0.410 J	<0.420	<0.420	<0.450	<0.310	0.680 J	SNA
12/4/2007	19.21	NP	Primary	4.67	3.31	<0.0385	2.33	1.99	51.0	40.6	5.13	535	SNA
2/19/2008	22.21	NP	Primary	0.0659 Ju	3.78	5.18	0.340 J	0.340 J	<0.240	<0.860	<0.420	0.970 Ju	SNA
5/6/2008	20.93	NP	Primary	0.145	2.84	3.81	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540uj	SNA
8/5/2008	19.54	NP	Primary	0.0799 J	3.72 j	4.67 j	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0390	SNA
11/19/2008	18.92	NP	Primary	3.64 j	3.05	0.161 u	1.52 j	1.50	24.4	12.6	2.76	148	SNA
11/19/2008	18.92	NP	Duplicate	3.72 j	3.80	0.355 j	1.52	1.17	23.1	11.9	2.68	116	SNA
2/25/2009	20.26	NP	Primary	26.3	3.10	0.446 Ju	2.90	0.840 J	1.68	4.28	1.23	4.55 j	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW09 Screen Elevation (feet, msl): 22.39 to 12.39													
3/2/2005	13.72	NP	Primary	<0.05	4.2	<1.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
5/25/2005	14.70	NP	Primary	<0.05	5	1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/23/2005	13.32	NP	Primary	<0.05	0.65	0.21	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
11/30/2005	14.07	NP	Primary	<0.05	0.92	0.26	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/21/2006	14.22	NP	Primary	<0.1	0.706	0.616	<1uj	<1	<1	<3	<1	<5	SNA
5/11/2006	14.77	NP	Primary	<0.1r	0.393 j	<0.0962uj	<1r	<1r	<1r	<3r	<1r	<5uj	SNA
8/2/2006	13.42	NP	Primary	<0.1	0.146	0.0966	<1	<1	<1	<3	<1	<5	<100
12/5/2006	14.74	NP	Primary	<0.1	0.917	0.276	<1	<1	<1	<3	<1	<5	SNA
2/28/2007	14.36	NP	Primary	<0.0430	0.800	0.174	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
5/23/2007	13.75	NP	Primary	<0.0430	0.328	0.0773 Ju	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/28/2007	13.22	NP	Primary	0.0677 Ju	0.153	<0.0389	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/5/2007	14.19	NP	Primary	0.0650 Ju	3.64	0.353	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
2/20/2008	14.75	NP	Primary	0.0797 Ju	5.15 j	4.54 j	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/6/2008	13.93	NP	Primary	<0.0430	0.457	0.160	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540uj	SNA
8/5/2008	13.34	NP	Primary	<0.0430	0.135	0.0797 J	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0390	SNA
11/18/2008	14.09	NP	Primary	0.0627 Ju	4.47	0.949	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0390	SNA
2/24/2009	13.57	NP	Primary	0.218 u	0.156	0.0653 Ju	<0.270uj	<0.280uj	<0.240uj	<0.860uj	<0.420	0.0667 r	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW10	Screen Elevation (feet, msl): 22.99 to 12.99												
2/28/2005	27.07	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	27.28	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	24.84	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/30/2005	27.22	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
11/30/2005	27.22	NP	Duplicate	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/23/2006	27.14	NP	Primary	<0.1	<0.0939	0.123 j	<1	<1	<1	<3	<1	<5	SNA
5/11/2006	26.35	NP	Primary	<0.1r	<0.0962uj	<0.0962uj	<1r	<1r	<1r	<3r	<1r	<5uj	SNA
7/31/2006	25.03	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/5/2006	27.27	NP	Primary	<0.1	<0.099	<0.099	<1	<1	<1	<3	<1	<5	SNA
12/5/2006	27.27	NP	Duplicate	<0.1	<0.0943	<0.0943	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	27.59	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	26.26	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/28/2007	24.51	NP	Primary	<0.0430	0.0362 J	<0.0356	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	27.97	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	27.40	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	26.25	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/5/2008	24.74	NP	Primary	<0.0430	<0.0194	<0.0194	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0390	SNA
11/17/2008	26.51	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	25.87	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW11 Screen Elevation (feet, msl): 25.57 to 10.57													
3/3/2005	14.63	NP	Primary	0.83	3.6	0.58	1	<0.7	<0.8	1	<0.5	4	SNA
5/25/2005	15.00	NP	Primary	<0.05	1.8	0.49	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/23/2005	14.35	NP	Primary	0.23	0.58	0.14	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
12/2/2005	14.69	NP	Primary	0.098	1.6	0.33	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/23/2006	14.87	NP	Primary	<0.1	1.04	0.441	<1	<1	<1	<3	<1	<5	SNA
3/23/2006	14.87	NP	Duplicate	<0.1	0.896	0.408	<1	<1	<1	<3	<1	<5	SNA
5/11/2006	14.88	NP	Primary	<0.1r	0.685 j	0.301 j	<1r	<1r	<1r	<3r	<1r	<5uj	SNA
8/1/2006	14.35	NP	Primary	0.241	0.8	0.229 j	<1	<1	<1	<3	<1	<5	<100
12/6/2006	14.84	NP	Primary	<0.1	0.895	0.14 j	<1	<1	<1	<3	<1	<5	SNA
12/6/2006	14.84	NP	Duplicate	<0.1	0.935	0.3 j	<1	<1	<1	<3	<1	<5	SNA
3/1/2007	14.62	NP	Primary	0.131 u	0.897	0.350 u	<0.330	<0.420	<0.420	<0.450	<0.310uj	<0.650uj	SNA
3/1/2007	14.62	NP	Duplicate	0.0986 Ju	0.992	0.259 u	<0.330	<0.420	<0.420	<0.450	<0.310uj	<0.650uj	SNA
5/23/2007	14.46	NP	Primary	0.0886 J	0.332	0.0938 Ju	0.600 J	0.690 J	<0.420	<0.450	<0.310	<0.650	SNA
8/28/2007	14.19	NP	Primary	0.854 u	0.942	0.205	14.5	3.94	1.37	1.78 J	<0.310	0.790 J	SNA
12/4/2007	14.57	NP	Primary	1.08	1.09	0.0668 J	17.0	2.97	1.41	2.37 J	<0.420	<0.540	SNA
2/20/2008	15.38	NP	Primary	0.526	8.13	<0.192	0.620 J	<0.280	<0.240	1.17 J	<0.420	0.680 Ju	SNA
5/6/2008	14.93	NP	Primary	25.9	396	24.0 J	314	151	1.76	5.45	0.800 J	0.760 J	SNA
8/5/2008	14.62	NP	Primary	37.0	96.2 J	<1.92	552	354	5.68	18.0	1.01	<1.95	SNA
8/5/2008	14.62	NP	Duplicate	27.0	87.3 J	<1.92	588	389	5.70	17.8	0.880 J	<1.95	SNA
11/18/2008	14.57	NP	Primary	1.20 j	28.0	7.19 J	102	136	5.09	18.4	0.510 J	<0.920	SNA
2/24/2009	14.97	NP	Primary	1.85 j	72.6	<13.7	140 j	133 j	4.22 j	10.9 j	<0.420	1.65 r	156

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW13 Screen Elevation (feet, msl): 32.01 to 22.01													
3/2/2005	26.21	NP	Primary	7	0.21	<0.11	930	110	470	1300	<0.5	110	SNA
5/25/2005	27.06	NP	Primary	13	0.34	<0.1	1000	130	870	2600	<1	150	SNA
8/25/2005	26.08	NP	Primary	0.25	0.085 j	<0.1	250	<0.7	10	21	<0.5	<1	SNA
11/30/2005	26.40	NP	Primary	2.2	0.18	<0.1	910	35	66	370	<0.5	95	SNA
3/21/2006	28.11	NP	Primary	8.53	1.27	<0.1	555 j	197	282	1650	<1	85.7	SNA
5/9/2006	27.73	NP	Primary	7.73	1.06	0.123 j	793	107	242	1840	<1	182	SNA
5/9/2006	27.73	NP	Duplicate	8.41	0.982	0.112 j	735	107	223	1670	<1	178	SNA
7/31/2006	26.60	NP	Primary	10.7	1.08	<0.0939	782	59.5	171	1930	<1	174	<100
12/6/2006	26.68	NP	Primary	5.12	0.576	<0.0948	1020	13.8	13.0	82.0	<1	126	SNA
2/28/2007	27.64	NP	Primary	9.93	0.733	0.0431 J	720	86.5	351	1810	<0.310	88.6	SNA
5/22/2007	27.33	NP	Primary	10.4	0.868 j	0.0457 J	1280	69.0	322	1630	<1.55	151	SNA
8/27/2007	25.91	NP	Primary	6.59 j	0.778	<0.0359	1210	29.2	169	638	<0.310	144	SNA
12/3/2007	25.95	NP	Primary	3.91	0.205	0.0521 J	641	17.5	35.2	234	0.770 J	151	SNA
2/20/2008	28.13	NP	Primary	3.05	0.592	<0.0222	555	51.9	28.4	74.7	<0.420	63.9	SNA
5/7/2008	27.76	NP	Primary	10.7	0.601	0.0808 J	456	103	181	1160	<0.420	110	SNA
8/7/2008	26.61	NP	Primary	1.88 j	0.247	0.0922 J	231	9.11	89.8	288	<0.420	13.7	SNA
11/19/2008	26.32	NP	Primary	10.5	0.637	0.0741 Ju	697	30.3	615	1720	<0.420	141	SNA
2/24/2009	26.75	NP	Primary	7.34	0.592	0.109 u	851	36.0	434	322	<0.420	48.8 r	<74.4

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW14	Screen Elevation (feet, msl):			31	to 21								
3/2/2005	26.29	NP	Primary	0.079	<0.085	<0.11	27	<0.7	<0.8	2	<0.5	<1	SNA
5/25/2005	27.14	NP	Primary	0.13	0.18	0.13	130	3	3	14	<0.5	<1	SNA
8/25/2005	26.21	NP	Primary	10	0.26	<0.1	920	160	210	2400	<1	150	SNA
11/30/2005	26.43	NP	Primary	0.055	0.25	0.15	55	<0.7	1	4	<0.5	<1	SNA
3/21/2006	28.36	NP	Primary	0.337	<0.101	0.174	19.3 j	<1	<1	<3	<1	<5	SNA
5/9/2006	27.99	NP	Primary	0.275 j	0.152 j	0.111	12.6	<1	<1	<3	<1	<5	SNA
7/31/2006	26.74	NP	Primary	0.329	<0.0943	0.367	3.48	<1	<1	<3	<1	<5	<100
12/6/2006	26.62	NP	Primary	0.895	<0.0943	<0.0943	7.02	<1	<1	<3	<1	<5	SNA
2/27/2007	27.85	NP	Primary	1.07	0.123	0.219 j	100	<0.420	1.91	3.40	<0.310	<0.650uj	SNA
5/22/2007	27.54	NP	Primary	0.206	0.186 j	0.296	1.84	<0.420uj	<0.420	<0.450	<0.310	<0.650	SNA
8/27/2007	26.03	NP	Primary	0.806 u	0.131	0.0716 J	48.9	<0.420	0.440 J	0.550 J	<0.310	<0.650	SNA
12/3/2007	26.18	NP	Primary	1.63	0.654	0.585	40.5	<0.280	<0.240	1.75 J	<0.420	<0.540	SNA
2/20/2008	28.30	NP	Primary	0.400	0.157	<0.0192	7.18	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/7/2008	27.98	NP	Primary	0.196	<0.0192	0.0923 J	0.960 J	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
8/7/2008	26.69	NP	Primary	0.463 j	0.0264 J	0.0747 J	16.2	0.510 J	0.820 J	1.61 J	<0.420	0.0737 J	SNA
11/19/2008	26.24	NP	Primary	0.883 j	0.0926 Ju	0.0951 Ju	16.2 j	0.520 J	0.930 J	1.12 J	<0.420	<0.0375	SNA
2/24/2009	26.87	NP	Primary	2.16	0.0892 u	0.123 u	51.3	0.510 J	1.83	2.53 J	<0.420	0.0900 r	<74.4

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW15 Screen Elevation (feet, msl): 36.98 to 26.98													
2/28/2005	33.89	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	35.29	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	33.51	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/2/2005	35.03	NP	Primary	<0.05	0.34	0.18	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	35.08	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	34.36	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	33.57	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/7/2006	34.86	NP	Primary	<0.1	0.0968	0.137	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	35.20	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	34.06	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	33.23	NP	Primary	0.0671 Ju	0.175	<0.0356	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	35.02	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	34.82	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	34.27	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/6/2008	33.17	NP	Primary	0.197 u	0.0908 J	0.0472 Ju	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0382	SNA
11/17/2008	34.33	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	33.71	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW16 Screen Elevation (feet, msl): 31.87 to 21.87													
2/28/2005	26.73	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	27.39	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	26.73	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/2/2005	26.89	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	28.66	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	28.34	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	27.23	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/6/2006	26.92	NP	Primary	<0.1	<0.0952	<0.0952	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	28.05	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	27.94	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	26.52	NP	Primary	0.0894 Ju	0.0648 J	<0.0359	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	26.31	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	28.42	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	28.29	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/6/2008	27.15	NP	Primary	0.317 u	<0.0194	0.0212 Ju	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0379	SNA
8/6/2008	27.15	NP	Duplicate	0.442 u	<0.0194	0.0252 Ju	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0379	SNA
11/17/2008	26.55	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	27.24	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW17	Screen Elevation (feet, msl): 28.47 to 13.47												
2/28/2005	16.09	0.01	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	17.96	0.01	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	15.21	0.03	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/29/2005	17.73	0.11	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/20/2006	19.14	0.32	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	18.72	0.26	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	15.85	0.05	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	19.16	0.02	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/27/2007	19.23	0.15	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	19.79	0.25	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	14.81	0.04	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/5/2007	15.63	NP	Primary	3.12	11.9	<0.192	406	4.71	0.860 J	10.6	<0.420	1.20 J	SNA
2/18/2008	18.19	0.23	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	18.96	0.02	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/4/2008	15.82	0.01	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/17/2008	15.06	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	16.34	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW18	Screen Elevation (feet, msl): 30.49 to 15.49												
3/2/2005	18.72	NP	Primary	0.062	1.1	0.61	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
5/26/2005	19.80	NP	Primary	0.09	0.45	0.22	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/26/2005	18.36	NP	Primary	0.32	0.44	0.1	0.6	<0.7	<0.8	<0.8	<0.5	<1	SNA
11/29/2005	18.81	NP	Primary	1	1.3	0.25	2	<0.7	2	2	<0.5	3	SNA
3/23/2006	20.38	NP	Primary	0.137	0.997	0.428	10.6	<1	<1	<3	<1	<5	SNA
5/9/2006	19.91	NP	Primary	0.243	0.857	0.3 j	1.21	<1	<1	<3	<1	<5	SNA
8/1/2006	18.62	NP	Primary	0.232	0.707 j	0.16 j	<1	<1	<1	<3	<1	<5	<100
12/4/2006	20.34	NP	Primary	0.527	1.11	0.184	<1	<1	<1	<3	<1	<5	SNA
3/1/2007	20.21	NP	Primary	7.12	265	<17.6	98.7	60.1	5.36	3.89	2.44 j	0.730 J	SNA
5/23/2007	19.77	NP	Primary	30.3	277	<18.1	136	194	16.9	87.5	5.80	2.58 J	SNA
8/29/2007	18.21	NP	Primary	1.20	5.68	<0.356	7.81	16.7	10.8	36.2	<0.310	4.98 J	SNA
12/5/2007	18.93	NP	Primary	0.381	0.847	0.175	0.710 J	<0.280	<0.240	<0.860	<0.420	0.680 J	SNA
2/19/2008	21.42	NP	Primary	19.3	38.7	<1.92	1110 j	2590 j	146 j	751 j	<0.420uj	2.34 Jj	SNA
5/6/2008	20.20	NP	Primary	98.3	377	21.2 J	1620	4300	228	1190	<0.420	34.7 j	SNA
8/6/2008	18.98	NP	Primary	68.1	120 J	132 J	2260	1820	133	513	0.980 J	16.8	SNA
11/18/2008	14.67	NP	Primary	6.63 j	50.2	<3.96	115 j	209	145	915	<0.420	60.2	SNA
2/25/2009	19.69	NP	Primary	57.3	64.8	4.44 J	156	1160	269	1710	0.730 J	29.4 r	5060000

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW19 Screen Elevation (feet, msl): 24.01 to 14.01													
3/2/2005	17.45	NP	Primary	0.93	1.7	0.63	8	<0.7	<0.8	<0.8	<0.5	4	SNA
5/26/2005	17.87	NP	Primary	0.46	2	0.78	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/26/2005	17.04	NP	Primary	0.91	2	0.5	7	2	1	1	<0.5	<1	SNA
11/29/2005	18.59	NP	Primary	0.43	0.91	0.45	1	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/23/2006	18.00	NP	Primary	<0.1	0.835	0.332 j	<1	<1	<1	<3	<1	<5	SNA
5/9/2006	17.82	NP	Primary	0.155	0.909	0.389	<1	<1	<1	<3	<1	<5	SNA
8/1/2006	17.18	NP	Primary	0.208	0.723 j	1.45 j	<1	<1	<1	<3	<1	<5	<100
12/4/2006	18.06	NP	Primary	1.25	0.814	0.293	4.49	<1	<1	<3	<1	<5	SNA
3/1/2007	17.86	NP	Primary	0.133 u	0.666	0.243 u	<0.330	<0.420	<0.420	<0.450	<0.310uj	<0.650uj	SNA
5/23/2007	17.71	NP	Primary	<0.0430	0.644	0.412	0.460 J	1.20	<0.420	0.480 J	<0.310	<0.650	SNA
8/29/2007	16.83	NP	Primary	0.875	0.545	0.262 u	1.10	0.670 J	<0.420	0.660 J	<0.310	<0.650	SNA
12/5/2007	17.26	NP	Primary	0.962	0.638	0.362	1.15	<0.280	0.450 J	<0.860	<0.420	0.560 J	SNA
2/19/2008	18.78	NP	Primary	0.254 u	0.944	1.03	4.40	1.29	<0.240	<0.860	<0.420	<0.540	SNA
5/6/2008	18.04	NP	Primary	1.12	0.802	0.463	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
8/6/2008	17.36	NP	Primary	0.752	0.357	0.211	0.820 J	<0.280	0.570 J	0.940 J	<0.420	<0.0390	SNA
11/18/2008	17.05	NP	Primary	1.07 j	0.482	0.561	1.71	0.580 J	0.760 J	<0.860	<0.420	0.560	SNA
2/25/2009	17.98	NP	Primary	0.245	0.691	0.540	0.380 J	0.420 J	0.270 J	<0.860	<0.420	0.0762 r	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW20	Screen Elevation (feet, msl): 29.24 to 19.24												
2/28/2005	21.21	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	21.59	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	20.81	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/5/2005	22.88	NP	Primary	<0.05	0.51	0.27	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	22.80	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	22.23	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	21.02	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	22.28	NP	Primary	<0.1	0.252	0.134	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	22.80	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	21.97	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/29/2007	20.85	NP	Primary	<0.0430	0.216	0.0756 Ju	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/29/2007	20.85	NP	Duplicate	<0.0430	0.248	<0.0363	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	22.23	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	23.05	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	22.24	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/5/2008	21.22	NP	Primary	<0.0430	0.286	0.164	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0390	SNA
11/17/2008	21.71	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	21.74	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW21	Screen Elevation (feet, msl): 28.93 to 13.93												
2/28/2005	19.57	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	20.21	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	19.25	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/5/2005	20.29	NP	Primary	0.19	7.8	1.9	<0.5	<0.7	<0.8	<0.8	62	<1	SNA
3/20/2006	22.15	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	21.48	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	19.86	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	21.60	NP	Primary	0.3	4.16	0.828	14.7	<1	<1	<3	21.5	<5	SNA
2/27/2007	22.09	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	21.13	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/29/2007	18.99	NP	Primary	0.485	2.42	0.394	<0.330	<0.420	<0.420	<0.450	92.7	3.81 J	SNA
12/3/2007	19.97	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	22.94	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	21.53	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/5/2008	20.01	NP	Primary	0.341 j	2.04	0.227	<0.270	<0.280	<0.240	<0.860	79.9	<0.0390	SNA
11/17/2008	19.58	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	20.72	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW23	Screen Elevation (feet, msl): 35.57 to 25.57												
2/28/2005	32.98	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	33.74	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	33.08	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/2/2005	33.25	NP	Primary	<0.05	0.087	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	34.82	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	NM	NM	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	33.55	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/6/2006	33.53	NP	Primary	<0.1	<0.0962	0.124	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	34.50	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	34.29	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	33.14	NP	Primary	0.0674 Ju	0.0445 J	<0.0356	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	33.08	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	34.81	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	34.50	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/6/2008	33.42	NP	Primary	0.193 u	0.0361 J	0.0488 Ju	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0379	SNA
11/17/2008	33.19	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	33.52	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naphthalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW24	Screen Elevation (feet, msl): 54.5 to 47												
2/28/2005	57.52	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	59.76	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	55.87	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/30/2005	57.54	NP	Duplicate	<0.05	0.14	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
12/1/2005	57.54	NP	Primary	<0.05	<0.08	0.12	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	60.41	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	59.01	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	57.03	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/5/2006	59.27	NP	Primary	<0.1	<0.0948	0.152	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	60.74	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	58.65	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	56.27	NP	Primary	0.0671 Ju	0.116	<0.0356	0.460 J	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	58.54	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	60.40	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	60.33	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/7/2008	57.38	NP	Primary	<0.0430	<0.0194	0.0272 J	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0390	SNA
11/17/2008	57.86	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	58.40	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW25	Screen Elevation (feet, msl): 49.36 to 36.36												
2/28/2005	45.14	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	46.70	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	43.39	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/1/2005	45.16	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	46.38	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	46.34	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	43.98	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/5/2006	46.06	NP	Primary	<0.1	<0.0943	<0.0943	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	47.59	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	45.91	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	43.26	NP	Primary	0.0675 Ju	<0.0359	<0.0359	<0.330	<0.420	<0.420	<0.450	<0.310	1.16 J	SNA
12/3/2007	45.44	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	47.62	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	47.27	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/7/2008	45.57	NP	Primary	<0.0430	0.0305 Ju	0.0484 Ju	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0386	SNA
11/17/2008	46.38	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	45.71	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW26	Screen Elevation (feet, msl): 70.48 to 63.98												
2/28/2005	69.69	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	70.76	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	65.25	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/1/2005	70.14	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/20/2006	71.20	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	70.58	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	65.99	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/5/2006	70.14	NP	Primary	<0.1	<0.0943	<0.0943	<1	<1	<1	<3	<1	<5	SNA
5/21/2007	70.95	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	65.23	NP	Primary	0.0676 Ju	0.108 J	0.138 J	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	71.39	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	71.37	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	70.72	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/7/2008	65.24	NP	Primary	<0.0430	0.0646 J	0.307	<0.270	<0.280	<0.240	<0.860	<0.420		SNA
11/17/2008	70.00	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	70.51	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW27	Screen Elevation (feet, msl): 84.04 to 69.04												
2/28/2005	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/29/2005	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/20/2006	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	69.08	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/27/2007	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	69.09	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/3/2007	Dry	Dry	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	69.08	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	69.09	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/7/2008	69.09	NP	Primary	<0.0430	<0.0194	0.0466 J	<0.270	<0.280	<0.240	<0.860	<0.420		SNA
11/17/2008	68.77	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	69.32	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW29 Screen Elevation (feet, msl): 26.74 to 16.74													
3/1/2005	9.46	NP	Primary	3.1	4.7	<1	8	3	3	4	0.5	5	SNA
5/24/2005	12.30	NP	Primary	3.4	3.5	<1	5	2	2	4	<0.5	1	SNA
8/25/2005	9.40	NP	Primary	1.8	3 j	<0.51	5	1	1	2	1	<1	SNA
12/1/2005	12.01	NP	Primary	2.6	3.7	0.24	7	2	3	3	3	2	SNA
3/23/2006	10.75	NP	Primary	0.971 j	3.86	0.252	1.09	<1	<1	<3	1.45	<5	SNA
5/10/2006	12.19	NP	Primary	1.84 j	6.84	0.483	2.78	2.24	1.64	3.17	<1	<5	SNA
8/2/2006	9.43	NP	Primary	1.82 j	4.24	3.24	5.68	2.00	1.38	<3	1.57	<5	<100
12/6/2006	10.43	NP	Primary	2.57	3.96	1.05 j	3.41	2.97	1.71	8.63	2.89	<5	SNA
3/1/2007	10.37	NP	Primary	3.14	4.72	0.132 Ju	3.11	1.65	1.64	1.16 J	2.58 j	0.750 J	SNA
5/23/2007	11.12	NP	Primary	2.07	4.17	1.37	2.35	1.92	1.21	2.48 J	4.05	<0.650	SNA
8/30/2007	9.20	NP	Primary	2.85	5.57	<0.0386	10.3	3.62	2.58	4.56	2.21	0.820 J	SNA
12/4/2007	9.72	NP	Primary	3.03	4.37	0.0743 J	16.6	3.75	2.63	4.81	<0.420	2.05 J	SNA
2/20/2008	10.62	NP	Primary	36.5	734	<48.5	14.2	2.47	1.80	3.51	0.690 J	<0.540	SNA
2/20/2008	10.62	NP	Duplicate	38.4	729	<48.1	14.7	2.54	1.75	3.41	0.880 J	0.940 Ju	SNA
5/7/2008	10.27	NP	Primary	2.14	31.8	1.30 J	141	13.8	2.94	3.11	<0.420	6.01	SNA
8/6/2008	9.62	NP	Primary	2.68 j	3.76	0.629 Ju	41.8	6.25	4.31	5.36	1.14	<0.0382uj	SNA
11/17/2008	9.60	NP	Primary	2.82 j	3.15	0.128 J	21.5	3.28	2.76	4.84	0.440 J	0.820 j	SNA
2/24/2009	10.17	NP	Primary	52.1	98.4	<5.33	52.7 j	24.1 j	5.03 j	10.0 j	7.31 j	<0.0481r	6350000

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW30 Screen Elevation (feet, msl): 25.65 to 15.65													
3/14/2005	NM	NM	Primary	0.78	1.8	0.48	2	<0.7	2	1	<0.5	<1	SNA
5/24/2005	12.03	NP	Primary	NA	1.1	0.53	NA	NA	NA	NA	NA	NA	SNA
8/26/2005	8.46	NP	Primary	0.51	1.8	<0.48	2	0.8	<0.8	1	<0.5	<1	SNA
12/1/2005	10.59	NP	Primary	0.3	2	0.37	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/23/2006	9.93	NP	Primary	0.174	0.866	0.236	<1	<1	<1	<3	<1	<5	SNA
5/10/2006	11.97	NP	Primary	<0.1	0.467	0.178	<1	<1	<1	<3	<1	<5	SNA
8/3/2006	8.59	NP	Primary	0.39 j	1.55	0.623	1.44	<1uj	1.99 j	4.19	<1	<5	<100
12/6/2006	9.82	NP	Primary	<0.1	0.892	0.449 j	<1	<1	<1	<3	<1	<5	SNA
3/1/2007	9.78	NP	Primary	0.261	1.58	0.265 u	<0.330	<0.420	<0.420	<0.450	<0.310uj	<0.650uj	SNA
5/23/2007	10.82	NP	Primary	0.141	0.966	0.421	<0.330	0.510 J	<0.420	<0.450	<0.310	<0.650	SNA
8/30/2007	8.18	NP	Primary	1.27	5.96	0.421	6.82	2.54	1.33	2.38 J	0.450 J	0.800 J	SNA
12/4/2007	8.77	NP	Primary	0.186 Ju	0.679	0.407	0.680 J	<0.280	<0.240	<0.860	<0.420	0.570 J	SNA
2/19/2008	9.76	NP	Primary	0.129 u	0.590	0.812	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/7/2008	9.68	NP	Primary	65.9	249	10.9 J	70.3	32.5	2.19	4.40	2.15	5.69	SNA
8/6/2008	8.78	NP	Primary	1.38 j	80.0	<4.00	34.2	11.6	2.42	6.23	0.850 J	2.32 j	SNA
11/17/2008	9.86	NP	Primary	22.4 j	212	22.2 J	27.2	7.80 J	3.40 J	<8.60	<4.20	0.786 j	SNA
2/24/2009	9.36	NP	Primary	3.36 j	1.52	<0.544	5.82 j	4.37 j	1.68 j	4.91 j	<0.420	0.940 r	13200 j
2/24/2009	9.36	NP	Duplicate	0.829 j	7.68 j	0.945 J	5.57 j	4.04 j	1.59 j	4.37 j	<0.420	0.962 r	353 j

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW31 Screen Elevation (feet, msl): 25.57 to 15.57													
3/3/2005	7.93	NP	Primary	3.9	5.1	1.2	12	3	3	7	<0.5	5	SNA
5/24/2005	12.00	NP	Primary	4.2	8.5	1.4	7	2	2	6	<0.5	1	SNA
5/24/2005	12.00	NP	Duplicate	3.5	12	1.5	7	2	2	6	<0.5	1	SNA
8/26/2005	7.72	NP	Primary	3.8	12 j	<0.47	9	3	3	7	<0.5	1	SNA
12/1/2005	10.43	NP	Primary	3.5	9.7	<0.94	5	2	3	6	<0.5	2	SNA
3/23/2006	9.45	NP	Primary	1.36 j	3.71	0.239	2.46	<1	3.4 j	7.87	<1	<5	SNA
5/10/2006	11.95	NP	Primary	1.43 j	5.7	0.416	7.19	<1	2.01	3.09	<1	<5	SNA
8/3/2006	7.97	NP	Primary	1.17 j	3.27	0.138	5.88	1.45 j	3.42	8.09	<1	<5	<100
12/5/2006	9.68	NP	Primary	2.53	7.29	<0.19	2.12	1.35	2.47	5.50	<1	<5	SNA
3/1/2007	9.55	NP	Primary	3.27	3.93	0.0411 Ju	1.62	1.26	2.37	2.79 J	<0.310uj	1.21 J	SNA
5/23/2007	10.77	NP	Primary	2.24	7.55	0.382 J	2.27	2.89	1.86	3.96	<0.310	1.26 J	SNA
8/30/2007	7.24	NP	Primary	3.05	6.54	0.139 J	4.60	1.43	1.95	4.89	<0.310	0.950 J	SNA
12/4/2007	8.31	NP	Primary	2.29	7.42	0.220 Ju	2.33	1.09	1.57	3.69	<0.420	1.34 J	SNA
2/21/2008	9.51	NP	Primary	2.51	4.28	<0.0190	6.81	1.76	3.59	6.88	<0.420	7.59	SNA
5/7/2008	9.46	NP	Primary	45.3	323	<19.4	5.45	1.02	1.48	3.95	0.640 J	5.83	SNA
8/6/2008	8.41	NP	Primary	63.3	1.71	2.36 Ju	37.0	0.580 J	0.990 J	2.05 J	0.910 J	0.686 J	SNA
11/18/2008	9.02	NP	Primary	2.59 j	499 j	0.0426 Ju	52.0	4.71	1.35	2.80 J	<0.420	<2.05	SNA
2/24/2009	8.76	NP	Primary	4.32 j	26.3	<2.72	45.4 j	8.01 j	1.94 j	4.05 j	<0.420	1.01 r	6800

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW32 Screen Elevation (feet, msl): 27.27 to 17.27													
3/2/2005	9.08	NP	Primary	3.9	13	<2.3	12	3	3	8	<0.5	5	SNA
3/2/2005	9.08	NP	Duplicate	3.9	13	<1.1	16	4	3	10	<0.5	5	SNA
5/24/2005	12.45	NP	Primary	2	35	<9.7	1	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/23/2005	7.97	NP	Primary	4.9	24 j	<2	10	3	3	6	<0.5	3	SNA
11/29/2005	8.48	0.49	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/20/2006	10.41	NP	Primary	0.787	8.31	0.569	59.7	<1	<1	<3	<1	<5	SNA
5/9/2006	12.78	NP	Primary	0.516	14.8	4.69	11.7	<1	<1	<3	<1	<5	SNA
8/3/2006	8.72	NP	Primary	0.747 j	6.11	0.246	61.9	1.24 j	<1uj	<3	<1	<5	<100
8/3/2006	8.72	NP	Duplicate	0.709 j	7.18 j	0.232 j	59.0	<1uj	1.91 j	<3	<1	<5	<100
12/5/2006	10.89	NP	Primary	0.452	11.4	<1.94	<1	<1	<1	<3	<1	<5	SNA
2/28/2007	10.41	NP	Primary	0.695	8.44	0.368 J	5.28	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
5/23/2007	11.37	NP	Primary	0.664	7.69	0.388 J	5.18	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/30/2007	7.56	NP	Primary	1.96	20.6	<0.385	1.58	<0.420	<0.420	1.12 J	<0.310	<0.650	SNA
12/4/2007	8.97	NP	Primary	1.04	29.6	2.15	0.790 J	0.840 J	0.370 J	1.19 J	<0.420	0.760 J	SNA
2/20/2008	11.05	NP	Primary	0.551	4.69	<0.100	51.5	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/7/2008	10.29	NP	Primary	0.409	3.91	0.512	0.310 J	<0.280	<0.240	1.14 J	<0.420	<0.540	SNA
8/6/2008	9.16	NP	Primary	0.479 j	6.65	0.710 J	3.06	<0.280	<0.240	<0.860	<0.420	<0.0379	SNA
11/17/2008	9.34	NP	Primary	0.872 j	5.15	0.222 Ju	2.36	1.86	0.250 J	0.940 J	<0.420	<0.975	SNA
2/24/2009	9.36	NP	Primary	1.51 j	4.67	0.692	8.45 j	0.530 J	0.290 J	1.33 J	<0.420	0.206 r	<74.4

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW33 Screen Elevation (feet, msl): 26.82 to 16.82													
3/2/2005	9.03	NP	Primary	0.23	9.2	<1.1	<0.5	<0.7	<0.8	2	<0.5	4	SNA
5/24/2005	12.91	NP	Primary	0.11	14	2.9	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/23/2005	8.38	NP	Primary	0.16	4.9 j	<0.98	<0.5	<0.7	<0.8	2	<0.5	<1	SNA
12/2/2005	9.54	NP	Primary	0.25	13	0.89	<0.5	<0.7	<0.8	1	<0.5	1	SNA
12/2/2005	9.54	NP	Duplicate	0.23	10	<0.96	<0.5	<0.7	<0.8	1	<0.5	<1	SNA
3/21/2006	10.82	NP	Primary	<0.1	5.49 j	0.464 j	<1uj	<1	<1	<3	<1	<5	SNA
5/10/2006	13.29	NP	Primary	<0.1	5.25	0.543	<1	<1	<1	<3	<1	<5	SNA
8/2/2006	9.01	NP	Primary	<0.1	4.31	3.8	20.2	<1	<1	<3	<1	<5	<100
12/5/2006	11.78	NP	Primary	<0.1	6.68	<0.472	<1	<1	<1	<3	<1	<5	SNA
12/5/2006	11.78	NP	Duplicate	<0.1	<0.0943	<0.0943	<1	<1	<1	<3	<1	<5	SNA
2/28/2007	10.82	NP	Primary	0.106	7.75	0.449 J	7.51	<0.420	<0.420	1.49 J	<0.310	10.0	SNA
5/23/2007	11.50	NP	Primary	0.112	4.81	1.46	4.76	<0.420	<0.420	0.930 J	<0.310	<0.650	SNA
8/29/2007	7.72	NP	Primary	0.606	5.39	<0.0712	191	0.620 J	<0.420	0.880 J	<0.310	<0.650	SNA
8/29/2007	7.72	NP	Duplicate	0.592	5.71	0.100 Ju	189	0.630 J	<0.420	0.740 J	<0.310	3.99 J	SNA
12/5/2007	9.43	NP	Primary	0.140 Ju	13.3	<0.192	<0.270	<0.280	<0.240	<0.860	<0.420	0.570 J	SNA
2/20/2008	12.12	NP	Primary	0.176 u	4.10	3.71	<0.270	<0.280	<0.240	0.940 J	<0.420	<0.540	SNA
5/7/2008	10.57	NP	Primary	0.147	6.03	0.515	<0.270	<0.280	<0.240	0.880 J	<0.420	<0.540	SNA
8/5/2008	9.16	NP	Primary	0.0833 J	7.35	2.35	9.09	<0.280	<0.240	1.00 J	<0.420	<0.0390	SNA
11/18/2008	9.66	NP	Primary	0.144 j	6.07	0.908	<0.270	<0.280	<0.240	<0.860	<0.420	<0.975	SNA
11/18/2008	9.66	NP	Duplicate	0.664 j	6.08	0.727	<0.270	<0.280	<0.240	1.00 J	<0.420	<0.938	SNA
2/24/2009	9.47	NP	Primary	0.534 j	5.87	<0.272	<0.270uj	<0.280uj	<0.240uj	0.940 J	<0.420	0.427 r	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW34 Screen Elevation (feet, msl): 22.37 to 12.37													
3/2/2005	25.37	NP	Primary	0.22	2.4	0.36	3	<0.7	<0.8	<0.8	<0.5	<1	SNA
5/25/2005	26.41	NP	Primary	0.056	1.4	0.59	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
5/25/2005	26.41	NP	Duplicate	0.05 Jj	1.4	0.78	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/23/2005	25.25	NP	Primary	1.1	5.6	<0.96	9	1	<0.8	<0.8	<0.5	<1	SNA
12/5/2005	26.09	NP	Primary	0.091	2	1.7	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/23/2006	27.09	NP	Primary	<0.1	0.509	0.449	<1	<1	<1	<3	<1	<5	SNA
5/10/2006	26.60	NP	Primary	<0.1	1	0.585	<1	<1	<1	<3	<1	<5	SNA
8/2/2006	25.48	NP	Primary	0.362 j	2.9	2.28	5.30	<1	<1	<3	<1	<5	<100
12/5/2006	26.00	NP	Primary	<0.1	0.73	0.472	<1	<1	<1	<3	<1	<5	SNA
3/1/2007	26.99	NP	Primary	<0.0430	1.32	0.631	<0.330	<0.420	<0.420	<0.450	<0.310uj	<0.650uj	SNA
5/24/2007	26.40	NP	Primary	0.123	2.62	1.25	0.940 J	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/29/2007	25.00	NP	Primary	0.542	3.23	0.701	6.66	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/5/2007	25.46	NP	Primary	0.0626 Ju	1.35	1.11	0.420 J	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
2/20/2008	27.06	NP	Primary	0.122 u	3.13	3.59	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/6/2008	26.64	NP	Primary	<0.0430	1.78	1.75	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540uj	SNA
8/5/2008	25.56	NP	Primary	0.242 j	4.00	1.28	3.39	<0.280	<0.240	<0.860	<0.420	<0.0390	SNA
11/18/2008	25.72	NP	Primary	<0.0430	1.16	2.07	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0390	SNA
2/24/2009	25.86	NP	Primary	0.546 j	1.21	1.57	0.600 J	<0.280uj	<0.240uj	<0.860uj	<0.420	<0.0481r	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW35 Screen Elevation (feet, msl): 20.37 to 10.37													
3/1/2005	19.38	NP	Primary	2.7	12	2.2	2	0.8	35	4	0.9	22	SNA
3/1/2005	19.38	NP	Duplicate	2.7	14	<2.1	2	0.8	36	4	0.9	23	SNA
5/24/2005	20.59	NP	Primary	1.4	6.3	1.9	2	<0.7	37	2	0.8	41	SNA
8/23/2005	19.09	NP	Primary	2.4	5.9 j	<1	4	0.8	18	5	34	8	SNA
12/1/2005	19.73	NP	Primary	2.1	5.6	1.1	0.9	<0.7	13	5	<0.5	8	SNA
3/21/2006	21.52	NP	Primary	0.588	NA	NA	<1	<1	1.95	<3	<1	16.4	SNA
5/10/2006	20.99	NP	Primary	2.29 j	1.32	<0.0952	<1	<1	10.6	3.13	<1	45.2	SNA
8/1/2006	19.54	NP	Primary	1.6	3.88 j	0.667 j	<1	<1	3.47	<3	<1	<5	<100
12/5/2006	21.28	NP	Primary	0.359	4.46	<0.189	<1	<1	1.24	<3	<1	<5	SNA
2/28/2007	21.41	NP	Primary	1.43	4.63	0.255	0.920 J	<0.420	19.0	1.84 J	1.19	32.1	SNA
5/22/2007	20.75	NP	Primary	1.09	4.13 j	0.697	1.94	<0.420uj	7.48	0.650 J	4.61	5.54	SNA
8/28/2007	18.88	NP	Primary	2.98	3.65	0.0863 J	10.0	<0.420	11.3	3.30	6.52	10.3	SNA
12/4/2007	19.08	NP	Primary	2.13	4.13	0.838	3.13	0.400 J	13.5	2.60 J	<0.420	17.6	SNA
2/19/2008	22.56	NP	Primary	0.143 u	2.81	3.05	0.830 J	<0.280	<0.240	<0.860	<0.420	0.780 Ju	SNA
5/7/2008	21.19	NP	Primary	1.54	4.40	0.0796 J	1.13	0.380 J	16.4	1.33 J	14.2	23.1	SNA
8/5/2008	19.81	NP	Primary	1.21 j	5.71	1.28	12.8	0.820 J	3.15	1.30 J	1.58	3.92	SNA
11/19/2008	19.40	NP	Primary	11.5	48.6	<2.22	145 j	420	106	466	4.21	<0.382	SNA
2/24/2009	20.47	NP	Primary	27.3	5.23	0.156 Ju	809	2280	440	2430	<0.420	37.2 r	3300000

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW36	Screen Elevation (feet, msl):			20	to 10								
3/1/2005	16.74	NP	Primary	2.2	6.7	<1	4	6	7	1	0.7	5	SNA
5/24/2005	16.68	NP	Primary	5.7	5	<1	3	3	7	1	0.9	3	SNA
8/25/2005	16.24	NP	Primary	2.4	5.7 j	<0.49	2	1	2	<0.8	0.7	1	SNA
12/2/2005	16.91	NP	Primary	5.4	6.2	<0.47	2	2	6	2	0.8	4	SNA
3/20/2006	16.95	NP	Primary	3.7	8.31 j	0.846 j	<1	3.61	9.86	<3	<1	<5	SNA
5/10/2006	16.85	NP	Primary	1.57 j	10.1	<0.952	1.37	1.51	6.47	<3	<1	<5	SNA
8/1/2006	16.67	NP	Primary	2.49	9.87	<0.976	<1	<1	5.02	<3	<1	<5	<100
12/6/2006	16.82	NP	Primary	1.27	5.75	0.212 j	<1	1.59	1.39	6.55	<1	<5	SNA
3/1/2007	16.92	NP	Primary	2.70	5.49	0.102 Ju	<0.330	1.30	2.84	0.800 J	1.58 j	<0.650uj	SNA
5/23/2007	16.05	NP	Primary	5.13	5.45	0.311	1.76	2.74	7.43	2.65 J	3.43	1.12 J	SNA
8/29/2007	16.52	NP	Primary	3.99	5.30	0.134 Ju	0.880 J	0.950 J	4.07	1.35 J	<0.310	4.37 J	SNA
12/4/2007	16.89	NP	Primary	3.51	5.72	0.515	1.41	1.13	4.93	2.24 J	<0.420	0.880 J	SNA
2/20/2008	17.13	NP	Primary	3.98	3.90	<0.0385	1.45	3.41	5.14	2.10 J	<0.420	1.19 Ju	SNA
5/7/2008	17.00	NP	Primary	4.72	4.29	<0.0385	1.15	2.20	6.09	2.20 J	<0.420	<0.540	SNA
8/7/2008	16.75	NP	Primary	4.60	4.63	0.262 J	1.08	0.920 J	5.89	2.00 J	<0.420	<0.0382	SNA
11/19/2008	16.80	NP	Primary	5.23	3.57	0.296 J	0.820 J	0.620 J	4.38	1.77 J	<0.420	0.635 u	SNA
2/25/2009	16.83	NP	Primary	5.44	4.41	0.477 Ju	0.830 J	1.44	4.22	1.80 J	<0.420	<0.0490	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
KMW37 Screen Elevation (feet, msl): 22.55 to 12.55													
3/3/2005	10.62	NP	Primary	4.4	12	2	12	8	9	19	7	6	SNA
5/24/2005	12.75	NP	Primary	2.4	7.2	<2	2	2	6	4	1	2	SNA
8/25/2005	10.54	NP	Primary	3.3	7.9 j	<0.98	6	3	9	9	2	2	SNA
8/25/2005	10.54	NP	Duplicate	3.4	9.8 j	<0.95	7	3	9	9	2	2	SNA
12/1/2005	16.66	NP	Primary	2.3	10	1.4	2	<0.7	7	6	0.8	3	SNA
3/20/2006	11.92	NP	Primary	0.842	6.78	0.528	1.04	1.08	1.79	<3	<1	<5	SNA
5/10/2006	12.84	NP	Primary	0.197 j	7.94	0.544	2.37	<1	<1	<3	<1	<5	SNA
8/1/2006	10.63	NP	Primary	1.41	8.49	<1.95	2.99	<1	5.36	<3	<1	<5	<100
12/6/2006	11.67	NP	Primary	0.553	8.62	1.77 j	<1	1.22	2.96	7.72	1.05	<5	SNA
2/28/2007	11.57	NP	Primary	1.30	6.64	0.388	6.59	0.720 J	0.960 J	1.94 J	2.57	<0.650	SNA
5/23/2007	11.88	NP	Primary	0.863	5.11	1.38	7.81	0.910 J	1.48	2.15 J	3.98	<0.650	SNA
8/29/2007	10.27	NP	Primary	3.07	7.16	0.442	5.33	1.02	1.87	2.91 J	2.55	3.94 J	SNA
12/4/2007	10.98	NP	Primary	1.46	3.57	1.02	4.66	0.470 J	2.54	2.84 J	2.95	0.780 J	SNA
2/19/2008	11.99	NP	Primary	1.65	4.41	<0.0962	5.05	1.29	1.66	3.49	3.52	0.620 Ju	SNA
5/6/2008	11.55	NP	Primary	1.56	4.80	0.271	2.22	1.79	2.01	4.50	2.09	5.53	SNA
8/6/2008	10.81	NP	Primary	1.69 j	6.06	0.182 Ju	3.37	1.16	6.09	5.00	0.920 J	<0.0382	SNA
11/18/2008	10.66	NP	Primary	2.32 j	5.31	0.151 J	3.05 j	0.910 J	4.55	3.64	3.57	2.71	SNA
2/24/2009	11.41	NP	Primary	3.27 j	3.08	<2.72	1.51	0.720 J	1.73	2.29 J	1.49	0.524 r	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
MW38	Screen Elevation (feet, msl): 28.85 to 18.85												
7/7/2005	25.73	NP	Primary	0.33	0.34	<0.1	260	4	2	4	0.5	<1	SNA
8/22/2005	25.73	NP	Primary	0.39	0.19	<0.1	230	4	5	6	<0.5	<1	SNA
11/30/2005	26.15	NP	Primary	0.37	0.19	<0.1	45	<0.7	2	1	<0.5	2	SNA
3/21/2006	27.68	NP	Primary	1.3	0.934	0.185	263 j	3.63	3.88	7.62	<1	<5	SNA
5/9/2006	27.24	NP	Primary	8.04 j	1.06	0.104	2840	47.7	261	53.6	3.66	5.48	SNA
5/9/2006	27.24	NP	Duplicate	8.33 j	2.82	0.388	2990 j	44	272	49.1	3.51	5.46	SNA
7/31/2006	26.14	NP	Primary	4.38	0.495	<0.0943	1090	31.6	89.0	74.9	2.33	10.9	<100
12/7/2006	26.35	NP	Primary	2.19	0.588	<0.0962	331	5.37	15.1	24.2	<1	5.71	SNA
2/27/2007	27.39	NP	Primary	0.585	0.307	0.0906 J	25.9	0.530 J	1.53	4.92	<0.310	5.98 j	SNA
2/27/2007	27.39	NP	Duplicate	0.606	0.295	0.125 j	28.0	0.570 J	1.56	4.88	<0.310	<0.650uj	SNA
5/22/2007	26.90	NP	Primary	6.00	0.919 j	0.0985 j	87.6	15.2	37.8	26.0	2.51	0.730 J	SNA
5/22/2007	26.90	NP	Duplicate	6.01	0.817 j	0.0694 J	85.8	14.6	36.1	24.5	2.35	0.700 J	SNA
8/28/2007	25.53	NP	Primary	0.682	0.101	<0.0356	169	1.88	3.10	3.56	0.320 J	0.880 J	SNA
12/3/2007	25.88	NP	Primary	0.824	0.193	0.0263 J	70.5	1.01	2.16	4.36	<0.420	1.96 J	SNA
12/3/2007	25.88	NP	Duplicate	0.750	0.175	0.0230 J	60.1	0.850 J	2.00	4.49	<0.420	3.07 J	SNA
2/21/2008	27.59	NP	Primary	0.571	0.266	<0.0192	20.0	<0.280	<0.240	1.65 J	<0.420	<0.540	SNA
5/7/2008	27.26	NP	Primary	6.41	1.81	0.373	2400	22.0	108	24.9	3.84	<0.540	SNA
8/7/2008	26.19	NP	Primary	4.25	0.923	0.107	1210	19.9	98.1 j	48.9	2.38	6.57	SNA
11/19/2008	26.02	NP	Primary	0.923 j	0.266	0.0586 Ju	127 j	1.18	4.61	3.97	<0.420	1.12	SNA
2/24/2009	26.34	NP	Primary	1.79	0.470	0.136 u	256	1.73	1.24	4.25	0.440 J	0.448 r	<74.4

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
MW39	Screen Elevation (feet, msl): 30.21 to 20.21												
7/7/2005	25.58	NP	Primary	33	2.9	0.18	21000	1100	2100	6600	530	280	SNA
8/22/2005	25.58	NP	Primary	37	2.6	<0.49	24000	620	2400	8400	740	390	SNA
8/22/2005	25.58	NP	Duplicate	36	2.8	<0.49	25000	610	2400	8400	700	390	SNA
11/30/2005	26.05	NP	Primary	36	3.2	<0.97	25000	2300	2700	6400	1100	510	SNA
3/21/2006	27.52	NP	Primary	82.5	9.48 j	<0.503uj	25500	1800	2590	7950	873 j	292 j	SNA
5/9/2006	27.08	NP	Primary	93 j	9.19	0.132	31000	1020	3400	10300	763	<500	SNA
7/31/2006	26.03	NP	Primary	113	12.3	<0.943	33900	2530 j	3470 j	11000 j	665	560	<100
12/7/2006	26.29	NP	Primary	70.6	9.09	<0.952	24700	994	3920	8080	357	420	265
2/27/2007	27.29	NP	Primary	77.8	5.68	<0.175	35800	809	5220	12100	318	495	<62.0
5/22/2007	26.75	NP	Primary	66.9	4.40 j	<0.178	22400	66.2	63.8	134	62.3 j	70.5	<62.0
8/28/2007	25.40	NP	Primary	64.2	5.24	<0.356	33700	656	3470	7270	1000	534	<62.0
12/3/2007	25.81	NP	Primary	73.2	6.69	<0.0962	30800	444	4020	4960	719	496	<74.4
2/21/2008	27.50	NP	Primary	63.5	4.57	<0.0962	22300	1020	3660	4540	500	440	<74.4
5/7/2008	27.11	NP	Primary	59.3	3.85	0.264 J	15500 j	514	2500 j	4270 j	257	328	<74.4uj
5/7/2008	27.11	NP	Duplicate	65.7	5.03	0.163 J	21200 j	654	3480 j	6410 j	313	394	SNA
8/7/2008	26.04	NP	Primary	71.2	2.79	<0.100	24800	1020	3710 j	6630	238	220	SNA
11/19/2008	26.00	NP	Primary	92.2	12.2	0.545 J	26600	3120	4810	9770	277	235 j	SNA
2/25/2009	26.23	NP	Primary	208	9.89	0.428 Ju	25300	1240	4000	7300	309	183 r	369000

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
MW40 Screen Elevation (feet, msl): 25.12 to 15.12													
7/7/2005	19.11	NP	Primary	<0.05	<0.08	<0.1	1	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/22/2005	19.11	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
11/30/2005	20.29	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	0.6	<1	SNA
3/21/2006	22.52	NP	Primary	0.405	0.102	<0.098	148 j	<1	<1	9.8	<1	5.7	SNA
5/10/2006	21.49	NP	Primary	0.246 j	0.105 j	<0.1	68.9	2.7	<1	<3	<1	<5	SNA
8/2/2006	19.54	NP	Primary	<0.1	<0.0952	<0.0952	<1	<1	<1	<3	<1	<5	<100
12/5/2006	22.11	NP	Primary	<0.1	<0.0943	<0.0943	<1	<1	<1	<3	<1	<5	SNA
2/27/2007	22.89	NP	Primary	0.138 u	0.0986	0.0437 J	19.8	<0.420	<0.420	<0.450	<0.310	8.01 j	SNA
5/22/2007	20.93	NP	Primary	<0.0430	0.0568 J	0.0544 J	<0.330	<0.420uj	<0.420	<0.450	<0.310	<0.650	SNA
5/22/2007	20.93	NP	Duplicate	<0.0430	<0.0359	0.0387 J	<0.330	0.920 J	<0.420	<0.450	<0.310	<0.650	SNA
8/28/2007	18.49	NP	Primary	0.0830 Ju	<0.0359	0.0450 J	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/28/2007	18.49	NP	Duplicate	0.0686 Ju	<0.0359	0.0414 J	0.330 J	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	20.38	NP	Primary	0.0432 J	0.0919 Ju	0.0248 J	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
2/19/2008	23.09	NP	Primary	0.0642 Ju	0.0412 Ju	<0.0191	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
2/19/2008	23.09	NP	Duplicate	0.0493 Ju	0.0477 Ju	<0.0191	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/7/2008	21.33	NP	Primary	0.276	0.128	0.0252 J	98.1	<0.280	<0.240	<0.860	0.650 J	<0.540	SNA
8/6/2008	19.63	NP	Primary	0.0960 Ju	<0.0192	0.0369 J	0.270 J	<0.280	<0.240	<0.860	<0.420	<0.0382	SNA
11/19/2008	19.68	NP	Primary	<0.0430uj	0.0353 J	0.0420 Ju	<0.270	<0.280	<0.240	<0.860	<0.420	0.0476 Ju	SNA
2/25/2009	20.45	NP	Primary	0.121	0.0514 Ju	0.0745 Ju	3.85	<0.280	<0.240	<0.860	0.590 J	0.0481 J	
2/25/2009	20.45	NP	Duplicate	0.131	0.0442 Ju	0.0816 Ju	3.74	<0.280	<0.240	<0.860	0.600 J	0.0495 J	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
W-15 Screen Elevation (feet, msl):				to									
2/28/2005	16.86	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/25/2005	17.45	NP	Primary	0.65	7.4	2.4	2	2	<0.8	1	<0.5	2	SNA
8/25/2005	16.47	NP	Primary	0.98	8.2	<0.97	5	3	3	7	1	3	SNA
11/29/2005	17.20	0.01	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/20/2006	17.90	0.02	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/11/2006	17.61	NP	Primary	0.532 j	6.49 j	0.414 j	2.86 j	1.99 j	1.47 j	<3r	<1r	<5uj	SNA
8/3/2006	16.67	NP	Primary	0.815 j	7.93	0.658	4.66	3.06	4.43	7.79	1.62	<5	<100
12/6/2006	17.21	NP	Primary	1.86	7.27	0.221 j	2.42	3.51	2.46	12.6	6.84	<5	SNA
2/27/2007	17.83	0.01	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/22/2007	17.52	NP	Primary	0.926	6.45 j	1.53	1.75	1.93 j	1.97	0.470 J	1.65	0.670 J	SNA
8/30/2007	16.51	NP	Primary	1.63	5.20	<0.190	1.84	1.59	2.88	5.39	1.64	0.990 J	SNA
12/4/2007	17.08	NP	Primary	1.84	7.94	1.52	1.09	1.08	3.81	5.30	<0.420	1.22 J	SNA
2/19/2008	19.06	NP	Primary	1.19	8.45	5.09	1.51	0.600 J	<0.240	4.19	<0.420	<0.540	SNA
5/6/2008	18.07	NP	Primary	1.71	6.39	0.423 J	0.920 J	0.530 J	0.350 J	3.29	0.850 J	7.58 j	SNA
5/6/2008	18.07	NP	Duplicate	1.63	5.81	0.226 J	0.890 J	0.550 J	0.310 J	3.39	0.870 J	<0.540uj	SNA
8/5/2008	17.24	NP	Primary	1.44 j	7.72	0.146 J	0.920 J	0.520 J	0.840 J	2.19 J	0.540 J	<0.0379	SNA
11/19/2008	16.94	NP	Primary	1.73 j	6.64	0.312 J	1.57	0.850 J	1.57	3.41	<0.420	<0.0371	SNA
2/23/2009	17.92	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
W-16	Screen Elevation (feet, msl): to												
3/14/2005	19.36	NP	Primary	0.26	19	4.2	5	<0.7	<0.8	1	<0.5	<1	SNA
5/25/2005	20.41	NP	Primary	1.1	17	2.7	47	2	2	4	1	<1	SNA
8/25/2005	19.09	NP	Primary	0.52	11 j	<0.99	11	<0.7	<0.8	0.9	<0.5	<1	SNA
12/5/2005	18.99	NP	Primary	0.77	4.8	1.3	<0.5	<0.7	<0.8	<0.8	0.7	<1	SNA
3/21/2006	21.55	NP	Primary	0.6	7.62 j	1.12 j	11.6 j	<1	<1	<3	3.01	<5	SNA
5/10/2006	21.00	NP	Primary	0.588 j	11.7	1.46	2.97	<1	<1	<3	<1	<5	SNA
8/3/2006	19.57	NP	Primary	0.376 j	7.81	<0.476	3.41	<1uj	1.93 j	4.35	<1	<5	<100
12/7/2006	21.15	NP	Primary	2.62	4.76	<0.19	52.0	6.38	6.10	16.10	5.38	<5	SNA
2/28/2007	21.38	NP	Primary	0.641	7.61	<0.349	6.77	1.07	<0.420	3.09	0.870 J	<0.650	SNA
5/22/2007	20.67	NP	Primary	0.494	8.98 j	0.732 J	2.21	1.55 j	<0.420	0.540 J	<0.310	<0.650	SNA
8/29/2007	18.84	NP	Primary	0.704	6.08	1.73	0.890 J	0.500 J	<0.420	0.660 J	<0.310	<0.650	SNA
12/5/2007	19.41	NP	Primary	1.32	6.76	0.116 J	5.75	2.50	1.59	5.61	2.29	<0.540	SNA
12/5/2007	19.41	NP	Duplicate	1.32	5.33	0.763 j	5.59	2.57	1.54	5.89	2.27	<0.540	SNA
2/20/2008	22.43	NP	Primary	0.597	4.82	<0.0388	3.78	1.13	<0.240	3.14	2.06	<0.540	SNA
5/6/2008	21.13	NP	Primary	0.438	4.58	0.240 J	0.450 J	0.330 J	<0.240	1.12 J	0.730 J	<0.540	SNA
8/5/2008	19.76	NP	Primary	0.673 j	6.30	0.417 J	0.280 J	0.980 J	0.320 J	2.54 J	0.610 J	0.250	SNA
11/19/2008	18.83	NP	Primary	0.577 j	3.44	0.289 j	<0.270uj	0.710 J	0.300 J	1.22 J	<0.420	0.208	SNA
2/25/2009	20.23	NP	Primary	0.463	4.50	1.11	0.350 J	0.380 J	<0.240	1.14 J	1.15	0.294	

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

[illegible]

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
W-18	Screen Elevation (feet, msl): to												
2/28/2005	19.35	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	12.88	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	18.99	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/29/2005	19.69	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/20/2006	22.02	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	21.20	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	19.43	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	21.39	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/27/2007	21.71	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	20.72	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	18.38	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/3/2007	19.01	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	22.67	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	21.03	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/4/2008	19.51	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/17/2008	18.62	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	20.11	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
W-19	Screen Elevation (feet, msl): to												
3/14/2005	17.16	NP	Primary	0.076	NA	NA	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
5/25/2005	18.53	NP	Primary	0.11	2	0.37	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/25/2005	16.86	NP	Primary	0.22	2.1	0.11	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
12/2/2005	17.43	NP	Primary	0.26	2.7	0.2	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/23/2006	19.49	NP	Primary	<0.1	1.55	0.275	<1	<1	<1	<3	<1	<5	SNA
5/10/2006	18.97	NP	Primary	<0.1	2.25	0.241	<1	<1	<1	<3	<1	<5	SNA
8/2/2006	17.25	NP	Primary	<0.1	2.47	2.14	<1	<1	<1	<3	<1	<5	<100
12/7/2006	18.95	NP	Primary	0.15	0.892	0.598	<1	<1	<1	<3	<1	<5	SNA
2/28/2007	19.10	NP	Primary	0.188	NA	NA	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
5/24/2007	18.41	NP	Primary	0.0681 J	3.96	1.15	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/29/2007	16.20	NP	Primary	0.595	2.46	0.0988	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/5/2007	16.43	NP	Primary	0.231 J	3.09	0.156	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
2/19/2008	20.07	NP	Primary	0.164 u	2.26	<0.0192	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/6/2008	18.61	NP	Primary	0.400	2.93	0.0771 Ju	<0.270	0.510 J	<0.240	<0.860	<0.420	0.590 J	SNA
8/5/2008	17.33	NP	Primary	0.567 j	2.71	0.0554 J	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0375	SNA
11/19/2008	16.44	NP	Primary	0.202 j	2.11	0.112 u	<0.270uj	<0.280	<0.240	<0.860	<0.420	0.388 J	SNA
2/25/2009	18.00	NP	Primary	0.122 u	2.83	0.311 u	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0490	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
W-20	Screen Elevation (feet, msl): to												
3/14/2005	13.12	NP	Primary	<0.05	0.41	0.24	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
5/25/2005	14.71	NP	Primary	<0.05	0.33	0.18	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/25/2005	12.96	NP	Primary	<0.05	0.23	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
12/2/2005	13.01	NP	Primary	<0.05	0.62	0.17	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/23/2006	14.16	NP	Primary	<0.1	0.203	0.135	<1	<1	<1	<3	<1	<5	SNA
5/10/2006	14.63	NP	Primary	<0.1	0.188 j	0.151	<1	<1	<1	<3	<1	<5	SNA
8/2/2006	13.29	NP	Primary	<0.1	0.531	0.463	<1	<1	<1	<3	<1	<5	<100
12/7/2006	14.45	NP	Primary	<0.1	1.26	0.17	<1	<1	<1	<3	<1	<5	SNA
2/28/2007	14.31	NP	Primary	<0.0430	0.290	0.0787 J	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
5/24/2007	14.25	NP	Primary	<0.0430	0.316	0.349	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/30/2007	12.43	NP	Primary	<0.0430	0.855	0.257	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/5/2007	12.97	NP	Primary	<0.0430	0.861	0.185	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
2/19/2008	14.72	NP	Primary	0.0678 Ju	0.220	0.314	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/6/2008	14.10	NP	Primary	0.0578 J	0.248	0.148	<0.270	0.400 J	<0.240	<0.860	<0.420	<0.540uj	SNA
8/5/2008	13.44	NP	Primary	0.0777 Ju	0.374	0.130	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0375	SNA
11/19/2008	12.89	NP	Primary	<0.0430uj	0.0808 J	0.0602 Ju	<0.270uj	<0.280	<0.240	<0.860	<0.420	<0.0382	SNA
2/25/2009	13.20	NP	Primary	0.250	0.486	0.284 u	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0490	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
W-21	Screen Elevation (feet, msl): to												
2/28/2005	13.67	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/23/2005	15.62	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/22/2005	12.43	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/29/2005	17.77	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/20/2006	NM	NM	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/9/2006	15.63	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/31/2006	13.12	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/4/2006	17.54	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/27/2007	15.47	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	14.41	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/27/2007	11.74	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/3/2007	17.09	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	17.02	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	14.44	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/4/2008	16.39	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/17/2008	14.79	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	14.36	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	
W-22	Screen Elevation (feet, msl): to												
3/1/2005	12.02	NP	Primary	<0.05	<0.082	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
5/25/2005	13.83	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
8/25/2005	11.33	NP	Primary	<0.05	<0.08	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
12/2/2005	12.69	NP	Primary	<0.05	0.086	<0.1	<0.5	<0.7	<0.8	<0.8	<0.5	<1	SNA
3/23/2006	13.92	NP	Primary	<0.1	0.122	0.112	<1	<1	<1	<3	<1	<5	SNA
5/10/2006	13.92	NP	Primary	<0.1	0.176 j	0.138	<1	<1	<1	<3	<1	<5	SNA
8/2/2006	11.57	NP	Primary	<0.1	<0.0952	<0.0952	<1	<1	<1	<3	<1	<5	<100
12/7/2006	15.99	NP	Primary	<0.1	<0.098	<0.098	<1	<1	<1	<3	<1	<5	SNA
2/28/2007	13.52	NP	Primary	<0.0430	<0.0349	<0.0349	<0.330	<0.420	<0.420	0.800 J	<0.310	<0.650	SNA
5/24/2007	12.81	NP	Primary	<0.0430	<0.0363	0.0793 Ju	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/30/2007	11.01	NP	Primary	<0.0430	<0.0196	<0.0196	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/30/2007	11.01	NP	Duplicate	<0.0430	<0.0192	0.0250 Ju	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/5/2007	11.59	NP	Primary	0.0514 r	0.0776 r	0.0304 r	<0.270r	<0.280r	<0.240r	<0.860r	<0.420r	<0.540r	SNA
2/19/2008	15.22	NP	Primary	0.0612 Ju	0.0851 Ju	<0.0196	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/6/2008	12.92	NP	Primary	0.0966 J	0.0563 J	0.0515 Ju	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540uj	SNA
8/5/2008	11.89	NP	Primary	0.0801 Ju	<0.0192	<0.0192	<0.270	<0.280	<0.240	<0.860	<0.420	0.0476 J	SNA
11/19/2008	12.57	NP	Primary	<0.0430uj	0.0979 J	0.0464 Ju	<0.270uj	<0.280	<0.240	<0.860	<0.420	<0.0375	SNA
2/25/2009	13.23	NP	Primary	0.0762 Ju	0.0470 Ju	0.0831 Ju	<0.270	<0.280	<0.240	<0.860	<0.420	0.137 r	

TABLE 2

GROUND WATER ANALYTICAL DATA
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL

NuStar Portland Terminal, Portland, Oregon

Sample Date ^a	Ground Water Elevation ^a (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Ground Water Cleanup Goal				1.0	1.0	1.0	40					347	

Notes

^a Depth to water measured on dates indicated in Table 1, which may differ from sampling dates.

Benzene, toluene, ethylbenzene, xylenes, MTBE, and naphthalene analyzed by EPA Method 8260B.

Bolded values exceed cleanup goals.

Ground water elevation is corrected for the observed LPH thickness. LPH density of 0.81 used beginning 12/04

“<” = prior to 2007, concentration as reported by analytical laboratory is less than the method reporting limit; beginning in 2007, concentration as reported by analytical laboratory is less than the method detection limit.

µg/L = microgram(s) per liter

mg/L = milligrams(s) per liter

EPA = United States Environmental Protection Agency

LPH = liquid phase hydrocarbons

MTBE = methyl tertiary butyl ether

NA = not analyzed, sample bottle broken during shipment

NM = depth to water not measured

NP = no product encountered

NS = not sampled

SNA = Sampled, but ethanol not analyzed

TPH = total petroleum hydrocarbons by northwest methods, with samples for diesel and motor oil range analyses prepared by silica gel cleanup

Quality Assurance/Quality Control Data Qualifiers

U or u – reported analyte was not detected

J or j – reported result is an estimated value

UJ or uj – reported analyte was not detected and reporting limit is an estimated value

R or r – reported result is rejected and unusable

Flags shown with capital letters are qualifiers by the analytical laboratory, and flags with lower -case letters are from the data validation process.

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW01	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/29/2005	<0.0093	<0.003	<0.0084	0.0491	<0.0093	<0.003	<0.0084	0.0743
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	0.0104	0.00344 j	<0.001	<0.005	<0.001	0.00393	<0.001	0.00641
	12/4/2006 (Dup)	0.0117	0.00230 j	<0.001	<0.005	<0.001	0.00448	<0.001	0.00721
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/30/2007	0.0200 j	0.00173 J	0.000105 J	0.00576	0.0106	0.00103 J	<0.0000553	0.00220 Ju
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	0.00118	0.000504 J	<0.000220	0.00165 Ju	0.00138	0.000808 J	<0.000220	0.00627
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
KMW02	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/29/2005	<0.0093	<0.003	<0.0084	0.0592	<0.0093	<0.003	<0.0084	0.0652
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	0.00666	0.00518 j	<0.001	0.00755	0.00102	0.00266	<0.001	0.00550
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/30/2007	0.000909 J	0.00118 J	0.0000830 J	0.00532	<0.000664	0.000480 Ju	0.000140 Ju	0.00561
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	0.000640 J	<0.000270	<0.000220	0.00441 Ju	0.000554 J	<0.000270	<0.000220	0.00402 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW03	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	12/1/2005	<0.0093	<0.003	<0.0084	0.0641	<0.0093	<0.003	<0.0084	0.071
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	0.00312	0.00220 j	<0.001	<0.005	0.00285	<0.002	<0.001	<0.005
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/28/2007	0.00335	0.00142 J	0.000140 J	0.00163 J	0.00289	0.000510 J	0.0000600 J	0.00423 J
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/6/2008	0.00254	0.00186 J	<0.000220	0.00303 Ju	<0.0180	<0.0270	<0.0220	0.181 J
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
KMW05	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/30/2005	<0.0093	<0.003	<0.0084	0.049	<0.0093	<0.003	<0.0084	0.0557
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	0.00167	<0.002	<0.001	0.00810 j	0.00166	0.00214	<0.001	<0.005uj
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/28/2007	0.00158	0.000580 Ju	0.000200 J	0.00176 Ju	0.00161	0.00214 j	0.000160 J	0.00503
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	0.00143	<0.000270	0.000367 J	0.00305 Ju	0.00158	<0.000270	<0.000220	0.00288 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW06	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/30/2005	<0.0093	<0.003	<0.0084	0.0603	<0.0093	<0.003	<0.0084	0.0609
	12/1/2005 (Dup)	<0.0093	0.0025 J	<0.0084	0.0435	<0.0093	<0.003	<0.0084	0.0369
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	0.00150	0.00214	<0.001	0.00558 j	<0.001	<0.002	<0.001	<0.005uj
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/28/2007	0.00157	0.00136 J	0.000420 J	0.00212 Ju	0.00157	0.00377 j	0.000300 J	0.00557
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	0.00195	0.000401 J	0.000596 J	0.00476 J	0.00183	0.000483 J	0.000484 J	0.00271 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW07	3/2/2005	0.0011 J	0.0032	<0.0012	0.0087	0.0015 J	<0.003	<0.0012	0.0191
	5/25/2005	<0.005	<0.003	0.0045	<0.0053	<0.005	0.0018 J	0.0037	<0.0053
	8/23/2005	<0.005	0.0047	<0.0012	0.0098	<0.005	<0.003	<0.0012	0.0076
	12/1/2005	<0.0093	<0.003	<0.0084	0.0501	<0.0093	<0.003	<0.0084	0.0987
	3/21/2006	<0.001	0.00568	<0.001	0.0112	<0.001	0.00887	<0.001	0.0159
	3/21/2006 (Dup)	0.00133	0.00618	<0.001	0.0101	<0.001	0.00711	<0.001	0.0124
	5/11/2006	<0.001	0.00336	<0.001	<0.005	<0.001	0.00314	<0.001	0.00519
	8/1/2006	0.00149	0.00621	0.00142	0.00955	0.00146	0.00240	0.00118	0.00944
	8/1/2006 (Dup)	0.00142	0.00653	0.00145	0.00818	0.00144	0.00226	0.00106	0.00849
	12/5/2006	0.00249	0.00402	0.00321	0.00568 j	0.00223	<0.002	0.00296	<0.005uj
	2/28/2007	0.00197	0.00144 J	0.00459	0.00580	0.00127	0.000644 J	0.00285	0.00513
	5/22/2007	<0.00332	0.00146 J	0.000547 J	0.00227 Ju	<0.000664	0.00155 J	0.000469 J	0.00345 J
	8/28/2007	0.00136	0.00161 J	0.000710 J	0.00207 Ju	0.00169	0.000780 J	0.000340 J	0.00112 J
	12/4/2007	0.0297	0.000960 J	0.0118	0.00164 J	0.0300	0.000460 J	0.00877	0.00237 Ju
	2/19/2008	<0.000664	0.000889 J	0.000178 J	0.00605	<0.000664	0.000805 J	0.000224 Ju	0.00669
	5/6/2008	0.000633 J	0.000796 J	0.000971 J	0.00302 J	<0.000664	0.00135 J	0.000863 J	0.00362 J
	8/5/2008	<0.0180	<0.0270	<0.0220	<0.0700	0.00124	<0.000270	0.000504 J	0.00442 Ju
	11/19/2008	0.0301 j	0.000754 J	0.00827 j	0.00331 Ju	0.0248 j	<0.000270	0.00664 j	0.00200 Ju
	11/19/2008 (Dup)	0.00575 j	0.000670 J	0.000621 J	0.00576 j	0.00565 j	<0.000270	<0.000220uj	0.00243 Ju
	2/25/2009	0.0620	0.000980 J	0.000660 J	0.0126	0.104	<0.000270	0.000400 J	0.0118

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW09	3/2/2005	<0.005	<0.003	<0.0012	0.152	0.002 J	<0.003	<0.0012	<0.005
	5/25/2005	<0.005	0.0026 J	<0.0012	0.0122	<0.005	0.0023 J	<0.0012	0.0067
	8/23/2005	0.0096	0.0056	0.004	0.849	0.0176	<0.003	<0.0012	0.0293
	11/30/2005	<0.0093	0.0029 J	<0.0084	0.123	<0.0093	<0.003	<0.0084	0.114
	3/21/2006	<0.001	0.00726	<0.001	0.025	<0.001	0.00397	<0.001	0.0149
	5/11/2006	<0.001	0.00588	<0.001	<0.005	<0.001	0.00228	<0.001	<0.005
	8/2/2006	0.0167	<0.002	<0.005	0.00707	0.0127	<0.002	<0.001	0.0200
	12/5/2006	<0.001	0.0161	<0.001	0.0563 j	<0.001	0.0138	<0.001	0.0167 j
	2/28/2007	0.00122	0.00771	0.00141	0.0383	<0.000664	0.000578 J	<0.0000553	0.00488 J
	5/23/2007	<0.000664	0.00399	0.000570 J	0.0826	<0.00664	<0.00133	<0.0000553	0.0820
	8/28/2007	0.0174	0.00239	0.00156	0.322	0.0177	0.00209 j	0.000100 J	0.0449
	12/5/2007	<0.000664	0.00342	<0.0000553	0.0135	<0.000664	0.000400 J	<0.0000553	0.0113
	2/20/2008	<0.000664uj	0.00191 Ju	<0.0000553uj	0.00266 Ju	<0.000664uj	0.000918 Ju	0.0000590 Ju	0.00462 Ju
	5/6/2008	0.000270 J	0.0117	<0.000220	0.0249	<0.000664	0.00139 J	0.0000980 Ju	0.0184
	8/5/2008	<0.0180	<0.0270	<0.0220	<0.0700	0.0135	<0.000270	<0.000220	0.0117
	11/18/2008	0.00128	0.00223	<0.000220	0.00506	0.00133	0.00118 J	<0.000220	0.00635 u
	2/24/2009	0.00862	0.00248	0.00157	0.424	0.0109 j	<0.000270	<0.000220	0.00204 J

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW10	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/30/2005	<0.0093	<0.003	<0.0084	0.0195	<0.0093	<0.003	<0.0084	0.0285
	11/30/2005 (Dup)	<0.0093	<0.003	<0.0084	0.0192	<0.0093	<0.003	<0.0084	0.0284
	3/23/2006	0.00139	0.00264	<0.001	0.00599	0.00137	<0.002	<0.001	0.0051
	5/11/2006	0.0011	<0.002	<0.001	<0.005	0.00117	<0.002	<0.001	<0.005
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/5/2006	0.00149	0.00217	<0.001	0.0185 j	0.00132	<0.002	<0.001	<0.005uj
	12/5/2006 (Dup)	0.00146	<0.002	<0.001	0.00583 j	0.00130	<0.002	<0.001	0.00528 j
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/28/2007	0.0118	0.000386 J	<0.0000553	0.00303 J	0.00142	0.00355	0.0000800 J	0.00506
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/5/2008	<0.0180	<0.0270	<0.0220	<0.0700	0.00133	<0.000270	<0.000220	0.00315 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW11	3/3/2005	0.0125	<0.003	<0.0012	0.0396	0.012	<0.003	<0.0012	0.015
	5/25/2005	<0.005	<0.003	0.002	0.0146	<0.005	<0.003	0.0012	0.0137
	8/23/2005	0.0032 J	<0.003	<0.0012	0.0093	0.0036 J	<0.003	<0.0012	0.0057
	12/2/2005	<0.0093	0.008	<0.0084	0.086	<0.0093	0.0028 J	<0.0084	0.0727
	3/23/2006	0.00291	0.00586	0.00356	0.0065	0.00245	<0.002	<0.001	0.00897
	3/23/2006 (Dup)	0.00275	0.006	0.00343	0.00761	0.00242	<0.002	<0.001	0.00669
	5/11/2006	0.00362	0.00452	0.00109	<0.005	0.00311	<0.002	<0.001	0.00514
	8/1/2006	0.00279	0.00271	0.00148	0.00864	0.00274	<0.002	<0.001	0.00777
	12/6/2006	<0.001	0.0177	0.00155	0.0213	<0.001	0.0141	<0.001	0.0189
	12/6/2006 (Dup)	<0.001	0.0180	0.00148	0.0213	<0.001	0.0168	<0.001	0.0203
	3/1/2007	0.00154	0.00361	0.00126	0.0128 j	0.00239	0.000773 J	0.000112 J	0.00575
	3/1/2007 (Dup)	0.00177	0.00318	0.00105	0.00578 u	0.00252	0.00172 J	0.000110 J	0.00680
	5/23/2007	0.00695 j	0.00124 J	0.000282 J	0.00306 Ju	0.00720 J	<0.00133	<0.000553	<0.00469
	8/28/2007	0.00447	0.00194 J	0.000870 J	0.00427 J	0.00418	0.000840 J	0.000350 J	0.00475 J
	12/4/2007	0.00507	0.00557	0.000920 J	0.0353	0.00557	<0.000133	0.000520 J	0.0403
	2/20/2008	0.00424 Ju	<0.000667uj	0.00126 Ju	0.00753 Ju	0.00476 j	<0.000133uj	0.000289 Ju	0.00760 j
	5/6/2008	0.0222	0.0162	0.00399	0.0262	0.0276	0.00147 J	0.00145	0.0318
	8/5/2008	<0.0180	<0.0270	<0.0220	<0.0700	0.00499	<0.000270	0.00167	0.00828 u
	8/5/2008 (Dup)	<0.0180	<0.0270	<0.0220	<0.0700	0.00504	<0.000270	0.00168	0.00928 u
	11/18/2008	0.0124	0.0347	0.00509	0.0238 J	0.0114	0.0101 J	<0.00220	0.0205 J
	2/24/2009	0.0477	0.0692	0.00180	0.0223	0.0493 j	0.00167 J	<0.000220	0.0177

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW13	3/2/2005	0.0097	0.0038	0.0045	0.0908	0.0092	<0.003	<0.0012	0.0516
	5/25/2005	0.0096	<0.003	0.0014	<0.0053	0.009	<0.003	<0.0012	0.33
	8/25/2005	0.0206	<0.003	0.0012	0.0501	0.0148	<0.003	<0.0012	0.0462
	11/30/2005	0.0102	<0.003	<0.0084	0.0523	0.0136	<0.003	<0.0084	0.0608
	3/21/2006	0.00971	0.00365	0.00477	0.0291	0.00914	<0.002	<0.001	<0.005
	5/9/2006	0.00888	0.00214	0.00122	0.0136	0.00909	<0.002	<0.001	<0.005
	5/9/2006 (Dup)	0.00917	0.00209	0.00112	0.0145	0.00884	<0.002	<0.001	<0.005
	7/31/2006	0.00984	<0.002	<0.005	0.0266	0.0102	<0.002	<0.001	0.0193
	12/6/2006	0.0116	<0.002	0.00225	0.0108	0.0102	<0.002	<0.001	<0.005
	2/28/2007	0.00868	0.00240	0.00467	0.0105	0.00959	0.000432 J	0.000386 J	0.00637
	5/22/2007	0.00883	0.00143 J	0.00110	0.00510	0.0100	0.00141 J	0.000303 J	0.00631 j
	8/27/2007	0.00987	0.00100 J	0.00277	0.00396 J	0.0113	0.000360 J	0.000490 J	0.00606
	12/3/2007	0.0140	0.00120 J	0.0151	0.00687	0.0153	<0.000133	0.000620 J	0.00563
	2/20/2008	0.00431	0.000482 J	0.00248	0.00601	0.00393	<0.000133	0.000181 J	0.00258 J
	5/7/2008	0.00759	0.000511 J	0.00160	0.00617	0.00852	0.000863 J	0.000205 J	0.00339 J
	8/7/2008	0.0243	0.000920 J	0.00423	0.0556	0.0294	0.000407 J	0.00101	0.0435
	11/19/2008	0.0101 j	0.000309 J	0.00158 j	0.00807 j	0.00893 j	<0.000270	0.000246 J	0.00180 Ju
	2/24/2009	0.0125	0.000400 J	0.000730 J	0.00375 Ju	0.0146 j	<0.000270	0.000350 J	0.00429 J
KMW14	3/2/2005	0.0227	<0.003	<0.0012	<0.005	0.0224	<0.003	<0.0012	<0.005
	5/25/2005	0.0036 J	<0.003	<0.0012	0.0411	0.003 J	<0.003	<0.0012	0.0544
	8/25/2005	0.0087	<0.003	0.0022	0.0615	0.0081	<0.003	<0.0012	0.0397
	11/30/2005	0.0136	<0.003	<0.0084	0.0799	0.0148	<0.003	<0.0084	0.0714
	3/21/2006	<0.001	0.00442	<0.001	0.0222	0.00115	<0.002	<0.001	<0.005
	5/9/2006	0.0023	0.00362	<0.001	0.0161	0.00213	<0.002	<0.001	<0.005
	7/31/2006	0.00364	0.00489	<0.005	0.0228	0.00393	<0.002	<0.001	0.0105
	12/6/2006	0.00510	0.00242	0.00222	0.0339	0.00658	<0.002	<0.001	0.0265
	2/27/2007	0.00236 j	0.00314 u	0.00241 u	0.0629 j	0.00245	0.000160 J	0.000160 Ju	0.0215 j
	5/22/2007	0.000975 J	0.00410 j	0.000890 J	0.0639	0.00110	0.00214 j	0.0000769 J	0.0253 j
	8/27/2007	0.00764	0.00119 J	0.0000800 J	0.00407 J	0.00738	0.000510 J	0.0000700 J	0.00431 J
	12/3/2007	0.00368	0.00986	0.00310	0.0564	0.00355	0.000170 J	0.0000900 J	0.0398
	2/20/2008	0.000974 J	0.00325	0.000968 J	0.0137	0.000927 J	0.000716 J	0.000243 J	0.00384 J
	5/7/2008	0.000678 J	0.000791 J	0.000538 J	0.0109	0.000799 J	0.000952 J	0.000104 J	0.00454 J
	8/7/2008	0.00348	0.000460 J	0.000279 J	0.00435 Ju	0.00496	<0.000270	<0.000220	0.00210 Ju
	11/19/2008	0.0293 j	0.000700 J	0.00802 j	0.00246 Ju	0.0242 j	0.000296 J	0.00657 j	0.00211 Ju
	2/24/2009	0.00808	0.000320 J	<0.000220	0.00255 Ju	0.00917 j	0.000311 J	<0.000220	0.00177 J

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW15	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	12/2/2005	<0.0093	<0.003	<0.0084	0.0721	<0.0093	<0.003	<0.0084	0.0908
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/7/2006	0.00131	0.00467	<0.001	0.0106	<0.001	<0.002	<0.001	<0.005
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	0.00104	0.00173 J	0.000270 J	0.00585	0.00114	0.00138 J	0.000130 J	0.00434 J
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/6/2008	0.000755 J	0.000537 J	0.000263 J	0.00430 Ju	<0.0180	<0.0270	<0.0220	<0.0700
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
KMW16	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	12/2/2005	<0.0093	<0.003	<0.0084	0.0744	<0.0093	<0.003	<0.0084	0.0753
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/6/2006	<0.001	0.00281	<0.001	0.0140	<0.001	<0.002	<0.001	<0.005
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	0.000760 J	0.00161 J	0.0000600 J	0.00391 J	0.000870 J	0.00378	0.000130 J	0.00699
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/6/2008	0.000565 J	0.00115 J	<0.000220	0.00306 Ju	<0.0180	<0.0270	<0.0220	<0.0700
	8/6/2008 (Dup)	0.000588 J	<0.000270	<0.000220	0.00340 Ju	<0.0180	<0.0270	<0.0220	<0.0700
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW17	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/29/2005	NS	NS	NS	NS	NS	NS	NS	NS
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	NS	NS	NS	NS	NS	NS	NS	NS
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	12/5/2007	0.00944	0.00524	0.00405	0.00297 J	0.00863	<0.000133	0.00107	0.00258 J
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/4/2008	NS	NS	NS	NS	NS	NS	NS	NS
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
KMW18	3/2/2005	0.0029 J	<0.003	<0.0012	0.0165	<0.005	<0.003	<0.0012	0.0298
	5/26/2005	0.0029 J	<0.003	0.0011 J	0.0152	<0.005	<0.003	<0.0012	0.0113
	8/26/2005	0.0044 J	<0.003	<0.0012	0.0951	0.003 J	<0.003	<0.0012	0.119
	11/29/2005	<0.0093	<0.003	<0.0084	0.0435	<0.0093	<0.003	<0.0084	0.0384
	3/23/2006	0.00621	0.00311	0.00116	0.00581	0.00511	<0.002	<0.001	0.00776
	5/9/2006	0.00469	0.016	0.00188	0.0201	0.00367	<0.002	<0.001	0.00567
	8/1/2006	0.00405	0.00907	<0.001	0.0120	0.00380	<0.002	<0.001	0.00881
	12/4/2006	0.00397	0.00454 j	0.00136	0.00713	0.00336	<0.002	<0.001	<0.005
	3/1/2007	0.00273	0.00344	0.00259	0.0860 j	0.00217	0.000418 J	0.00102	0.0343
	5/23/2007	0.0168 j	0.0531	0.00192	0.181	0.0146	0.00243	0.000898 J	0.128
	8/29/2007	0.0102	0.0158	0.00654	0.0359	0.00926	0.00152 J	0.00105	0.00445 J
	12/5/2007	0.00684	0.00611	0.000970 J	0.0490	0.00570	<0.000133	0.000330 J	0.0362
	2/19/2008	0.0119 j	0.00667 j	0.00172 j	0.0220 j	0.0110 j	0.000959 Ju	0.000690 Ju	0.0166 j
	5/6/2008	0.0159	0.00735	0.00414	0.0230	0.0187	0.000626 J	0.00179	0.0166
	8/6/2008	0.0218	0.0360	0.0197	0.795	<0.0180	<0.0270	<0.0220	<0.0700
	11/18/2008	0.0113 j	0.00555	0.00241 j	0.0490 j	0.00806 j	0.000401 J	0.000479 J	0.0135
	2/25/2009	0.0116	0.00988	0.00364	0.100	0.0115	<0.000270	0.000500 J	0.0301

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW19	3/2/2005	0.0027 J	0.0051	0.003	0.0387	0.0014 J	<0.003	0.0024	0.0372
	5/26/2005	<0.005	0.0046	0.0029	0.0276	<0.005	0.0019 J	0.00092 J	0.0183
	8/26/2005	0.0124	<0.003	0.0027	0.0419	0.0117	<0.003	0.0014	0.0558
	11/29/2005	<0.0093	0.0028 J	<0.0084	0.0455	<0.0093	<0.003	<0.0084	0.0476
	3/23/2006	0.00223	0.0123	0.00218	0.00744	0.00194	0.00396	<0.001	0.00804
	5/9/2006	0.0025	0.0179	0.00223	0.0286	<0.001	0.00296	<0.001	0.0226
	8/1/2006	0.00462	0.00511	0.00126	<0.005	0.00468	<0.002	<0.001	0.00770
	12/4/2006	0.00810	0.00329 j	<0.001	<0.005	0.00824	<0.002	<0.001	<0.005
	3/1/2007	0.00207	0.00249	0.00111	0.0142 j	0.00135	0.00136 J	0.000185 J	0.0119
	5/23/2007	0.00160 j	0.00552	0.000506 J	0.00495 J	0.00152	0.0112	0.000581 J	0.0116
	8/29/2007	0.00456	0.00118 J	0.00106	0.00322 J	0.00549	0.000670 J	0.000890 J	0.00328 J
	12/5/2007	0.00415	0.00240	0.000640 J	0.00586	0.00449	<0.000133	0.000510 J	0.00777
	2/19/2008	0.00170 j	0.000281 Ju	0.000328 Ju	0.00429 Ju	0.00154 j	<0.000133uj	0.000142 Ju	0.00500 j
	5/6/2008	0.00109	0.00119 J	0.000402 J	0.00310 J	0.00102	0.000574 J	0.000300 Ju	0.00388 J
	8/6/2008	0.00380	0.000794 J	0.000360 J	0.00296 Ju	<0.0180	<0.0270	<0.0220	<0.0700
	11/18/2008	0.00760	0.0119	0.00537	0.0258	0.00518	0.000303 J	0.000762 J	0.00285 Ju
	2/25/2009	0.00515	0.00393	0.000610 J	0.00306 Ju	0.00498 j	0.000651 J	<0.000220	0.00198 J
KMW20	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	12/5/2005	0.0113	0.0021 J	<0.0084	0.091	0.0102	<0.003	<0.0084	0.114
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	0.0141	<0.002	<0.001	<0.005	0.0118	<0.002	<0.001	0.00501
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/29/2007	0.0117	0.000455 J	<0.0000553	0.00376 J	0.0119	0.000140 J	<0.0000553	0.00243 J
	8/29/2007 (Dup)	0.0116	0.000380 J	<0.0000553	0.00288 J	0.0118	0.000340 J	0.0000700 J	0.00200 J
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/5/2008	<0.0180	<0.0270	<0.0220	<0.0700	0.0104	<0.000270	<0.000220	0.00152 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW21	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	12/5/2005	<0.0093	0.0059	<0.0084	0.0556	<0.0093	<0.003	<0.0084	0.0653
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	0.00230	<0.002	<0.001	<0.005	0.00234	<0.002	<0.001	<0.005
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/29/2007	0.00374	0.000972 J	0.000247 J	0.00490 J	0.00362	0.00152 J	0.0000600 J	0.00368 J
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/5/2008	<0.0180	0.101 J	<0.0220	<0.0700	0.00347	<0.000270	<0.000220	0.00477 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
KMW23	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	12/2/2005	<0.0093	<0.003	<0.0084	0.106	<0.0093	<0.003	<0.0084	0.174
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/6/2006	<0.001	0.00546	0.00106	0.0200	<0.001	0.00242	<0.001	<0.005
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	<0.000664	0.00141 J	0.000130 J	0.00604	<0.000664	0.000870 J	0.000310 J	0.00294 J
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/6/2008	0.000467 J	0.000518 J	<0.000220	0.00421 Ju	<0.0180	<0.0270	<0.0220	<0.0700
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW24	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/30/2005 (Dup)	<0.0093	<0.003	<0.0084	0.0615	<0.0093	<0.003	<0.0084	0.0744
	12/1/2005	<0.0093	0.0028 J	<0.0084	0.0415	<0.0093	<0.003	<0.0084	0.0394
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/5/2006	<0.001	0.00354	0.00313	0.0368 j	<0.001	0.00254	<0.001	0.0310 j
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	0.00743	0.000900 J	0.000310 J	0.0127	0.00856	0.00122 J	0.0000800 J	0.0108
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	0.00786	<0.000270	0.000980 J	0.00985	0.00852	<0.000270	<0.000220	0.00837
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
KMW25	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	12/1/2005	<0.0093	0.0043	<0.0084	0.0943	<0.0093	<0.003	<0.0084	0.107
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/5/2006	<0.001	<0.002	<0.001	<0.005uj	<0.001	<0.002	<0.001	0.00518 j
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	<0.000664	0.00135 J	0.000360 J	0.00383 J	<0.000664	0.00256	0.000120 J	0.00541
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	0.000345 J	<0.000270	0.000222 J	0.00260 Ju	0.000181 J	<0.000270	<0.000220	0.00264 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW26	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	12/1/2005	<0.0093	<0.003	<0.0084	0.0904	<0.0093	<0.003	<0.0084	0.0679
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/5/2006	0.00219	0.00497	<0.001	0.00671	0.00179	0.00253	<0.001	0.0140
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	0.00248	0.0106	0.00151	0.0256	NA	NA	NA	NA
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	NA	NA	NA	NA	NA	NA	NA	NA
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
KMW27	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/29/2005	NS	NS	NS	NS	NS	NS	NS	NS
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	NS	NS	NS	NS	NS	NS	NS	NS
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	NA	NA	NA	NA	NA	NA	NA	NA
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW29	3/1/2005	0.0219	0.0056	0.0014	0.0336	0.021	<0.003	<0.0012	0.0059
	5/24/2005	0.0109	<0.003	<0.0012	0.0412	0.0108	0.0021 J	0.0013	0.0229
	8/25/2005	0.0131	<0.003	<0.0012	0.0531	0.0111	<0.003	<0.0012	0.0544
	12/1/2005	0.0259	<0.003	<0.0084	0.0487	0.0294	<0.003	<0.0084	0.0507
	3/23/2006	0.00647	0.00258	<0.001	<0.005	0.00426	<0.002	<0.001	<0.005
	5/10/2006	0.0075	0.00242	<0.001	0.0073	0.00582	<0.002	<0.001	<0.005
	8/2/2006	0.0128	0.00211	<0.005	0.0103	0.00995	<0.002	<0.005	0.00872
	12/6/2006	0.00802	0.00282	<0.001	0.0310	0.00825	<0.002	<0.001	<0.005
	3/1/2007	0.0200	0.00193 J	0.00117	0.00658 u	0.00864	0.000154 J	0.000442 J	0.00496 J
	5/23/2007	0.00569 j	0.00221	0.000587 J	0.00294 Ju	0.00677	0.000529 J	0.000486 J	<0.00469
	8/30/2007	0.0164 j	0.00358	0.00125	0.00414 J	0.0177	0.000440 Ju	0.00100	0.00200 Ju
	12/4/2007	0.0227	0.00331	0.00161	0.00182 J	0.0244	0.000330 J	0.00104	0.00222 Ju
	2/20/2008	0.0188 j	0.0250 j	0.00269 j	0.00686 j	0.0211 j	0.00545 j	0.00167 j	0.00878 j
	2/20/2008 (Dup)	0.00820 j	<0.000667uj	0.000955 Ju	0.00453 Ju	0.00543 j	<0.000133uj	0.000832 Ju	0.00297 Ju
	5/7/2008	0.0160	0.0596	0.00429	0.00382 Ju	0.0163	0.00496	0.000839 J	0.00307 J
	8/6/2008	0.0196	0.00848	0.00166	0.00729	<0.0180	<0.0270	<0.0220	<0.0700
	11/17/2008	0.0324	0.00602	0.00211	0.00775	0.0372	0.000872 J	0.00124	0.00438 Ju
	2/24/2009	0.0444	0.00652	0.00689	0.0754	0.0367	<0.00270	0.00490	0.0761

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW30	3/14/2005	0.005	<0.003	<0.0012	0.0145	0.0037 J	<0.003	<0.0012	0.0107
	5/24/2005	<0.005	0.0137	0.00095 J	0.0597	<0.005	0.0036	0.002	0.0419
	8/26/2005	0.0066	<0.003	<0.0012	0.0989	0.0104	<0.003	<0.0012	0.0755
	12/1/2005	<0.0093	<0.003	<0.0084	0.0631	<0.0093	<0.003	<0.0084	0.0786
	3/23/2006	0.00426	0.00593	<0.001	0.0296	0.00201	<0.002	<0.001	0.024
	5/10/2006	<0.001	0.00843	<0.001	0.0116	<0.001	0.00386	<0.001	0.00932
	8/3/2006	0.0344	0.0190	0.00362	0.896	0.0116	<0.002	<0.001	0.181
	12/6/2006	0.00180	0.00653	<0.001	0.00686	0.00135	0.00347	<0.001	0.00520
	3/1/2007	0.00414	0.000930 J	0.000280 J	0.00983 u	0.00355	0.000237 J	0.0000908 J	0.00808
	5/23/2007	0.00372 j	0.0216	0.000365 J	0.00949	0.00445	0.00379	0.000151 J	0.00771 u
	8/30/2007	0.0263 j	0.00742	0.000973 J	0.0216	0.0277	0.00137 J	0.000500 J	0.00894
	12/4/2007	0.00576	0.00505	0.000190 J	0.0130	0.00407	0.00132 J	0.000150 J	0.0168
	2/19/2008	0.000840 J	0.00150 J	<0.0000553	0.0138	<0.000664	0.000923 J	0.0000810 Ju	0.0130
	5/7/2008	0.0258	0.00575	0.000807 J	0.0517	0.0318	0.00211 J	0.000613 J	0.0462
	8/6/2008	0.0462	0.0120	0.000876 J	0.0550	0.0310 J	<0.0270	<0.0220	<0.0700
	11/17/2008	0.0373	0.00995	0.00249	0.0369	0.0564	0.00210	0.00202	0.0319
	2/24/2009	0.0476 j	0.0712 j	0.00174	0.0462 j	0.0479 j	0.00141 J	<0.000220	0.00858
	2/24/2009 (Dup)	0.0142 j	0.00976 j	0.00246	0.0203 j	0.0148 j	0.000439 J	0.000716 J	0.0137

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW31	3/3/2005	0.0272	<0.003	0.0081	0.0132	0.0272	<0.003	0.0072	0.0187
	5/24/2005	0.0242	0.0061	0.0235	0.0299	0.025	<0.003	0.025	0.0387
	5/24/2005 (Dup)	0.0243	0.0066	0.0228	0.0273	0.0247	<0.003	0.0255	0.0564
	8/26/2005	0.0259	<0.003	0.0091	0.0733	0.0219	<0.003	0.0082	0.0676
	12/1/2005	0.0272	<0.003	<0.0084	0.0515	0.0268	<0.003	<0.0084	0.0354
	3/23/2006	0.0202	0.00805	0.00342	<0.005	0.0196	<0.002	0.00268	<0.005
	5/10/2006	0.0232	0.0108	0.00516	0.0104	0.0195	0.00302	0.0041	0.00571
	8/3/2006	0.0229	0.00448	0.00498	<0.005	0.0168	<0.002	0.00384	0.00578
	12/5/2006	0.0225	0.0127	0.00455	0.0119 j	0.0224	<0.002	0.00372	0.00556 j
	3/1/2007	0.0160	0.00116 J	0.00488	0.00658 u	0.0152	0.000197 J	0.00187	0.00451 J
	5/23/2007	0.0173 j	0.00617	0.00347	0.00788	0.0167	0.00169 J	0.000820 J	0.00796 Ju
	8/30/2007	0.0180 j	0.00125 J	0.00658	0.00502	0.0216	0.000230 Ju	0.00614	0.00316 J
	12/4/2007	0.0200	0.00185 J	0.0443	0.00617	0.0215	<0.000133	0.0515	0.0106
	2/21/2008	0.00971	0.00156 J	0.00218	0.00250 Ju	0.00999	<0.000133	0.00146	0.00262 J
	5/7/2008	0.0111	0.00222	0.00608	0.00296 Ju	0.0144	0.000647 Ju	0.00725	0.00574
	8/6/2008	0.0190	0.0134	0.00878	0.0128	<0.0180	<0.0270	<0.0220	<0.0700
	11/18/2008	0.0229	0.00914	0.0172	0.0376 J	0.0209	0.00671 J	0.0141	0.0408 J
	2/24/2009	0.0301	0.0309	0.00822	0.00736	0.0299 j	0.000513 J	0.00479	0.00590

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW32	3/2/2005	0.0277	<0.003	0.0126	<0.005	0.0277	<0.003	0.0118	0.0076
	3/2/2005 (Dup)	0.0272	<0.003	0.0127	0.322	0.0296	<0.003	0.0118	0.0065
	5/24/2005	<0.005	0.312	0.0592	0.0832	0.0025 J	0.0086	0.0611	0.0888
	8/23/2005	0.0332	0.0048	0.0117	0.0726	0.0291	<0.003	0.0106	0.0246
	11/29/2005	NS	NS	NS	NS	NS	NS	NS	NS
	3/20/2006	0.026	0.0188	0.0468	0.012	0.0267	<0.002	0.0499	0.009
	5/9/2006	0.0166	0.0532	0.043	0.0154	0.016	0.00225	0.0362	0.00735
	8/3/2006	0.0141	0.0186	0.0168	0.0336	0.0106	<0.002	0.0128	<0.005
	8/3/2006 (Dup)	0.0155	0.0136	0.0161	0.0177	0.0113	<0.002	0.0164	0.00718
	12/5/2006	0.00782	0.0288	0.0317	0.0100 j	0.00675	0.00217	0.0283	0.00971 j
	2/28/2007	0.00841	0.00294	0.0145	0.00675	0.00896	0.000166 J	0.0132	0.00458 J
	5/23/2007	0.00330 j	0.00993	0.0105	0.0286	0.00217	0.00194 J	0.00851	0.0311
	8/30/2007	0.00633 j	0.00247	0.0366	0.00712	0.00649	0.000350 Ju	0.0311	0.00462 J
	12/4/2007	0.0124	0.00976	0.0146	0.00386 J	0.0144	0.000460 J	0.00896	0.00363 Ju
	2/20/2008	0.00420 j	0.00384 j	0.00572 j	0.0119 j	0.00426 j	<0.000133uj	0.00504 j	0.00682 j
	5/7/2008	0.00701	0.00390	0.00344	0.00164 Ju	0.00778	0.000790 J	0.00287	0.00191 Ju
	8/6/2008	0.00602	0.00635	0.00542	0.00268 Ju	0.00577	0.000362 J	0.00287	0.00253 Ju
	11/17/2008	0.00679	0.00529	0.00669	0.00815	0.00747	0.000588 J	0.00361	0.00517 u
	2/24/2009	0.0124	0.00259	0.00263	0.00492 J	0.0132 j	<0.000270	0.00156	0.00196 J

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW33	3/2/2005	0.0013 J	<0.003	<0.0012	0.0111	<0.005	<0.003	<0.0012	0.0223
	5/24/2005	<0.005	0.0026 J	<0.0012	0.0231	<0.005	0.0036	0.0033	0.0347
	8/23/2005	<0.005	<0.003	<0.0012	0.0101	<0.005	<0.003	<0.0012	0.0071
	12/2/2005	<0.0093	0.0027 J	<0.0084	0.133	<0.0093	<0.003	<0.0084	0.0858
	12/2/2005 (Dup)	<0.0093	0.0032	<0.0084	0.112	<0.0093	<0.003	<0.0084	0.0915
	3/21/2006	0.00103	0.00486	<0.001	0.00677	<0.001	<0.002	<0.001	<0.005
	5/10/2006	0.00117	0.00466	<0.001	0.0198	<0.001	<0.002	<0.001	0.0146
	8/2/2006	<0.001	<0.002	<0.005	0.0122	0.00105	0.00951	0.00220	0.132
	12/5/2006	0.00135	0.00742	<0.001	0.0162 j	0.00115	<0.002	<0.001	0.0106 j
	12/5/2006 (Dup)	<0.001	0.00321	<0.001	<0.005uj	<0.001	0.00242	<0.001	0.00837 j
	2/28/2007	0.00334	0.00905	0.00187	0.0164	<0.000664	0.000163 J	<0.0000553	0.00661
	5/23/2007	<0.000664	0.00341	0.000277 J	0.00492 J	<0.00664	<0.00133	<0.000553	0.0108 J
	8/29/2007	0.00107	0.00102 J	<0.0000553	0.00362 J	0.00106	<0.000133	<0.0000553	0.00128 J
	8/29/2007 (Dup)	0.00101	0.00100 J	<0.0000553	0.00362 J	0.000890 J	0.000140 J	<0.0000553	0.00220 J
	12/5/2007	0.000770 J	0.00282	<0.0000553	0.0446	0.000750 J	<0.000133	<0.0000553	0.0693
	2/20/2008	0.00159 j	0.000212 Ju	0.0000610 Ju	0.00392 Ju	0.00142 j	<0.000133uj	<0.0000553uj	0.00392 Ju
	5/7/2008	0.000531 J	0.00198 J	<0.000220	0.00213 Ju	<0.000664	0.000702 Ju	<0.0000553	0.00173 Ju
	8/5/2008	<0.0180	<0.0270	<0.0220	<0.0700	0.00101	0.00151 J	0.000705 J	0.0101 u
	11/18/2008	0.000807 J	0.00152 J	<0.000220	0.00347 Ju	0.000843 J	<0.000270	<0.000220	0.00270 Ju
	11/18/2008 (Dup)	0.000972 J	0.00140 J	<0.000220	0.00389 J	0.00109	<0.000270	<0.000220	0.00276 Ju
	2/24/2009	0.000447 J	0.00192 J	<0.000220	0.00202 J	0.000308 J	<0.000270	<0.000220	0.00134 J

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW34	3/2/2005	0.0081	0.0058	0.0018	0.0422	0.0062	<0.003	<0.0012	0.0181
	5/25/2005	0.0032 J	0.0045	0.0029	2.91	<0.005	0.0052	<0.0012	2.37
	5/25/2005 (Dup)	0.0032 J	0.0035	0.0024	2.87	0.0022 J	0.0043	<0.0012	2.53
	8/23/2005	0.0263	0.0019 J	0.00097 J	0.0923	0.0242	<0.003	<0.0012	0.0785
	12/5/2005	<0.0093	0.0073	<0.0084	3.43	<0.0093	0.0048	<0.0084	3.4
	3/23/2006	0.0028	0.00948	0.00378	1.58	0.0011	0.00571	<0.001	1.24
	5/10/2006	0.00211	0.00662	<0.001	1.33	0.00195	0.00514	<0.001	1.14
	8/2/2006	0.0192	0.0545	<0.005	0.498	0.0190	<0.002	<0.001	0.411
	12/5/2006	0.00114	0.00657	0.00130	0.714 j	<0.001	0.00433	<0.001	0.569 j
	3/1/2007	0.00136	0.00532	0.00128	0.345 j	<0.000664	0.00433 j	<0.0000553	0.394
	5/24/2007	0.00521	0.00365	0.000336 J	0.428	<0.00664	<0.00133	<0.000553	0.432
	8/29/2007	0.0149	0.00169 J	0.000375 J	0.258	0.0172	0.000290 J	0.000140 J	0.182
	12/5/2007	0.000950 J	0.00732	0.000630 J	0.915	<0.000664	0.00320	0.000150 J	0.932
	2/20/2008	0.00197 j	0.00159 Ju	0.0000810 Ju	0.676 j	0.00172 j	0.00124 Ju	0.0000940 Ju	0.715 j
	5/6/2008	0.00300	0.00369	<0.000220	0.497	0.00123	0.00358	0.0000940 Ju	0.520
	8/5/2008	<0.0180	<0.0270	<0.0220	0.340 Ju	0.0168	<0.000270	<0.000220	0.330
	11/18/2008	0.000455 J	0.00843	<0.000220	1.18	0.000383 J	0.00744	<0.000220	1.13
	2/24/2009	0.00306	0.00195 J	<0.000220	0.316	0.00188 j	0.00552	<0.000220	0.326

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW35	3/1/2005	0.0154	0.0035	0.0051	0.0194	0.0179	<0.003	0.0049	0.0758
	3/1/2005 (Dup)	0.0174	0.0033	0.0051	0.0185	0.0155	<0.003	0.0048	0.0178
	5/24/2005	0.0032 J	0.0057	0.0037	0.118	0.0035 J	0.0021 J	0.0038	0.143
	8/23/2005	0.0164	0.0069	0.0041	0.0092	0.0145	<0.003	0.0041	0.0117
	12/1/2005	0.016	0.0041	<0.0084	0.0615	0.0112	<0.003	<0.0084	0.0602
	3/21/2006	0.00388	0.00897	0.00215	0.0102	0.00412	0.00232	0.0017	0.0122
	5/10/2006	0.0125	0.00724	0.00329	0.0109	0.00884	<0.002	0.00296	0.00641
	8/1/2006	0.0162	0.00893	0.00307	0.00883	0.0136	0.00228	0.00265	0.0119
	12/5/2006	0.00250	0.0114	0.00232	0.0104 j	0.00254	<0.002	0.00218	0.0122 j
	2/28/2007	0.00628	0.0146	0.00268	0.0125	0.00664	0.00127 J	0.00121	0.00840
	5/22/2007	0.00758	0.0125 j	0.00205	0.00488 J	0.00710	0.00125 J	0.00133	0.00584 j
	8/28/2007	0.0141	0.00541	0.00288	0.00260 Ju	0.0156	0.000750 J	0.00197	0.00437 J
	12/4/2007	0.00884	0.00547	0.00285	0.494	0.0107	0.000700 J	0.00144	0.554
	2/19/2008	0.00161	0.0193	0.00149	0.0939	0.00133	0.00153 J	0.000221 Ju	0.0162
	5/7/2008	0.00528	0.00698	0.00148	0.00437 Ju	0.00635	0.000426 Ju	0.00159	0.00482 J
	8/5/2008	0.0202 J	<0.0270	<0.0220	<0.0700	0.0112	0.00184 J	0.00256	0.00555 u
	11/19/2008	0.0280	0.00186 J	0.00458	0.00346 Ju	0.0322	<0.000270	0.00395	0.00362 Ju
	2/24/2009	0.0169	0.0189	0.00259	0.0156	0.0188 j	0.000833 J	0.00115	0.0160
KMW36	3/1/2005	0.0409	0.0262	0.0095	0.0862	0.0416	<0.003	<0.0012	0.0184
	5/24/2005	0.0364	<0.003	0.0014	<0.0053	0.0365	0.0019 J	0.0019	0.009
	8/25/2005	0.0378	0.0097	0.0155	0.388	0.036	<0.003	<0.0012	0.259
	12/2/2005	0.0492	<0.003	<0.0084	0.0253	0.046	<0.003	<0.0084	0.0121
	3/20/2006	0.0488	0.00262	0.00112	0.0518	0.0523	<0.002	<0.001	0.00987
	5/10/2006	0.0502	0.00658	<0.001	0.025	0.0414	<0.002	<0.001	0.00718
	8/1/2006	0.0484	<0.002	<0.001	0.0239	0.0429	<0.002	0.00126	0.0122
	12/6/2006	0.0632	0.00378	0.00262	0.106	0.0186	<0.002	<0.001	0.0186
	3/1/2007	0.0278	0.000370 J	0.00105	0.0254	0.0318	<0.000133uj	0.000542 J	0.0131
	5/23/2007	0.0351 j	0.000782 J	0.000638 J	0.00873	0.0377	<0.00133	<0.000553	0.00612 Ju
	8/29/2007	0.0256	0.000603 J	0.000550 J	0.399	0.0243	0.000600 J	0.000440 J	0.0390
	12/4/2007	0.0440	0.000360 J	0.000720 J	0.00432 J	0.0489	<0.000133	0.000490 J	0.00535
	2/20/2008	0.0412 j	<0.000667uj	0.000605 Ju	0.00508 Ju	0.0432 j	<0.000133uj	0.000450 Ju	0.00253 Ju
	5/7/2008	0.0256	<0.000270	0.000545 J	0.0181	0.0281	<0.000133	0.000485 J	0.0166
	8/7/2008	0.0200	<0.000270	0.000672 J	0.0140	0.0232	<0.000270	0.000554 J	0.0144
	11/19/2008	0.0355	0.000583 J	0.000808 J	0.0210	0.0148	0.000270 J	0.000590 J	0.0117
	2/25/2009	0.0232	<0.000270	<0.00440	0.00489 J	0.0252	<0.000270	0.000430 J	0.00537

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
KMW37	3/3/2005	0.0333	<0.003	0.0027	<0.005	0.0342	<0.003	0.0025	0.0088
	5/24/2005	0.007	0.0079	0.003	0.0105	0.0085	<0.003	0.0025	0.0103
	8/25/2005	0.012	<0.003	0.0064	0.0592	0.0119	<0.003	0.0055	0.0599
	8/25/2005 (Dup)	0.0112	<0.003	0.0051	0.0574	0.0109	<0.003	0.0052	0.0636
	12/1/2005	0.0144	<0.003	<0.0084	0.1	0.0104	<0.003	<0.0084	0.0913
	3/20/2006	0.00402	0.00574	0.00212	0.0101	0.0039	<0.002	0.00223	0.00874
	5/10/2006	0.0023	0.00657	0.00146	0.011	0.0016	0.00255	0.0013	0.00828
	8/1/2006	0.0206	0.00518	0.00447	0.00930	0.0217	<0.002	0.00414	0.0138
	12/6/2006	0.00337	0.00553	0.00234	0.00811	0.00364	<0.002	0.00219	<0.005
	2/28/2007	0.0116	0.00243	0.00358	0.00582	0.00996	0.000513 J	0.00198	0.00646
	5/23/2007	0.0105 j	0.00137 J	0.00300	0.00428 J	0.0137	0.00139 J	<0.000553	0.00724 Ju
	8/29/2007	0.0101	0.00138 J	0.00441	0.00373 J	0.00974	0.00135 J	0.00413	0.00417 J
	12/4/2007	0.00490	0.00273	0.00295	0.00180 J	0.00562	0.000580 J	0.00233	0.00336 Ju
	2/19/2008	0.0170	0.00122 J	0.00321	0.00327 J	0.0156	<0.000133	0.00220	0.00312 J
	5/6/2008	0.0108	0.000636 J	0.00253	0.00237 Ju	0.0117	0.000652 Ju	0.00225	0.00215 Ju
	8/6/2008	0.0133	0.00147 J	0.00360	0.00494 Ju	<0.0180	<0.0270	<0.0220	<0.0700
	11/18/2008	0.0121 j	0.00132 J	0.00258 j	0.00324 Ju	0.0104 j	0.000298 J	0.00210 j	0.00257 Ju
	2/24/2009	0.0161	0.00150 J	0.00311	0.00274 J	0.0181 j	<0.000270	0.00240	0.00308 J

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
MW38	7/7/2005	0.0084	0.0099	0.0017	0.0093	0.0094	<0.003	0.0012 J	<0.0053
	8/22/2005	0.0093	<0.003	<0.0012	<0.0053	0.0076	<0.003	<0.0012	<0.0053
	11/30/2005	<0.0093	<0.003	<0.0084	0.116	<0.0093	<0.003	<0.0084	0.134
	3/21/2006	0.0123	<0.002	<0.001	<0.005	0.0118	<0.002	<0.001	<0.005
	5/9/2006	0.0198	<0.002	0.00285	0.00549	0.0198	<0.002	0.00249	<0.005
	5/9/2006 (Dup)	0.0211	<0.002	0.00303	0.00601	0.0164	<0.002	0.00251	<0.005
	7/31/2006	0.0169	0.00386	<0.005	0.0104	0.0158	<0.002	0.00131	0.0134
	12/7/2006	0.0155	0.00448	<0.001	0.00855	0.0144	<0.002	<0.001	<0.005
	2/27/2007	0.0133 j	0.00907 j	0.000400 Ju	0.00818 j	0.00925	<0.000133uj	0.000250 J	0.000650 Ju
	2/27/2007 (Dup)	0.00648 j	0.00302 u	0.000420 Ju	0.00200 Ju	0.00895	0.00253 j	0.000210 J	0.0242 j
	5/22/2007	0.0161	0.00220 j	0.00180	0.00413 J	0.0182	0.000949 J	0.00138	0.00544 j
	5/22/2007 (Dup)	0.0160	0.000681 J	0.00168	0.00330 J	0.0178	0.000260 J	0.00137	0.00253 J
	8/28/2007	0.00582	0.00305	0.000420 J	0.00293 Ju	0.00604	0.00123 J	0.000280 J	0.00461 J
	12/3/2007	0.00737	0.00146 J	0.000290 J	0.00120 J	0.00747	<0.000133	0.000220 J	0.00141 Ju
	12/3/2007 (Dup)	0.00677	0.000840 J	0.000250 J	0.000990 J	0.00748	0.000160 J	0.000200 J	0.00253 Ju
	2/21/2008	0.00887	0.000597 J	0.0000910 J	0.00193 Ju	0.00877	<0.000133	0.000134 J	0.00226 J
	5/7/2008	0.0195	<0.000270	0.00332	0.000883 Ju	0.0232	0.00120 J	0.00280	0.00157 J
	8/7/2008	0.0176	<0.000270	0.00168	0.00122 Ju	0.0216	<0.000270	0.00134	0.00259 Ju
	11/19/2008	0.00801 j	0.00139 J	0.00212 j	0.00286 Ju	0.00667 j	<0.000270	0.00161 j	0.00152 Ju
	2/24/2009	0.0135	<0.000270	0.000620 J	0.00183 Ju	0.0152 j	0.000399 J	0.000476 J	0.00183 J

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GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
MW39	7/7/2005	0.0521	0.0043	0.00088 J	0.0105	0.0437	<0.003	<0.0012	<0.0053
	8/22/2005	0.0507	0.0025 J	<0.0012	<0.0053	0.0483	<0.003	<0.0012	0.0066
	8/22/2005 (Dup)	0.0483	<0.003	<0.0012	<0.0053	0.0503	<0.003	<0.0012	<0.0053
	11/30/2005	0.0573	<0.003	<0.0084	0.0479	0.0588	<0.003	<0.0084	0.0525
	3/21/2006	0.0593	<0.002	<0.001	<0.005	0.0582	<0.002	<0.001	<0.005
	5/9/2006	0.0601	0.00348	0.00103	0.0168	0.0547	<0.002	<0.001	<0.005
	7/31/2006	0.0546	0.00414	<0.005	0.00568	0.0460	<0.002	<0.001	<0.005
	12/7/2006	0.0582	0.00432	<0.001	0.00571	0.0547	<0.002	<0.001	<0.005
	2/27/2007	0.0702 j	0.0206 j	0.000872 J	0.00895 j	0.0551	0.00196 J	0.000730 Ju	0.00583 j
	5/22/2007	0.0472	0.00208 j	0.000538 J	0.00385 J	0.0525	0.00102 J	0.000324 J	0.00630 j
	8/28/2007	0.0549	0.00399	0.000930 J	0.00240 Ju	0.0585	0.00176 J	0.000670 J	0.00528
	12/3/2007	0.0579	0.00241	0.00114	0.00138 J	0.0652	0.000410 J	0.000810 J	0.00276 Ju
	2/21/2008	0.0510	0.00526	0.000760 J	0.00169 Ju	0.0517	<0.000133	0.000570 J	0.00304 J
	5/7/2008	0.0451	0.00105 J	0.000558 J	0.00115 Ju	0.0570	0.000352 J	0.000441 Ju	0.00237 J
	5/7/2008 (Dup)	0.0461	0.000760 J	0.000611 J	0.00132 Ju	0.0542	0.000229 J	0.000343 Ju	0.00137 J
	8/7/2008	0.0460	0.000836 J	0.000736 J	0.00130 Ju	0.0527	<0.000270	0.000474 J	0.00348 Ju
	11/19/2008	<0.0180	0.000543 J	0.000796 J	0.00627	0.0118 j	0.000649 J	0.000673 J	0.00266 Ju
	2/25/2009	0.0481	0.00120 J	0.000500 J	0.00150 Ju	0.0574	<0.000270	0.000430 J	0.00163 J

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GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
MW40	7/7/2005	<0.005	0.0041	0.0035	0.0144	<0.005	<0.003	<0.0012	<0.0053
	8/22/2005	<0.005	<0.003	<0.0012	<0.0053	<0.005	<0.003	<0.0012	<0.0053
	11/30/2005	<0.0093	<0.003	<0.0084	0.0666	<0.0093	<0.003	<0.0084	0.0829
	3/21/2006	<0.001	<0.002	<0.001	<0.005	<0.001	<0.002	<0.001	<0.005
	5/10/2006	<0.001	0.00464	<0.001	<0.005	<0.001	0.00407	<0.001	<0.005
	8/2/2006	<0.001	<0.002	<0.005	<0.005	<0.001	<0.002	<0.001	0.00570
	12/5/2006	<0.001	0.00271	<0.001	<0.005uj	<0.001	0.00229	<0.001	<0.005uj
	2/27/2007	<0.000664uj	0.000580 Ju	0.000310 Ju	0.00119 Ju	<0.000664	0.00190 J	0.0000700 J	0.00504 j
	5/22/2007	<0.000664	0.00248 j	<0.0000553	0.00176 Ju	<0.000664	0.00196 J	<0.0000553	0.00210 J
	5/22/2007 (Dup)	<0.000664	0.00233 j	<0.0000553	0.00153 Ju	<0.000664	0.00330 j	<0.0000553	0.00412 J
	8/28/2007	0.00125	0.000990 J	<0.0000553	0.00225 Ju	0.000980 J	0.00308 j	<0.0000553	0.00481 J
	8/28/2007 (Dup)	0.00102	0.00106 J	<0.0000553	0.00357 J	0.00112	0.000600 J	<0.0000553	0.000990 J
	12/3/2007	<0.000664	0.00104 J	0.0000700 J	0.00135 J	<0.000664	0.000750 J	<0.0000553	0.00302 Ju
	2/19/2008	<0.000664	0.000322 J	<0.0000553	0.00101 Ju	<0.000664	0.000323 J	0.0000600 Ju	0.00291 J
	2/19/2008 (Dup)	<0.000664	0.000473 J	<0.0000553	0.00110 Ju	<0.000664	0.000276 J	<0.0000553	0.00153 Ju
	5/7/2008	0.000498 J	0.000411 J	<0.000220	0.00129 Ju	<0.000664	0.00119 J	<0.0000553	0.00170 Ju
	8/6/2008	0.00113	0.000572 J	0.000220 J	0.00205 Ju	0.000854 J	0.000585 J	0.000560 J	0.00230 Ju
	11/19/2008	0.000834 J	0.000491 J	<0.000220	0.00196 Ju	0.00225	0.000410 J	<0.000220	0.00168 Ju
	2/25/2009	0.000590 J	0.000360 J	<0.000220	0.00114 Ju	0.000390 J	0.000350 J	<0.000220	0.00231 J
	2/25/2009 (Dup)	0.000710 J	<0.000270	<0.000220	0.000970 Ju	0.000480 J	<0.000270	<0.000220	<0.000700

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
W-15	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/25/2005	0.0048 J	<0.003	0.0075	0.0098	0.0043 J	<0.003	0.0051	<0.0053
	8/25/2005	0.0102	<0.003	0.0053	0.0375	0.0074	<0.003	0.0049	0.0359
	11/29/2005	NS	NS	NS	NS	NS	NS	NS	NS
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/11/2006	0.0066	0.00247	0.00314	0.0224	0.0057	<0.002	0.00142	<0.005
	8/3/2006	0.00880	<0.002	0.00292	0.0146	0.00677	<0.002	0.00180	0.0183
	12/6/2006	0.0123	0.00272	0.00489	<0.005	0.00725	<0.002	0.00623	0.00810
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/22/2007	0.00589	0.00104 J	0.00314	0.00472 J	0.00631	<0.000133uj	0.00243	0.00204 J
	8/30/2007	0.0103 j	0.00169 J	0.00296	0.00326 J	0.0110	0.00109 J	0.00275	0.00479 J
	12/4/2007	0.00856	0.00221	0.00344	0.00298 J	0.0101	<0.000133	0.00233	0.00253 Ju
	2/19/2008	0.00524	0.000953 J	0.00216	0.00179 Ju	0.00460	<0.000133	0.00135	0.00249 J
	5/6/2008	0.00499	0.00129 J	0.00295	0.00116 Ju	0.00560	<0.000133	0.00258	0.00158 Ju
	5/6/2008 (Dup)	0.00482	0.00119 J	0.00291	0.000917 Ju	0.00558	<0.000133	0.00248	0.00255 Ju
	8/5/2008	0.00514	0.00207	0.00372	0.00131 Ju	<0.0180	<0.0270	<0.0220	<0.0700
	11/19/2008	0.0703 j	0.00288	0.000895 J	0.00336 Ju	0.0640 j	0.000360 J	0.000754 J	0.00227 Ju
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
W-16	3/14/2005	0.0097	0.012	0.003	0.0372	0.0049 J	<0.003	0.0015	0.0148
	5/25/2005	0.0239	<0.003	0.0051	<0.0053	0.0236	<0.003	0.0036	<0.0053
	8/25/2005	0.0068	<0.003	0.0058	0.403	<0.005	<0.003	0.0056	0.375
	12/5/2005	0.0134	0.0026 J	<0.0084	0.0966	0.0135	<0.003	<0.0084	0.152
	3/21/2006	0.0298	0.00632	0.00363	0.0203	0.0277	<0.002	0.00233	<0.005
	5/10/2006	0.0158	0.00667	0.00254	0.00942	0.015	<0.002	0.00146	0.0228
	8/3/2006	0.0161	0.00586	0.00193	0.00587	0.0127	0.00265	0.00113	<0.005
	12/7/2006	0.0289	0.00603	0.00406	0.0368	0.0252	<0.002	0.00226	<0.005
	2/28/2007	0.0104	0.00323	0.00192	0.00811	0.00659	0.000233 J	0.000793 J	0.00177 Ju
	5/22/2007	0.0100	0.00412 j	0.00136	0.00640	0.0104	0.000392 J	0.000599 J	0.00214 J
	8/29/2007	0.00856	0.00487	0.00122	0.00291 J	0.00802	0.000550 J	0.000460 J	0.00351 J
	12/5/2007	0.0130	0.00325	0.00107	0.00742	0.0135	<0.000133	0.000730 J	<0.000469
	12/5/2007 (Dup)	0.0129	0.00312	0.00105	0.00674	0.0137	<0.000133	0.000750 J	0.00168 J
	2/20/2008	0.0142 j	0.0157 j	0.00282 Ju	0.00884 Ju	0.0218 j	0.00800 j	0.00185 j	0.00707 j
	5/6/2008	0.00589	0.00251	0.000827 J	0.00413 J	0.00616	0.000934 J	0.000517 Ju	0.00183 J
	8/5/2008	0.00746	0.00180 J	0.000784 J	0.00309 Ju	<0.0180	<0.0270	<0.0220	<0.0700
	11/19/2008	0.00686 j	0.00222	0.000704 J	0.00639 j	0.00497 j	<0.000270	<0.000220uj	0.00171 Ju
	2/25/2009	0.00545	0.000920 J	0.000850 J	0.00192 Ju	0.00245	<0.000270	0.000520 J	0.00161 J
W-17	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/29/2005	NS	NS	NS	NS	NS	NS	NS	NS
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	NS	NS	NS	NS	NS	NS	NS	NS
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/4/2008	NS	NS	NS	NS	NS	NS	NS	NS
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
W-18	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/29/2005	NS	NS	NS	NS	NS	NS	NS	NS
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	NS	NS	NS	NS	NS	NS	NS	NS
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/4/2008	NS	NS	NS	NS	NS	NS	NS	NS
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
W-19	3/14/2005	0.0038 J	0.0051	<0.0012	0.0107	0.0016 J	<0.003	<0.0012	0.0056
	5/25/2005	0.0053	<0.003	<0.0012	<0.0053	0.0045 J	<0.003	<0.0012	<0.0053
	8/25/2005	0.0163	<0.003	<0.0012	0.0378	0.0129	<0.003	<0.0012	0.0693
	12/2/2005	0.0208	<0.003	<0.0084	0.0737	0.016	<0.003	<0.0084	0.101
	3/23/2006	0.00559	<0.002	<0.001	<0.005	0.00399	<0.002	<0.001	<0.005
	5/10/2006	0.00484	0.0023	<0.001	<0.005	0.00329	<0.002	<0.001	0.00592
	8/2/2006	0.0140	<0.002	<0.005	<0.005	0.0154	<0.002	<0.001	0.0103
	12/7/2006	0.0135	<0.002	<0.001	<0.005	0.0117	<0.002	<0.001	0.0130
	2/28/2007	0.00280	0.000730 J	0.0000700 J	0.00638	0.00251	0.000231 J	<0.0000553	0.00351 Ju
	5/24/2007	0.00598	0.00106 J	0.0000729 J	0.00480 J	<0.00664	<0.00133	<0.000553	<0.00469
	8/29/2007	0.0106	0.000632 J	<0.0000553	0.00417 J	0.0109	0.000170 J	<0.0000553	0.00103 J
	12/5/2007	0.0125	<0.000133	<0.0000553	0.000800 J	0.0144	<0.000133	<0.0000553	0.000730 J
	2/19/2008	0.00239	<0.000133	<0.0000553	0.00365 J	0.00178	<0.000133	<0.0000553	0.00243 J
	5/6/2008	0.00418	<0.000270	<0.000220	0.00108 J	0.00396	0.000859 J	0.0000630 Ju	0.00124 J
	8/5/2008	0.00950	0.000559 J	0.000330 J	0.00265 Ju	<0.0180	<0.0270	<0.0220	<0.0700
	11/19/2008	0.00768 j	0.00153 J	<0.000220uj	0.00333 Ju	0.00645 j	0.000470 J	<0.000220uj	0.00216 Ju
	2/25/2009	0.00268	<0.000270	<0.000220	0.00265 Ju	0.00200	<0.000270	<0.000220	0.00109 J

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
W-20	3/14/2005	0.0014 J	<0.003	<0.0012	0.0757	<0.005	<0.003	<0.0012	0.0109
	5/25/2005	<0.005	<0.003	<0.0012	0.0202	<0.005	0.003 J	<0.0012	0.0479
	8/25/2005	<0.005	<0.003	<0.0012	0.102	<0.005	<0.003	<0.0012	0.0982
	12/2/2005	<0.0093	<0.003	<0.0084	0.101	<0.0093	<0.003	<0.0084	0.0834
	3/23/2006	<0.001	0.00378	<0.001	0.0304	<0.001	0.00241	<0.001	0.0119
	5/10/2006	<0.001	0.00253	<0.001	0.0276	<0.001	<0.002	<0.001	0.0103
	8/2/2006	<0.001	<0.002	<0.005	0.0487	<0.001	<0.002	<0.001	0.0436
	12/7/2006	0.00402	0.00244	<0.001	0.0685	<0.001	<0.002	<0.001	0.0210
	2/28/2007	0.000970 J	0.00156 J	0.000750 J	0.0564	<0.000664	0.000856 J	<0.0000553	0.00541
	5/24/2007	<0.000664	0.00102 J	0.0000984 J	0.00747	<0.000664	0.00276	<0.0000553	0.0111
	8/30/2007	0.000727 J	0.00131 J	0.000142 J	0.0396	0.000790 J	0.00156 J	0.000160 Ju	0.0329
	12/5/2007	<0.000664	0.000740 J	<0.0000553	0.0124	<0.000664	<0.000133	0.0000800 J	0.00886
	2/19/2008	<0.000664	0.000347 J	<0.0000553	0.00738	<0.000664	0.000399 J	<0.0000553	0.00818
	5/6/2008	0.000299 J	0.000489 J	<0.000220	0.00480 J	<0.000664	0.00119 J	0.0000720 Ju	0.00407 J
	8/5/2008	<0.000180	0.000895 J	<0.000220	0.0174	<0.0180	<0.0270	<0.0220	<0.0700
	11/19/2008	0.000184 J	0.00538	<0.000220uj	0.00367 Ju	<0.000180uj	0.000481 J	<0.000220uj	0.00202 Ju
	2/25/2009	0.000350 J	0.000420 J	<0.000220	0.00678	<0.000180	0.000300 J	<0.000220	0.00326 J
W-21	2/28/2005	NS	NS	NS	NS	NS	NS	NS	NS
	5/23/2005	NS	NS	NS	NS	NS	NS	NS	NS
	8/22/2005	NS	NS	NS	NS	NS	NS	NS	NS
	11/29/2005	NS	NS	NS	NS	NS	NS	NS	NS
	3/20/2006	NS	NS	NS	NS	NS	NS	NS	NS
	5/9/2006	NS	NS	NS	NS	NS	NS	NS	NS
	7/31/2006	NS	NS	NS	NS	NS	NS	NS	NS
	12/4/2006	NS	NS	NS	NS	NS	NS	NS	NS
	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/4/2008	NS	NS	NS	NS	NS	NS	NS	NS
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3
GROUND WATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS
NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Cleanup Goal						0.005	0.012	0.0032	
W-22	3/1/2005	<0.005	<0.003	<0.0012	0.119	<0.005	<0.003	<0.0012	0.135
	5/25/2005	<0.005	<0.003	<0.0012	0.0905	<0.005	<0.003	<0.0012	0.0659
	8/25/2005	<0.005	<0.003	0.0018	0.286	<0.005	<0.003	0.001 J	0.272
	12/2/2005	<0.0093	<0.003	<0.0084	0.223	<0.0093	<0.003	<0.0084	0.199
	3/23/2006	<0.001	0.00484	0.0014	0.0379	<0.001	0.00576	<0.001	0.0286
	5/10/2006	<0.001	0.00507	0.0023	0.0534	<0.001	0.00256	<0.001	0.026
	8/2/2006	<0.001	0.00210	<0.005	0.0444	<0.001	<0.002	<0.001	0.0392
	12/7/2006	<0.001	0.00495	0.00178	0.0270	<0.001	0.00234	<0.001	0.0179
	2/28/2007	<0.000664	0.00172 J	0.000810 J	0.0119	<0.000664	0.00135 J	0.0000557 J	0.00694
	5/24/2007	<0.000664	0.00228	0.000123 J	0.0181	<0.00664	<0.00133	<0.0000553	0.0654
	8/30/2007	0.00258 j	0.00246	<0.0000553	0.0424	<0.000664	0.00358	0.000150 Ju	0.0505
	8/30/2007 (Dup)	<0.000664uj	0.00281	0.000182 J	0.0454	<0.000664	0.00341	<0.0000553	0.0486
	12/5/2007	0.00237 r	0.0120 r	0.00871 r	0.0508 r	<0.000664r	<0.000133r	0.000220 r	0.0482 r
	2/19/2008	<0.000664	0.00180 J	0.000664 J	0.0123	<0.000664	0.00119 J	<0.0000553	0.00783
	5/6/2008	0.000300 J	0.00152 J	<0.000220	0.0112	<0.000664	0.00114 J	0.000137 Ju	0.0112
	8/5/2008	<0.000180	0.00135 J	<0.000220	0.0223	<0.0180	<0.0270	<0.0220	0.125 J
	11/19/2008	0.000509 J	0.00116 J	<0.000220uj	0.0328 j	<0.000180uj	0.00122 J	<0.000220uj	0.0292
	2/25/2009	0.000230 J	0.000920 J	<0.000220	0.00839	<0.000180	0.000970 J	<0.000220	0.00857

Notes

Prior to 2006, arsenic analyzed by EPA Method 7060A, copper and zinc analyzed by EPA Method 6010B, and lead analyzed by EPA Method 7421.

Beginning in 2006, arsenic, copper, lead, and zinc analyzed by EPA Method 6020.

Pre-2005 data in Appendix E.

Bolded values exceed cleanup goals.

“<” = prior to 2007, concentration as reported by analytical laboratory is less than the method reporting limit;
beginning in 2007, concentration as reported by analytical laboratory is less than the method detection limit.

mg/L =milligram(s) per liter

EPA = United States Environmental Protection Agency

NS = not sampled

Dup = Field Duplicate

Quality Assurance/Quality Control Data Qualifiers

U or u – reported analyte was not detected

J or j – reported result is an estimated value

UJ or uj – reported analyte was not detected and reporting limit is an estimated value

R or r – reported result is rejected and unusable

Flags shown with capital letters are qualifiers by the analytical laboratory, and flags with lower -case letters are from the data validation process.”

TABLE 4

GROUND WATER ANALYTICAL DATA, POLYNUCLEAR AROMATIC HYDROCARBONS

NuStar Portland Terminal, Portland, Oregon

Well ID	Date	Type	Unit	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
KMW01	8/7/2008	Primary	ug/L	<0.0430	<0.0810	<0.0420	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	<0.0360	<0.0250	<0.0390	<0.0610	<0.0340
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW02	8/7/2008	Primary	ug/L	<0.0426	<0.0802	<0.0416	<0.0257	<0.0416	<0.0337	<0.0257	<0.0248	<0.0248	<0.0248	<0.0347	<0.0307	<0.0356	<0.0356	<0.0248	<0.0386	<0.0604	<0.0337
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW03	8/6/2008	Primary	ug/L	<0.0422	<0.0794	<0.0412	<0.0255	<0.0412	<0.0333	<0.0255	<0.0245	<0.0245	<0.0245	<0.0343	<0.0304	<0.0353	<0.0353	<0.0245	<0.0382	<0.0598	<0.0333
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW05	8/7/2008	Primary	ug/L	45.0	<0.0810	3.88	0.840	0.430	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	0.0500J	5.13	<0.0250	<0.0390	4.23	0.150
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW06	8/7/2008	Primary	ug/L	<0.0417	<0.0786	<0.0408	<0.0252	<0.0408	<0.0330	<0.0252	<0.0243	<0.0243	<0.0243	<0.0340	<0.0301	<0.0350	<0.0350	<0.0243	0.0971	<0.0592	<0.0330
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW07	8/5/2008	Primary	ug/L	<0.0430	<0.0810	<0.0420	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	0.110	<0.0250	<0.0390	<0.0610	<0.0340
	11/19/2008	Primary	ug/L	25.9	25.4	<0.210	<0.130	<0.210	<0.170	<0.130	<0.125	<0.125	<0.125	<0.175	<0.155	<0.180	0.650	<0.125	148	1.10	<0.170
	11/19/2008	Duplicated	ug/L	20.3	20.0	0.0673J	0.0673J	0.0481J	<0.0327	<0.0250	<0.0240	<0.0240	<0.0240	<0.0337	<0.0298	<0.0346	<0.0346	<0.0240	116	<0.0587	<0.0327
	2/25/2009	Primary	ug/L	2.28j	2.80j	<0.0333r	<0.0235r	<0.0304r	<0.0216r	<0.0275r	<0.0275r	<0.0343r	<0.0216r	<0.0294r	<0.0343r	<0.0275r	0.118j	<0.0275r	4.55j	0.275j	<0.0343r
	8/5/2008	Primary	ug/L	<0.0430	<0.0810	<0.0420	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	<0.0360	<0.0250	<0.0390	<0.0610	<0.0340
KMW09	11/18/2008	Primary	ug/L	<0.0430	<0.0810	<0.0420	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	<0.0360	<0.0250	<0.0390	<0.0610	<0.0340
	2/24/2009	Primary	ug/L	<0.0295r	<0.0295r	<0.0324	<0.0229	<0.0295	<0.0210	<0.0267	<0.0267	<0.0333	<0.0210	<0.0286	<0.0333uj	<0.0267	<0.0305uj	<0.0267	0.0667Jr	<0.0229	<0.0333
	8/5/2008	Primary	ug/L	<0.0430	<0.0810	<0.0420	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	<0.0360	<0.0250	<0.0390	<0.0610	<0.0340
KMW10	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	8/5/2008	Primary	ug/L	<2.15	<4.05	<2.10	<1.30	<2.10	<1.70	<1.30	<1.25	<1.25	<1.25	<1.75	<1.55	<1.80	<1.80	<1.25	<1.95	<3.05	<1.70
KMW11	8/5/2008	Duplicated	ug/L	<2.15	<4.05	<2.10	<1.30	<2.10	<1.70	<1.30	<1.25	<1.25	<1.25	<1.75	<1.55	<1.80	<1.80	<1.25	<1.95	<3.05	<1.70
	11/18/2008	Primary	ug/L	2.59	<1.91	<0.991	<0.613	<0.991	<0.802	<0.613	<0.590	<0.590	<0.590	<0.825	<0.731	<0.849	<0.849	<0.590	<0.920	<1.44	<0.802
	2/24/2009	Primary	ug/L	0.654r	0.606r	0.538	0.0865Jj	<0.0298r	<0.0212r	<0.0269r	<0.0269r	<0.0337r	<0.0212r	<0.0288r	<0.0337r	<0.0269r	0.606j	<0.0269r	1.65r	0.221u	0.0673J
KMW13	8/7/2008	Primary	ug/L	2.55	2.37	<0.0420	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	0.0700J	<0.0250	13.7	<0.0610	<0.0340
	11/19/2008	Primary	ug/L	22.4	37.5	<0.0404r	<0.0250r	<0.0404	<0.0327	<0.0250	<0.0240	<0.0240	<0.0240	<0.0337	<0.0298	<0.0346	<0.0346r	<0.0240	141	0.260	<0.0327
	2/24/2009	Primary	ug/L	12.8r	21.1r	0.154	<0.0231	<0.0298	<0.0212	<0.0269	<0.0269	<0.0337	<0.0212	<0.0288	<0.0337uj	<0.0269	0.192j	<0.0269	48.8r	0.240u	<0.0337
KMW14	8/7/2008	Primary	ug/L	<0.0453	<0.0853	<0.0442	<0.0274	<0.0442	<0.0358	<0.0274	<0.0263	<0.0263	<0.0263	<0.0368	<0.0326	<0.0379	<0.0379	<0.0263	0.0737J	<0.0642	<0.0358
	11/19/2008	Primary	ug/L	<0.0413	<0.0779	<0.0404r	<0.0250r	<0.0404	<0.0327	<0.0250	<0.0240	<0.0240	<0.0240	<0.0337	<0.0298	<0.0346	<0.0346r	<0.0240	<0.0375	<0.0587	<0.0327
	2/24/2009	Primary	ug/L	<0.0310r	<0.0310r	<0.0340	<0.0240	<0.0310	<0.0220	<0.0280	<0.0280	<0.0350	<0.0220	<0.0300	<0.0350uj	0.0500J	<0.0320uj	<0.0280	0.0900Jr	0.0900Ju	<0.0350
KMW15	8/6/2008	Primary	ug/L	<0.0422	<0.0794	<0.0412	<0.0255	<0.0412	<0.0333	<0.0255	<0.0245	<0.0245	<0.0245	<0.0343	<0.0304	<0.0353	<0.0353	<0.0245	<0.0382	<0.0598	0.167
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW16	8/6/2008	Primary	ug/L	<0.0417	<0.0786	<0.0408	<0.0252	<0.0408	<0.0330	<0.0252	<0.0243	<0.0243	<0.0243	<0.0340	<0.0301	<0.0350	<0.0350	<0.0243	<0.0379	<0.0592	<0.0330
	8/6/2008	Duplicated	ug/L	<0.0417	<0.0786	<0.0408	<0.0252	<0.0408	<0.0330	<0.0252	<0.0243	<0.0243	<0.0243	<0.0340	<0.0301	<0.0350	<0.0350	<0.0243	<0.0379	<0.0592	<0.0330
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 4

GROUND WATER ANALYTICAL DATA, POLYNUCLEAR AROMATIC HYDROCARBONS

NuStar Portland Terminal, Portland, Oregon

Well ID	Date	Type	Unit	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
KMW17	8/4/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW18	8/6/2008	Primary	ug/L	8.63j	1.08	<0.412	<0.255	<0.412	<0.333	<0.255	<0.245	<0.245	<0.245	<0.343	<0.304	<0.353	<0.353	<0.245	16.8	<0.598	<0.333
	11/18/2008	Primary	ug/L	9.05	10.2	<0.200	<0.124	<0.200	<0.162	<0.124	<0.119	<0.119	<0.119	<0.167	<0.148	<0.171	<0.171	<0.119	60.2	<0.290	<0.162
	2/25/2009	Primary	ug/L	5.72r	7.40r	<0.163	<0.115	<0.149	<0.106	<0.135	<0.135	<0.168	<0.106	<0.144	<0.168uj	<0.135	<0.154uj	<0.135	29.4r	<0.115	<0.168
KMW19	8/6/2008	Primary	ug/L	0.460j	<0.0810	<0.0420	<0.0260	0.0500j	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	<0.0360	<0.0250	<0.0390	<0.0610	<0.0340
	11/18/2008	Primary	ug/L	1.17	<0.0810	0.0600j	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	0.0900j	<0.0250	0.560	0.120	<0.0340
	2/25/2009	Primary	ug/L	0.248r	<0.0295r	<0.0324	<0.0229	<0.0295	<0.0210	<0.0267	<0.0267	<0.0333	<0.0210	<0.0286	<0.0333uj	<0.0267	<0.0305uj	<0.0267	0.0762jr	<0.0229	<0.0333
KMW20	8/5/2008	Primary	ug/L	0.520	<0.0810	<0.0420	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	<0.0360	<0.0250	<0.0390	<0.0610	1.01
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW21	8/5/2008	Primary	ug/L	25.4	<0.0810	1.79	0.780	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	0.0600j	5.38	<0.0250	<0.0390	2.83	0.0600j
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW23	8/6/2008	Primary	ug/L	<0.0417	<0.0786	<0.0408	<0.0252	<0.0408	<0.0330	<0.0252	<0.0243	<0.0243	<0.0243	<0.0340	<0.0301	<0.0350	<0.0350	<0.0243	<0.0379	<0.0592	<0.0330
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW24	8/7/2008	Primary	ug/L	<0.0430	<0.0810	<0.0420	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	<0.0360	<0.0250	<0.0390	<0.0610	<0.0340
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW25	8/7/2008	Primary	ug/L	<0.0426	<0.0802	<0.0416	<0.0257	<0.0416	<0.0337	<0.0257	<0.0248	<0.0248	<0.0248	<0.0347	<0.0307	<0.0356	<0.0356	<0.0248	<0.0386	<0.0604	<0.0337
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW26	8/7/2008	--	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW27	8/7/2008	--	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/17/2008	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
KMW29	8/6/2008	Primary	ug/L	2.16j	<0.0794uj	1.84j	0.373j	<0.0412uj	<0.0333uj	<0.0255uj	<0.0245uj	<0.0245uj	<0.0245uj	<0.0343uj	<0.0304uj	0.0588j	3.08j	<0.0245uj	<0.0382uj	0.980j	0.0784j
	11/17/2008	Primary	ug/L	1.06j	0.120j	0.880j	0.200j	0.100j	<0.0340uj	<0.0260uj	<0.0250uj	<0.0250uj	<0.0250uj	<0.0350uj	<0.0310uj	0.0500j	1.63j	<0.0250uj	0.820j	1.14j	0.0700j
	2/24/2009	Primary	ug/L	2.44r	0.317r	1.59j	0.269j	0.212j	<0.0212	<0.0269	<0.0269	<0.0337	<0.0212	<0.0288	<0.0337uj	0.0962j	2.67j	<0.0269	<0.0481r	1.87j	0.144j
KMW30	8/6/2008	Primary	ug/L	12.6j	<0.0810uj	0.340uj	<0.0260uj	<0.0420uj	<0.0340uj	<0.0260uj	<0.0250uj	<0.0250uj	<0.0250uj	<0.0350uj	<0.0310uj	<0.0360uj	0.490j	<0.0250uj	2.32j	0.450j	0.0600j
	11/17/2008	Primary	ug/L	6.81j	0.0971j	0.175j	<0.0252	<0.0408	<0.0330	<0.0252	<0.0243	<0.0243	<0.0243	<0.0340	<0.0301	<0.0350	0.262j	<0.0243	0.786j	0.204j	<0.0330
	2/24/2009	Primary	ug/L	6.93r	0.270r	0.280	<0.0240	<0.0310	<0.0220	<0.0280	<0.0280	<0.0350	<0.0220	<0.0300	<0.0350uj	<0.0280	0.230j	<0.0280	0.940r	0.130u	<0.0350
KMW31	2/24/2009	Duplicated	ug/L	6.72r	0.288r	0.288	<0.0231	<0.0298	<0.0212	<0.0269	<0.0269	<0.0337	<0.0212	<0.0288	<0.0337uj	<0.0269	0.240j	<0.0269	0.962r	0.173u	<0.0337
	8/6/2008	Primary	ug/L	45.7j	<0.794	1.37	<0.255	<0.412	<0.333	<0.255	<0.245	<0.245	<0.245	<0.343	<0.304	<0.353	1.96	<0.245	0.686j	2.75	<0.333
	11/18/2008	Primary	ug/L	<2.26	36.8	<2.21	<1.37	<2.21	<1.79	<1.37	<1.32	<1.32	<1.32	<1.84	<1.63	<1.89	<1.89	<1.32	<2.05	<3.21	<1.79
KMW32	2/24/2009	Primary	ug/L	59.7r	<0.0295r	1.88j	0.362j	0.419j	<0.0210r	<0.0267r	<0.0267r	<0.0333r	<0.0210r	<0.0286r	<0.0333r	0.143j	2.94j	<0.0267r	1.01r	4.72j	0.295j
	8/6/2008	Primary	ug/L	3.00j	<0.0786	0.437	<0.0252	<0.0408	<0.0330	<0.0252	<0.0243	<0.0243	<0.0243	<0.0340	<0.0301uj	0.0583j	<0.0350	<0.0243	<0.0379	0.786	0.117
KMW32	11/17/2008	Primary	ug/L	5.75	<2.02	<1.05	<0.650	<1.05	<0.850	<0.650	<0.625	<0.625	<0.625	<0.875	<0.775	<0.900	<0.900	<0.625	<0.975	<1.52	<0.850

TABLE 4

GROUND WATER ANALYTICAL DATA, POLYNUCLEAR AROMATIC HYDROCARBONS

NuStar Portland Terminal, Portland, Oregon

Well ID	Date	Type	Unit	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
KMW32	2/24/2009	Primary	ug/L	2.70r	<0.0304r	0.471	<0.0235	0.108	<0.0216	<0.0275	<0.0275	<0.0343	<0.0216	<0.0294	<0.0343uj	0.0882J	0.431j	<0.0275	0.206r	0.275u	0.186
KMW33	8/5/2008	Primary	ug/L	0.310	<0.0810	2.30	0.900	0.470	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	6.22	<0.0250	<0.0390	<0.0610	0.100
	11/18/2008	Primary	ug/L	<1.08	<2.02	<1.05	<0.650	<1.05	<0.850	<0.650	<0.625	<0.625	<0.625	<0.875	<0.775	<0.900	<0.900	<0.625	<0.975	<1.52	<0.850
	11/18/2008	Duplicated	ug/L	<1.03	<1.95	<1.01	<0.625	<1.01	<0.817	<0.625	<0.601	<0.601	<0.601	<0.841	<0.745	<0.865	<0.865	<0.601	<0.938	<1.47	<0.817
	2/24/2009	Primary	ug/L	0.262r	0.0680Jr	2.51	0.786	0.583	<0.0214	<0.0272	<0.0272	<0.0340	<0.0214	<0.0291	<0.0340uj	0.0971	6.61j	<0.0272	0.427r	0.175u	0.146
KMW34	2/24/2009	Primary	ug/L	0.262r	0.0680Jr	2.51	0.786	0.583	<0.0214	<0.0272	<0.0272	<0.0340	<0.0214	<0.0291	<0.0340uj	0.0971	6.61j	<0.0272	0.427r	0.175u	0.146
	8/5/2008	Primary	ug/L	<0.0430	0.180	<0.0420	0.160	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	0.260	<0.0250	<0.0390	<0.0610	<0.0340
	11/18/2008	Primary	ug/L	<0.0430	<0.0810	<0.0420	<0.0260	<0.0420	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	<0.0360	<0.0250	<0.0390	<0.0610	<0.0340
	2/24/2009	Primary	ug/L	<0.0298r	<0.0298r	<0.0327	<0.0231	<0.0298	<0.0212	<0.0269	<0.0269	<0.0337	<0.0212	<0.0288	<0.0337uj	<0.0269	<0.0308uj	<0.0269	<0.0481r	0.0481Ju	<0.0337
KMW35	8/5/2008	Primary	ug/L	55.4	31.1	0.630	0.250	<0.0420	<0.0340	<0.0260	<0.0250	0.190	<0.0250	<0.0350	<0.0310	<0.0360	1.85	<0.0250	3.92	1.23	<0.0340
	11/19/2008	Primary	ug/L	<0.422	<0.794	<0.412r	<0.255r	2.16j	19.3j	8.14j	55.0j	3.33j	4.22j	24.7j	4.22j	35.6j	<0.353r	0.588J	<0.382	7.75j	35.0j
	2/24/2009	Primary	ug/L	76.3r	45.2r	0.819j	0.267j	<0.0295r	<0.0210r	<0.0267r	<0.0267r	<0.0333r	<0.0210r	<0.0286r	<0.0333r	0.0667J	2.57j	<0.0267r	37.2r	1.97j	0.0857J
	8/7/2008	Primary	ug/L	0.696	<0.0794	1.00	0.333	0.0980	<0.0333	<0.0255	<0.0245	<0.0245	<0.0245	<0.0343	<0.0304	<0.0353	1.71	<0.0245	<0.0382	1.15	<0.0333
KMW36	11/19/2008	Primary	ug/L	0.731	0.115	0.0865J	0.250j	1.18j	<0.0327	<0.0250	<0.0240	<0.0240	<0.0240	<0.0337	<0.0298	<0.0346	1.59j	<0.0240	0.635u	1.04	<0.0327
	2/25/2009	Primary	ug/L	1.52	0.0980	0.961	0.275	0.167	<0.0216	<0.0275	<0.0275	<0.0343uj	<0.0216	<0.0294	<0.0343uj	<0.0275	1.76	<0.0275uj	<0.0490	1.14	<0.0343
	8/6/2008	Primary	ug/L	4.45j	<0.0794	0.225	<0.0255	<0.0412	<0.0333	<0.0255	<0.0245	<0.0245	<0.0245	<0.0343	<0.0304	<0.0353	0.765	<0.0245	<0.0382	<0.0598	<0.0333
KMW37	11/18/2008	Primary	ug/L	6.52	6.19	<0.200	0.238J	0.238J	<0.162	<0.124	<0.119	<0.119	<0.119	<0.167	<0.148	<0.171	1.43	<0.119	2.71	2.10	<0.162
	2/24/2009	Primary	ug/L	17.1r	<0.0295r	0.238j	0.0952j	0.143j	<0.0210r	<0.0267r	<0.0267r	<0.0333r	<0.0210r	<0.0286r	<0.0333r	<0.0267r	0.657j	<0.0267r	0.524r	0.914j	<0.0333r
	8/7/2008	Primary	ug/L	14.6	11.0	0.760	0.120	0.150	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	0.940	<0.0250	6.57	1.91	0.100
MW38	11/19/2008	Primary	ug/L	4.21	2.84	0.0962j	<0.0250r	<0.0404	<0.0327	<0.0250	<0.0240	<0.0240	<0.0240	<0.0337	<0.0298	0.0769J	0.0577J	<0.0240	1.12	0.750	0.0769J
	2/24/2009	Primary	ug/L	6.40r	2.46r	0.543	0.0952	0.152	<0.0210	<0.0267	<0.0267	<0.0333	<0.0210	<0.0286	<0.0333uj	<0.0267	0.724j	<0.0267	0.448r	1.30	0.0762J
	8/7/2008	Primary	ug/L	63.0	40.0	0.780	0.190	0.0900J	<0.0340	<0.0260	<0.0250	<0.0250	<0.0250	<0.0350	<0.0310	<0.0360	0.950	<0.0250	220	1.08	<0.0340
MW39	11/19/2008	Primary	ug/L	38.2j	64.2j	0.0784J	0.108j	0.0686J	<0.0333	<0.0255	<0.0245	<0.0245	<0.0245	<0.0343	<0.0304	<0.0353	0.892j	<0.0245	235j	0.962j	<0.0333
	2/25/2009	Primary	ug/L	39.8r	61.9r	0.709j	0.136j	0.0971j	<0.0214	<0.0272	<0.0272	<0.0340	<0.0214	<0.0291	<0.0340uj	<0.0272	1.14j	<0.0272	183r	1.25j	<0.0340
	8/6/2008	Primary	ug/L	<0.0422	<0.0794	<0.0412	<0.0255	<0.0412	<0.0333	<0.0255	<0.0245	<0.0245	<0.0245	<0.0343	<0.0304uj	<0.0353	<0.0353	<0.0245	<0.0382	<0.0598	<0.0333
MW40	11/19/2008	Primary	ug/L	<0.0410	<0.0771	<0.0400r	<0.0248r	<0.0400r	<0.0324	<0.0248	<0.0238	<0.0238	<0.0238	<0.0333	<0.0295	<0.0343	<0.0343r	<0.0238	0.0476Ju	<0.0581	<0.0324
	2/25/2009	Primary	ug/L	<0.0298	<0.0298	<0.0327	<0.0231	<0.0298	<0.0212	<0.0269	<0.0269	<0.0337uj	<0.0212	<0.0288	<0.0337uj	<0.0269	<0.0308	<0.0269uj	0.0481J	<0.0231uj	<0.0337
	2/25/2009	Duplicated	ug/L	<0.0307	<0.0307	<0.0337	<0.0238	<0.0307	<0.0218	<0.0277	<0.0277	<0.0347uj	<0.0218	<0.0297	<0.0347uj	<0.0277	<0.0317	<0.0277uj	0.0495J	0.149j	0.0693J
	8/5/2008	Primary	ug/L	<0.0417	<0.0786	<0.0408	<0.0252	<0.0408	<0.0330	<0.0252	<0.0243	<0.0243	<0.0243	<0.0340	<0.0301	<0.0350	<0.0350	<0.0243	<0.0379	<0.0592	0.136
W-15	11/19/2008	Primary	ug/L	19.9	0.648	<0.0400r	<0.0248r	0.0762J	<0.0324	<0.0248	<0.0238	<0.0238	<0.0238	<0.0333	<0.0295	<0.0343	<0.0343r	<0.0238	<0.0371	0.114	<0.0324
	2/23/2009	--	ug/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	8/5/2008	Primary	ug/L	<0.0413	<0.0779	0.288	<0.0250	<0.0404	<0.0327	<0.0250	<0.0240	<0.0240	<0.0240	<0.0337	<0.0298	0.0962	0.683	<0.0240	0.250	<0.0587	0.135
W-16	11/19/2008	Primary	ug/L	0.123	<0.0764	0.208	0.0849J	<0.0396	<0.0321	<0.0245	<0.0236	<0.0236	<0.0236	<0.0330	<0.0292	0.0943	0.651	<0.0236	0.208	0.0755J	0.113
	2/25/2009	Primary	ug/L	0.157	<0.0304	0.235	<0.0235	<0.0304	<0.0216	<0.0275	<0.0275	<0.0343uj	<0.0216	<0.0294	<0.0343uj	0.0784J	0.441	<0.0275uj	0.294	<0.0235	0.108
	8/5/2008	Primary	ug/L	0.442j	<0.0779	3.42	0.673	0.221	<0.0327	<0.0250	<0.0240	<0.0240	<0.0240	<0.0337	<0.0298	0.0865J	2.23	<0.0240	<0.0375	1.97	0.192
W-19	11/19/2008	Primary	ug/L	<0.209	<0.393	<0.204	0.243J	0.291J	<0.165	<0.126	<0.121	<0.121	<0.121	<0.170	<0.150	<0.175	1.46	<0.121	0.388J	1.12	<0.165
	2/25/2009	Primary	ug/L	0.0686J	<0.0304	0.637	0.0588J	0.118	<0.0216	<0.0275	<0.0275	<0.0343uj	<0.0216	<0.0294	<0.0343uj	<0.0275	0.216	<0.0275uj	<0.0490	0.147	0.0784J
	8/5/2008	Primary	ug/L	<0.0413	<0.0779	<0.0404	<0.0250	<0.0404	<0.0327	<0.0250	<0.0240	<0.0240	<0.0240	<0.0337	<0.0298	<0.0346	<0.0346	<0.0240	<0.0375	<0.0587	<0.0327
W-20	11/19/2008	Primary	ug/L	<0.0422	<0.0794	<0.0412	<0.0255	<0.0412	<0.0333	<0.0255	<0.0245	<0.0245	<0.0245	<0.0343	<0.0304	<0.0353	<0.0353	<0.0245	<0.0382	<0.0598	<0.0333
	2/25/2009	Primary	ug/L	<0.0304	<0.0304	<0.0333	<0.0235	<0.0304	<0.0216	<0.0275	<0.0275	<0.0343uj	<0.0216	<0.0294	<0.0343uj	<0.0275	<0.0314	<0.0275uj	<0.0490	<0.0235	<0.0343
	8/5/2008	Primary	ug/L	<0.0410	<0.0771	<0.0400	<0.0248	<0.0400	<0.0324	<0.0248	<0.0238	<0.0238	<0.0238	<0.0333	<0.0295	<0.0343	<0.0343r	<0.0238	<0.0371	0.114	<0.0324
W-22	11/19/2008	Primary	ug/L	<0.0413	<0.0779	<0.0404	<0.0250	<0.0404	<0.0327	<0.0250	<0.0240	<0.0240	<0.0240	<0.0337	<0.0298	<0.0346	<0.0346	<0.0240	<0.0375	<0.0587	<0.0327
	2/25/2009	Primary	ug/L	<0.0304r	0.0490Jr	<0.0333	<0.0235	<0.0304	<0.0216	<0.0275	<0.0275	<0.0343	<0.0216	<0.0294	<0.0343uj	<0.0275	<0.0314uj	<0.0275	0.137r	<0.0235	<0.0343

TABLE 4

GROUND WATER ANALYTICAL DATA, POLYNUCLEAR AROMATIC HYDROCARBONS

NuStar Portland Terminal, Portland, Oregon

Well ID	Date	Type	Unit	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene

Notes:

< = Concentration as reported by the analytical laboratory is less than the Method Detection Limit (MDL).

ug/L = microgram(s) per liter.

Quality Assurance/Quality Control Data Qualifiers.

U or u reported analyte was not detected.

J or j reported result is an estimated value.

UJ or uj reported analyte was not detected and reporting limit is an estimated value.

R or r reported result is rejected and unusable.

Flags shown with capital letters are qualifiers by the analytical laboratory, and flags with lower?case letters are from the data validation process.

Polynuclear aromatic hydrocarbons analyzed by EPA Method 8270C with selective ion monitoring.

TABLE 5

STORM SEWER SAMPLING ANALYTICAL RESULTS

NuStar Portland Terminal, Portland, Oregon

Sample Identification	Sample Location	Sample Date	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Total Xylenes µg/L	MTBE µg/L	Naphthalene µg/L	TPH Gasoline mg/L	TPH Diesel mg/L	TPH Motor Oil mg/L
WP202-080802	WP-202 Outfall	8/8/2002	<0.20	<0.20	<0.20	<0.60	<0.30	<1.0	<0.050	<0.000084	<0.00011
WP-202A-101508	WP-202 Manhole Nearest the Outfall	10/15/2008	<0.270	1.23	0.240J	1.35J	<0.420	0.0686J	<0.043	0.0549J	0.140u
WP-202A-010809	WP-202 Manhole Nearest the Outfall	1/8/2009	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0382	<0.043	0.0251J	0.169
AAC505o-101508	WP-202 Manhole Upstream of Plant Tie-ins	10/15/2008	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0390uj	<0.043	0.0731u	0.0539u
AAC505o-010809	WP-202 Manhole Upstream of Plant Tie-ins	1/8/2009	<0.270uj	<0.280uj	<0.240uj	<0.860uj	<0.420	<0.0390	<0.043uj	0.0509J	0.181
WP-209-080802	WP-209 Outfall	8/8/2002	430	6000	58	140	100	8.9	17	0.00078	0.00012J
OF-WP209-051303	WP-209 Outfall	5/13/2003	150	74	33	53	100	2	0.900	0.17	<0.10
WP209-OF	WP-209 Outfall	8/14/2003	99	32	41	76	6	2	0.900	0.16	ND
Lower Outfall (WP-209 Outfall)	WP-209 Outfall	3/24/2006	38.2	14.8	3.82	11.7	40.3	<5.0	0.167	235.0	104.0
WP209outfall-102908	WP-209 Outfall	10/29/2008	0.840J	0.790J	<0.240	1.27J	0.510J	<0.0375	0.0963J	0.149	0.0470Ju
WP209outfall-040109	WP-209 Outfall	4/1/2009	<0.270	0.320J	<0.240	<0.860	<0.420	<0.0526	<0.043uj	0.0656J	0.173
SW-WP209-051309	WP-209 Lower Section Inlet	5/13/2003	<0.5	<0.7	<0.8	<0.8	<0.5	<1	<0.050	<0.080	<0.10
WP-209-RR	WP-209 Lower Section Inlet	8/14/2003	<0.5	<0.7	<0.8	<0.8	<0.5	<1	<0.050	<0.080	<0.10
Mid-Inlet (Sewer Line 1 Opening)	WP-209 Lower Section Inlet	3/24/2006	<1.0	<1.0	<1.0	<3.0	<1.0	<5.0	<0.100	<96.2	<96.2
WP-209inlet-102908	WP-209 Lower Section Inlet	10/29/2008	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0371	<0.043uj	0.0374J	0.0453Ju
WP-209inlet-040109	WP-209 Lower Section Inlet	4/1/2009	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0500	0.0857Ju	0.0352J	0.227

Notes

µg/L = micrograms per liter

MTBE = methyl tertiary butyl ether

TPH = total petroleum hydrocarbons

TABLE 6

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

NuStar (former ExxonMobil) Portland Terminal
9420 NW St. Helens Road, Portland, Oregon

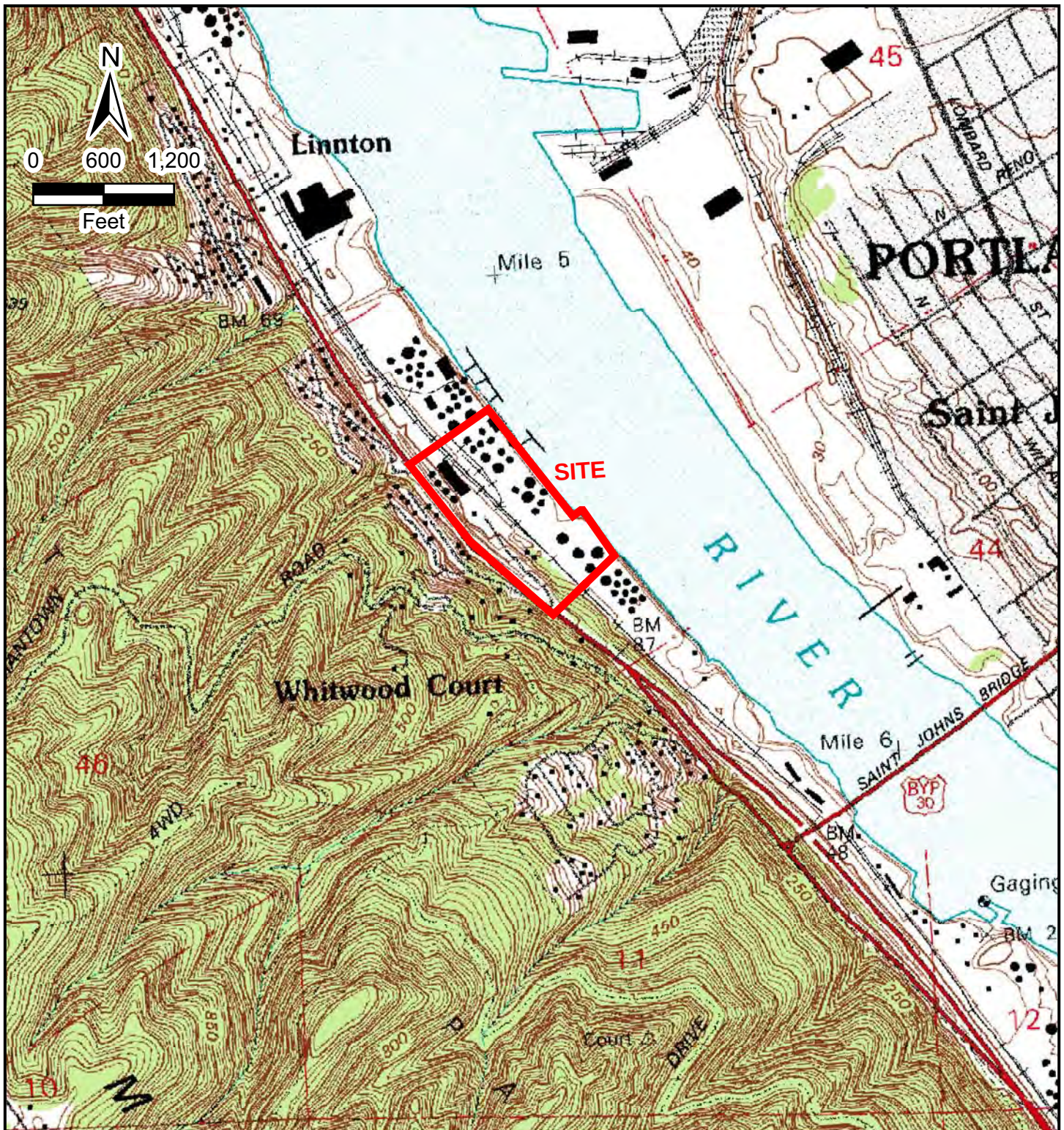
Alternative	Effectiveness	Implementability	Installation Costs	Annual O&M Costs	Net Present Value ^a
Dual Phase Extraction (Alternative 1)	- Relies on system operation for hydraulic control without a physical barrier - Achieves inward hydraulic gradient from the river during periods of lowest river stages - Vapor extraction component offers some treatment benefit in addition to hydraulic control	Requires coordination with site operations and working around infrastructure, but no foreseeable issues are considered unsolvable	• \$716,000	• 302,000	• \$4,002,000
Combined Ground Water Extraction and Dual Phase Extraction (Alternative 2)	- Relies on system operation for hydraulic control without a physical barrier - Achieves inward hydraulic gradient from the river during periods of lowest river stages - Operates more efficiently than dual phase extraction alone - Vapor extraction component offers some treatment benefit in addition to hydraulic control	- Requires coordination with site operations and working around infrastructure, but no foreseeable issues are considered unsolvable - Incremental greater effort than dual phase extraction alone with design and installation of additional ground water equipment, conveyance piping, and controls Greater operational complexity compared to dual phase extraction alone	• \$829,000	• \$280,000	• \$3,881,000
Concrete Sealant Applied to the Revetment with Dual Phase Extraction (Alternative 3)	- Physical barrier in addition to extraction operation for additional protection of river - Potentially achieves inward hydraulic gradient from the river during periods of lowest river stages - Vapor extraction component offers some treatment benefit in addition to hydraulic control - Incremental improved operating efficiency from physical barrier limiting river water intrusion during high river stages	- Requires coordination with site operations and working around infrastructure, but no foreseeable issues are considered unsolvable - Dual phase extraction component easier to design, install, and operate than combined ground water and dual phase extraction Handling of chemical(s) at the riverfront presents additional risks compared to other alternatives	• \$905,000	• \$296,000	• \$4,126,000

Notes

^a Net present value calculated for 15 years using an inflation factor of 3 percent and a discount rate of 7 percent

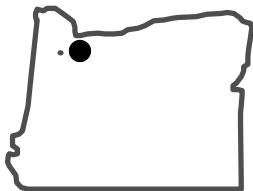
COCs = constituents of concern

O&M = operation and maintenance



NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.



QUADRANGLE LOCATION

General Notes:
Base Map from U.S.G.S.
Portland, Oregon
7.5 Minute Topographic
Quadrangle

**FIGURE 1
SITE LOCATION MAP**

NuStar Portland Terminal
9420 NW St. Helens Road, Portland, Oregon



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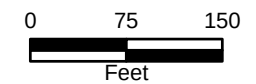
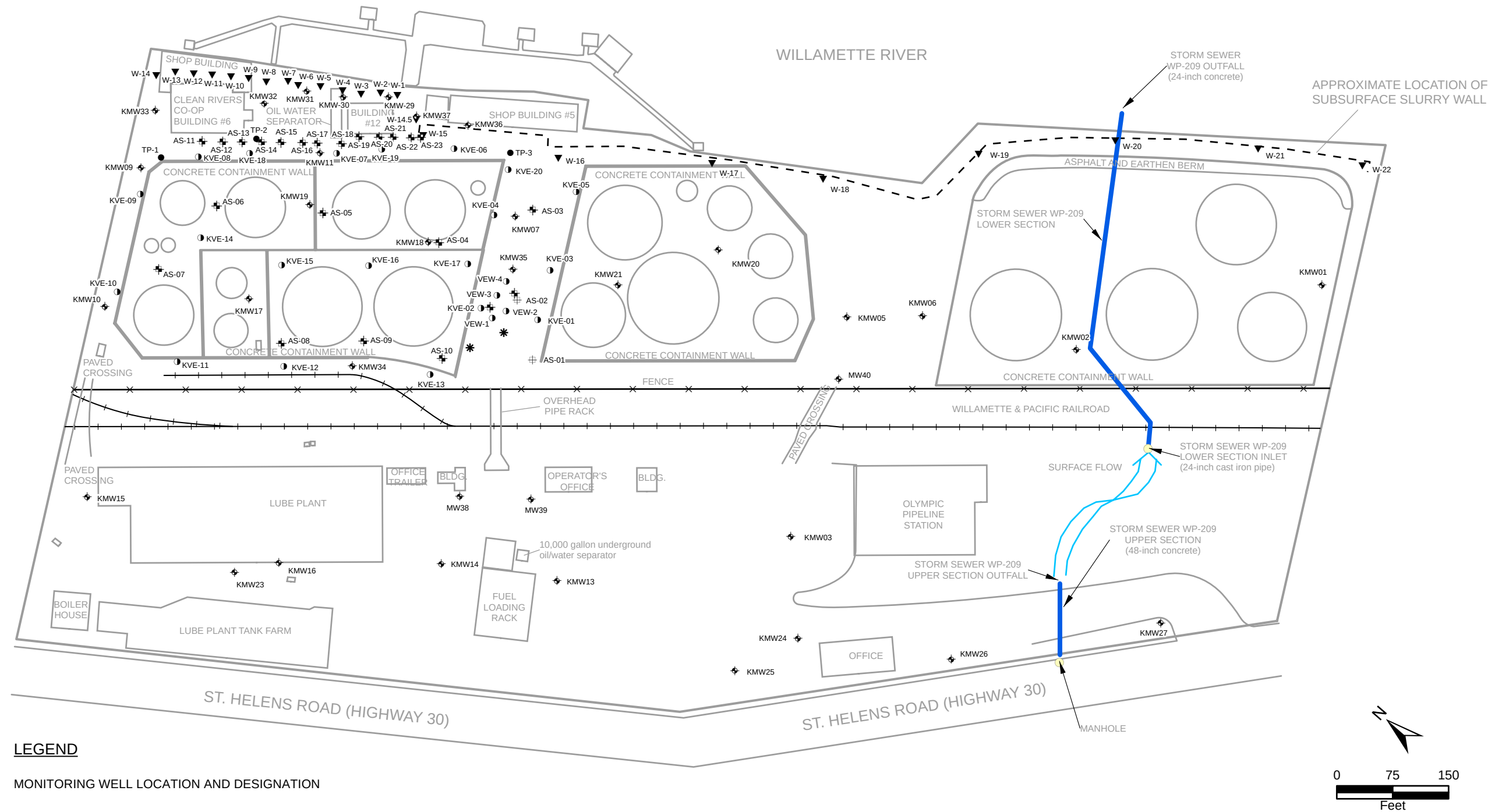


FIGURE 2

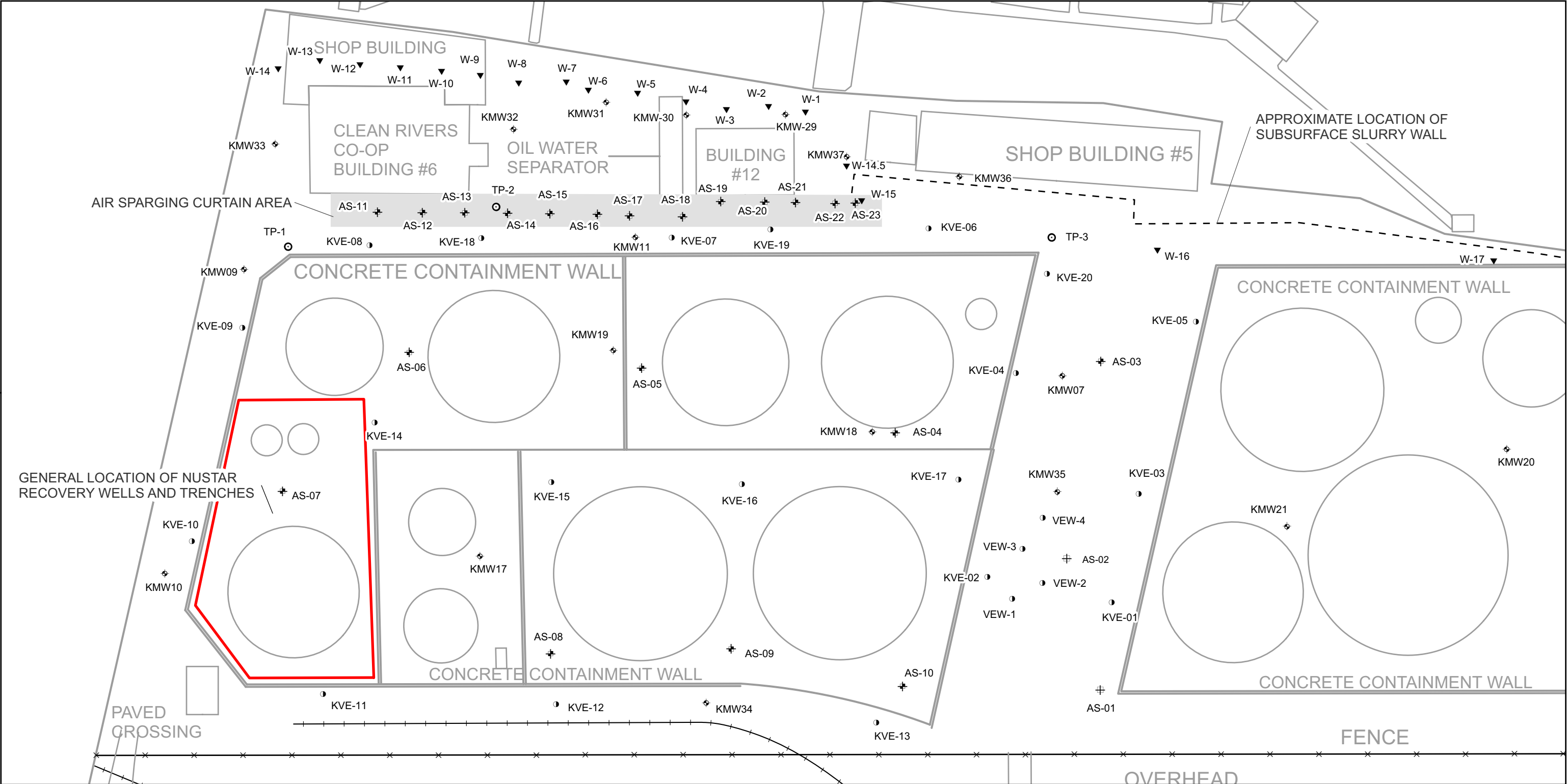
SITE MAP

NuStar Portland Terminal
9420 NW St. Helens Road, Portland, Oregon



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LEGEND

- KMW11 MONITORING WELL LOCATION AND DESIGNATION
- AS-05 AIR SPARGING WELL LOCATION AND DESIGNATION
- KVE-01 VAPOR EXTRACTION WELL LOCATION AND DESIGNATION
- W-11 GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)
- TP-1 TEMPORARY VAPOR MONITORING WELL LOCATION AND DESIGNATION
- AS-01 AIR SPARGING WELL NOT CONNECTED TO REMEDIATION SYSTEM

NOTES

- ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
- SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.

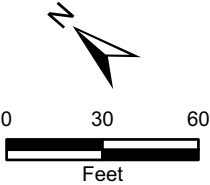


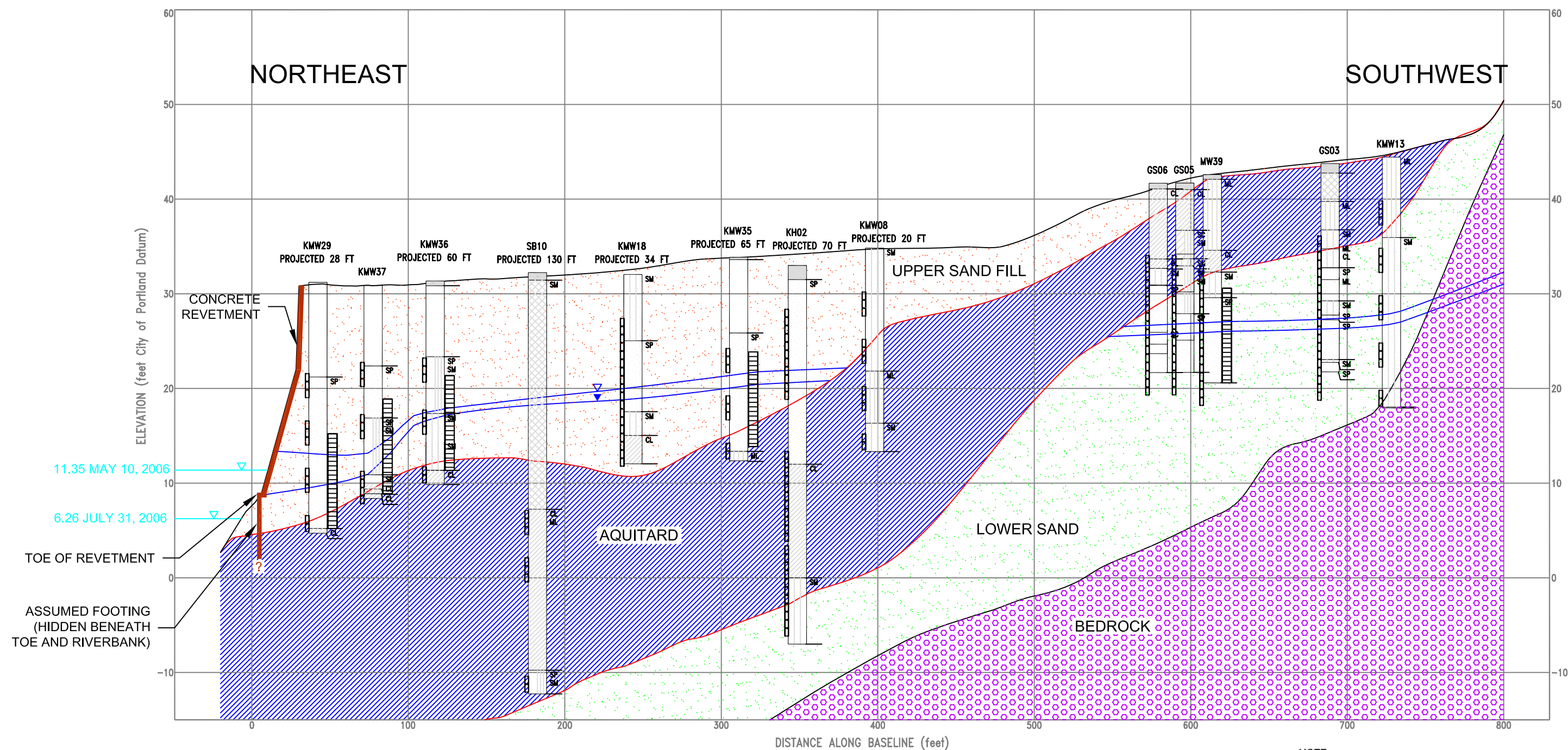
FIGURE 3
SITE MAP DETAIL
NORTH TANK FARM AREA

NuStar Portland Terminal
9420 NW St. Helens Road, Portland, Oregon



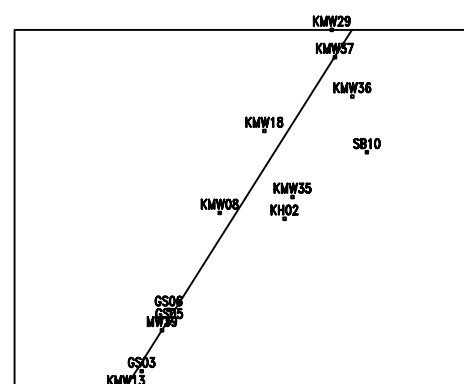
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NOTE:
HYDROSTRATIGRAPHIC UNIT CONTACTS
FROM THREE-DIMENSIONAL MODEL OF SITE.

CROSS SECTION LOCATION



EXPLANATION:

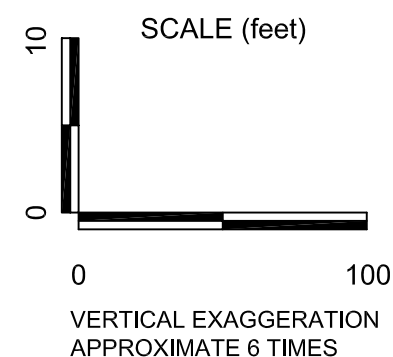
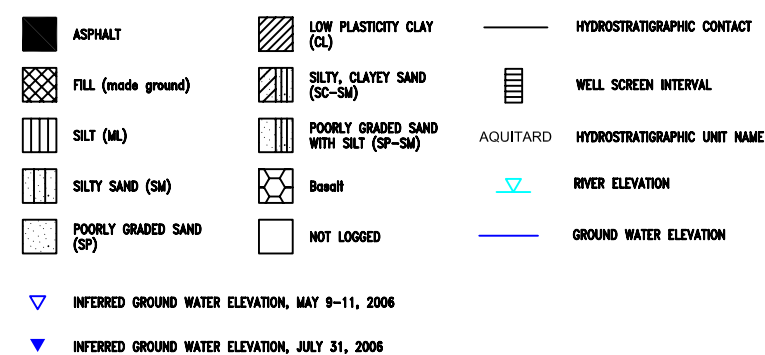


FIGURE 4
STRATIGRAPHIC CROSS SECTION

NuStar Portland Terminal
9420 NW St. Helens Road, Portland, Oregon



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LITHOLOGY

UPPER SAND

AQUITARD

LOWER SAND

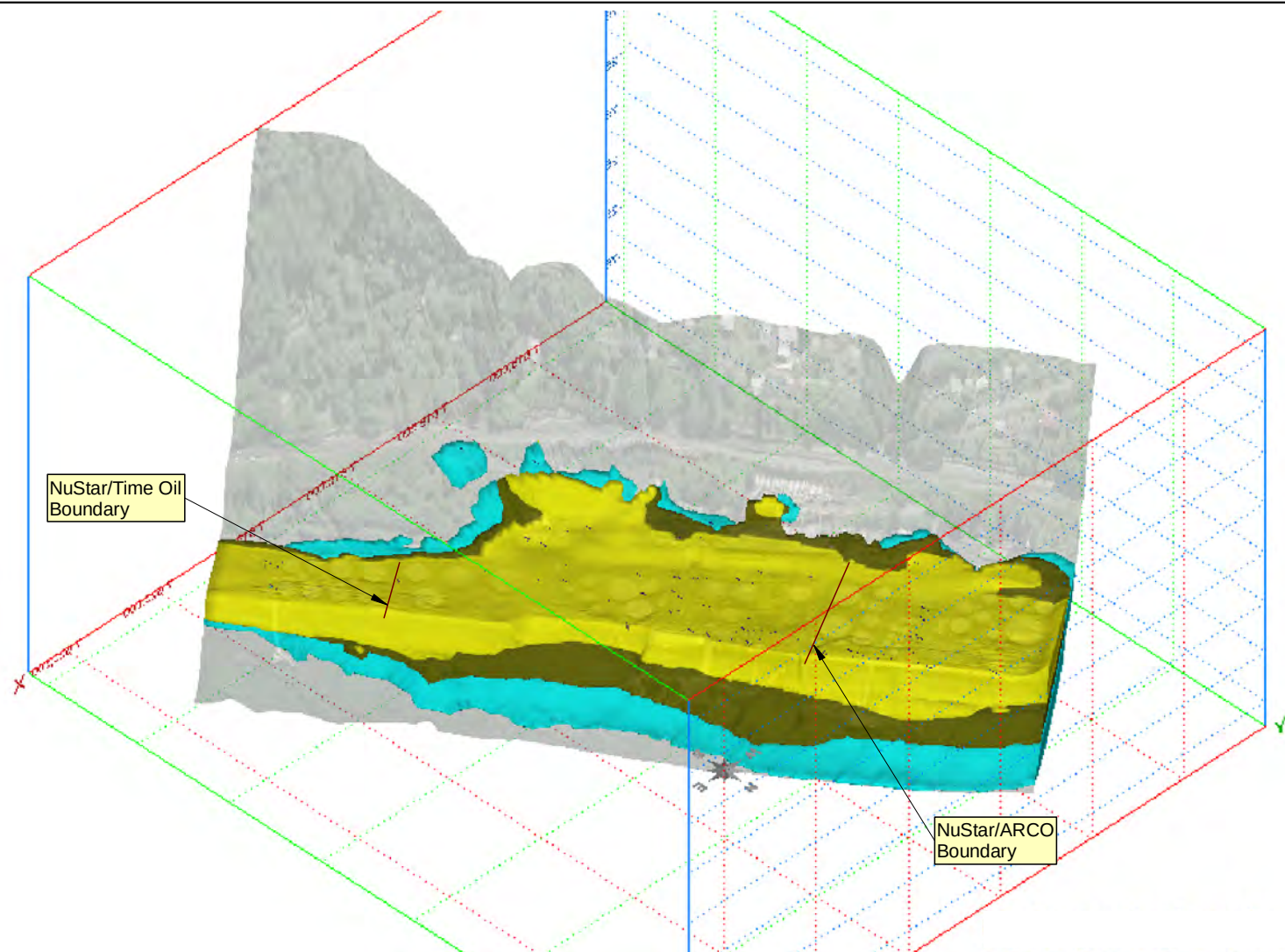


FIGURE 5
STRATIGRAPHIC VISUALIZATION

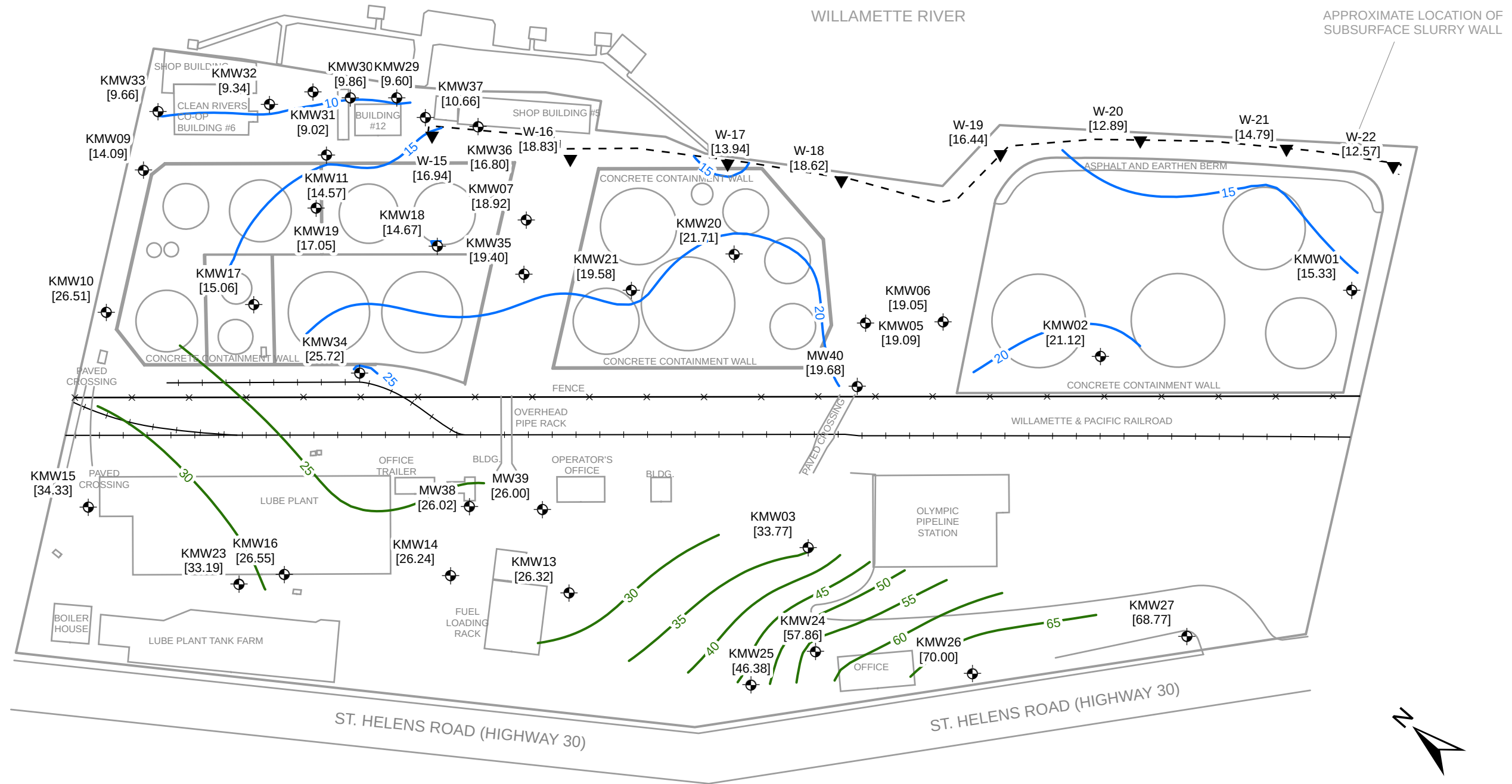
NuStar Portland Terminal
9420 NW St. Helens Road, Portland, Oregon



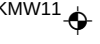
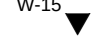
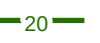
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LEGEND

-  KMW11 MONITORING WELL LOCATION AND DESIGNATION
-  W-15 GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)
-  50 GROUND WATER ELEVATION CONTOUR UPPER SAND FILL FEET CITY OF PORTLAND DATUM
-  20 GROUND WATER ELEVATION CONTOUR LOWER SAND UNIT AND BEDROCK (UNITS BELOW AQUITARD) FEET CITY OF PORTLAND DATUM
- [14.57] GROUND WATER ELEVATION FEET CITY OF PORTLAND DATUM

NOTES

- ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
- SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.

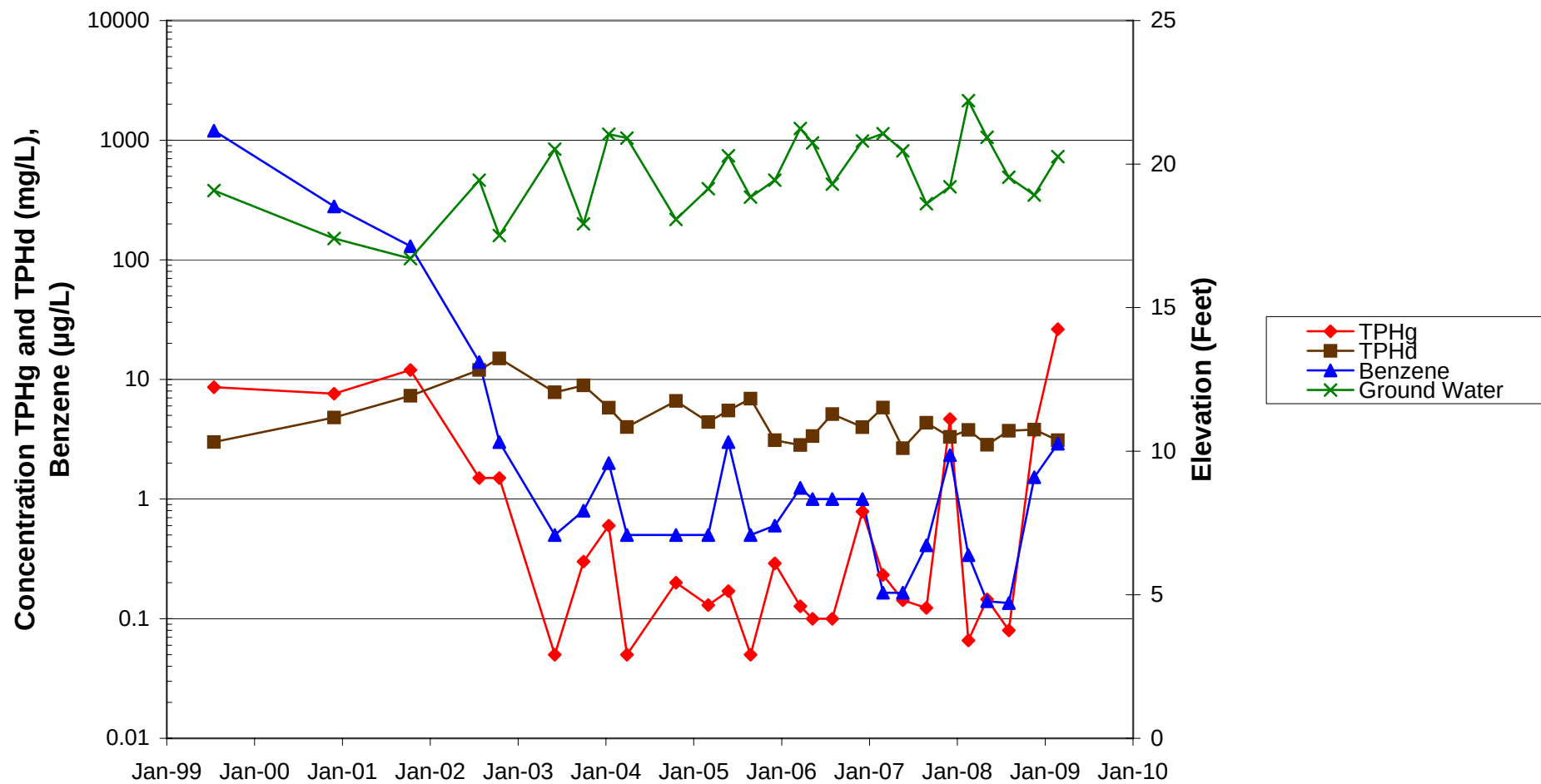
FIGURE 6
GROUND WATER ELEVATION MAP
NOVEMBER 17, 2008

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LEGEND

TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
mg/L	MILLIGRAMS PER LITER
µg/L	MICROGRAMS PER LITER

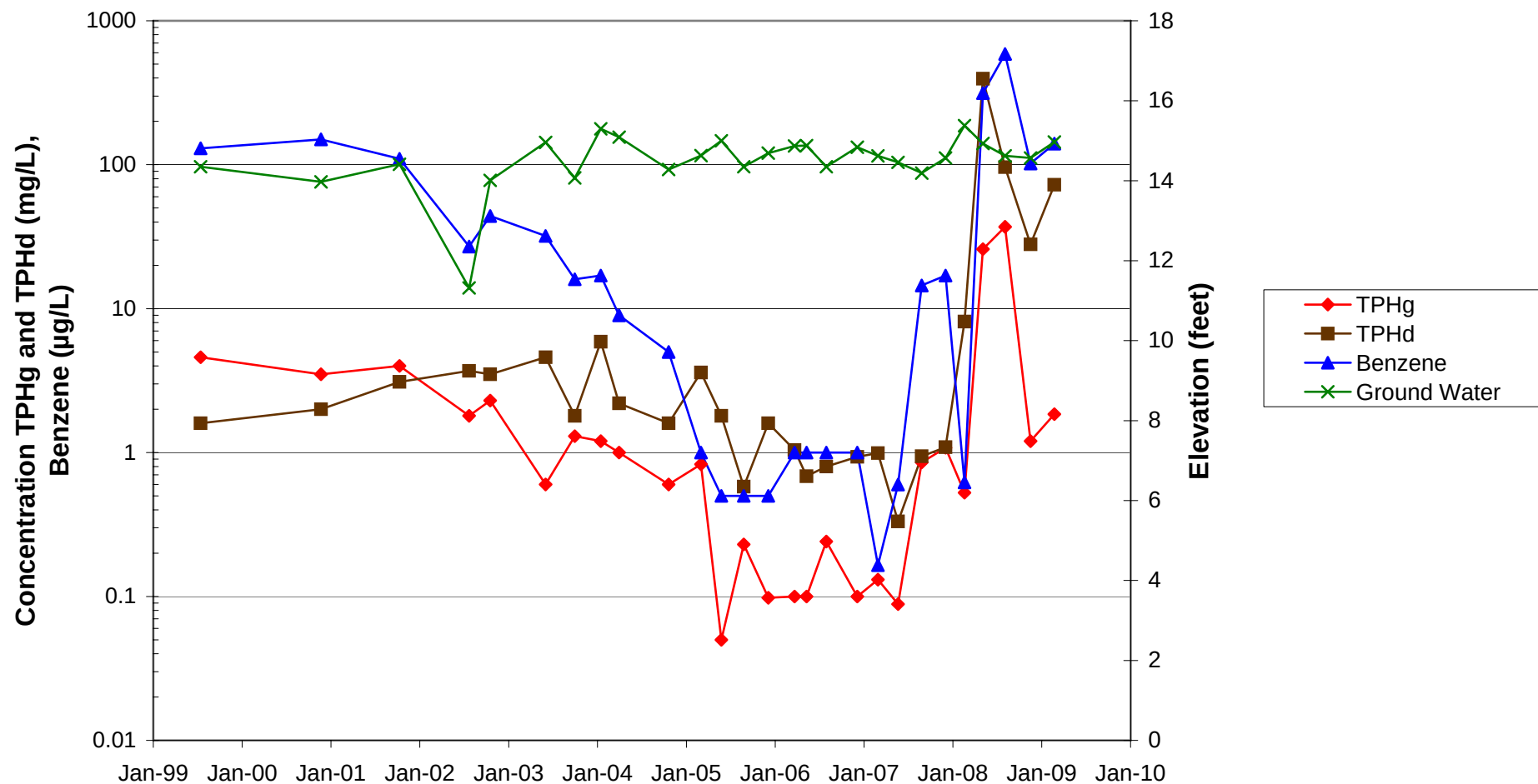
FIGURE 7
MONITORING WELL KMW07
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 1999 TO 2009

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LEGEND

TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
mg/L	MILLIGRAMS PER LITER
µg/L	MICROGRAMS PER LITER

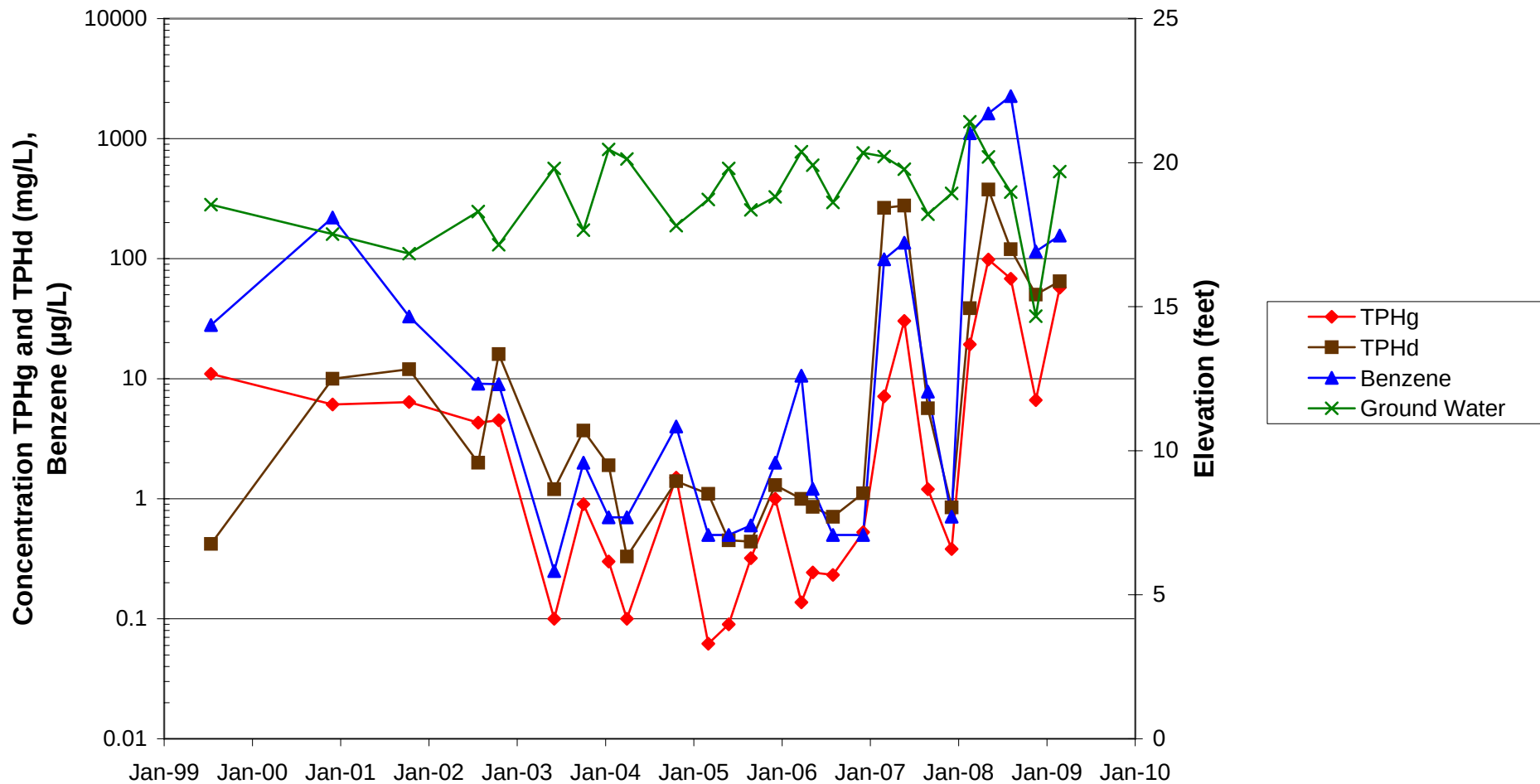
FIGURE 8
MONITORING WELL KMW11
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 1999 TO 2009

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LEGEND

TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
mg/L	MILLIGRAMS PER LITER
µg/L	MICROGRAMS PER LITER

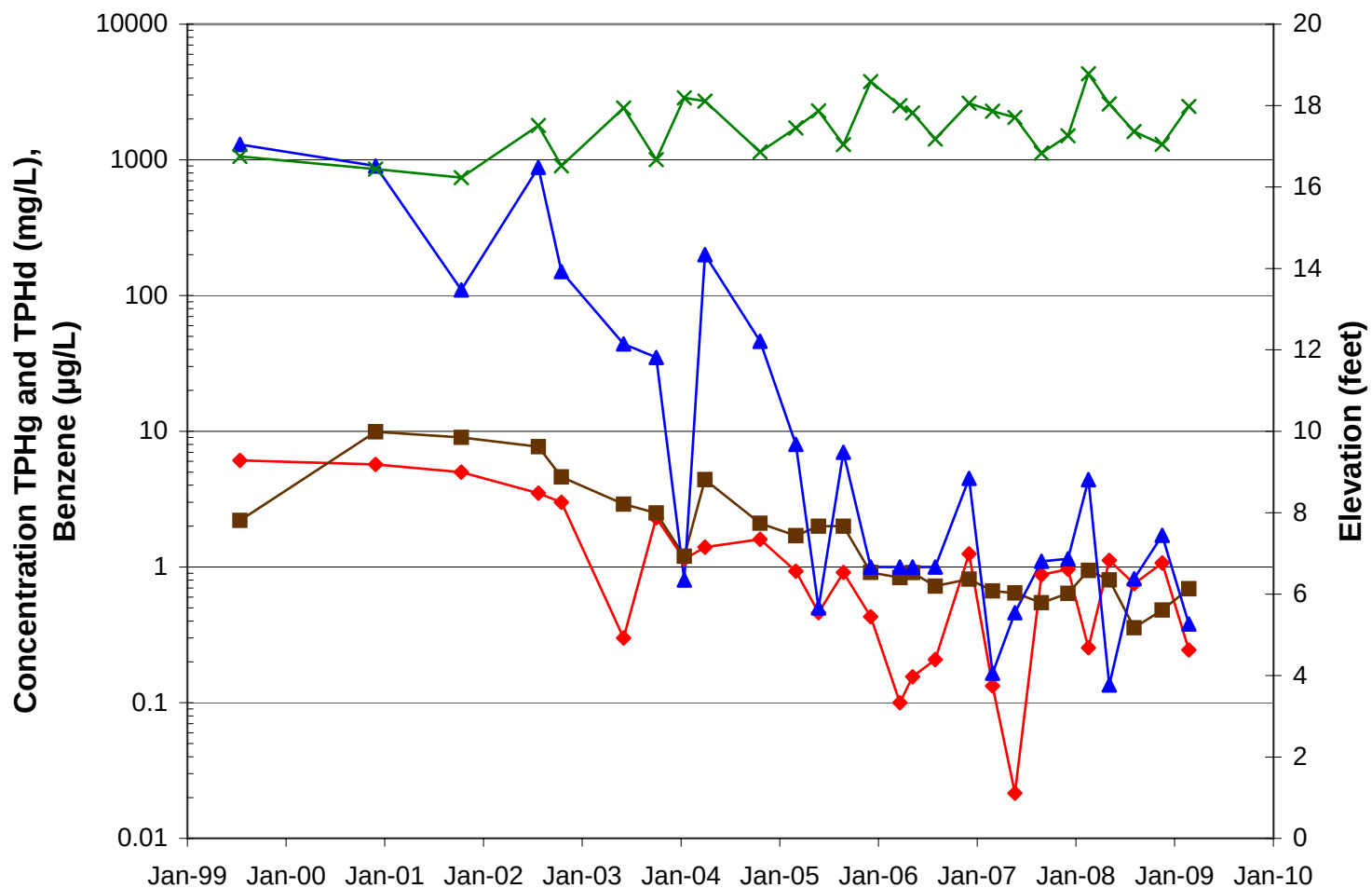
FIGURE 9
MONITORING WELL KMW18
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 1999 TO 2009

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LEGEND

TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
mg/L	MILLIGRAMS PER LITER
µg/L	MICROGRAMS PER LITER

Sampling Date

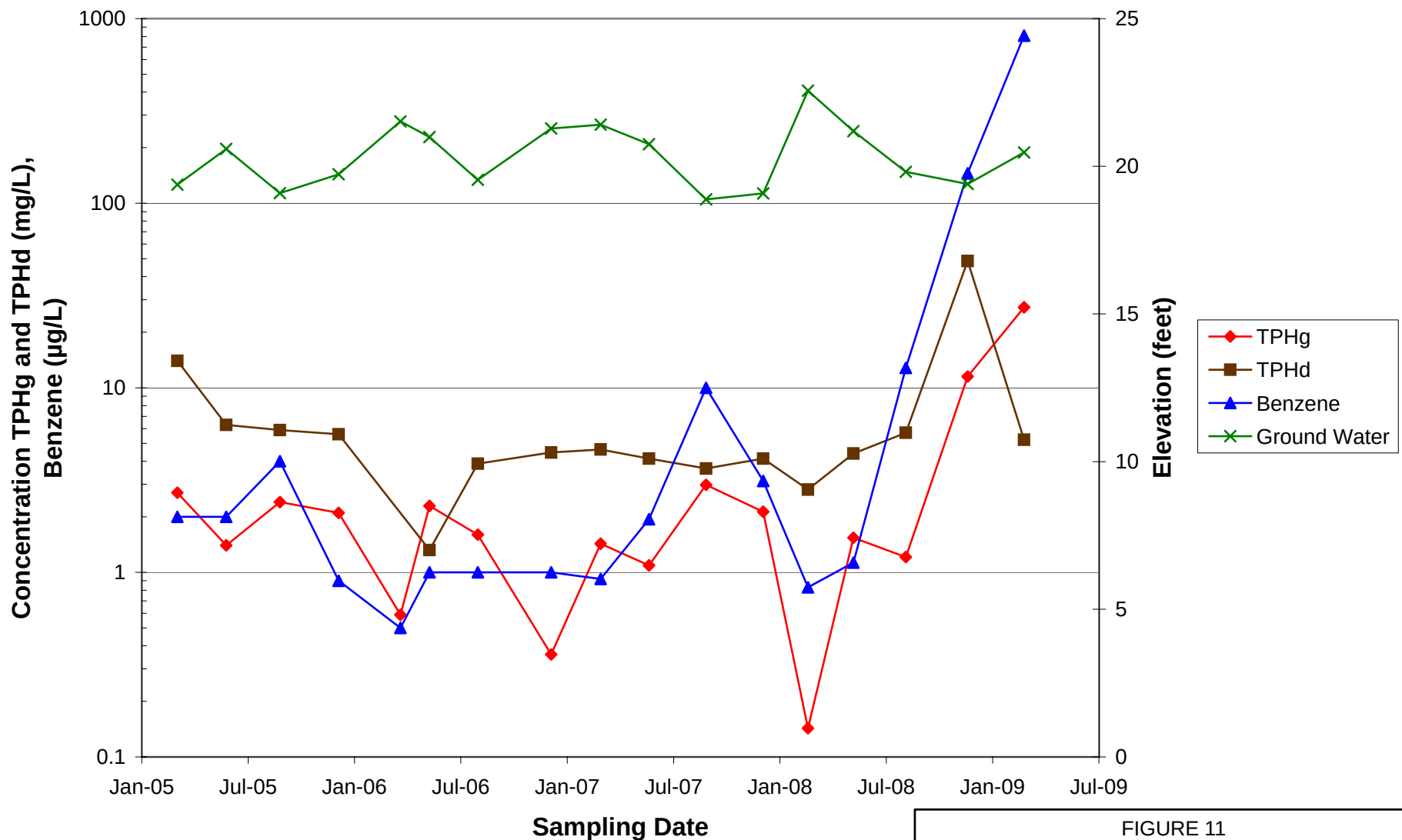
FIGURE 10
MONITORING WELL KMW19
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 1999 TO 2009

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LEGEND

TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
mg/L	MILLIGRAMS PER LITER
µg/L	MICROGRAMS PER LITER

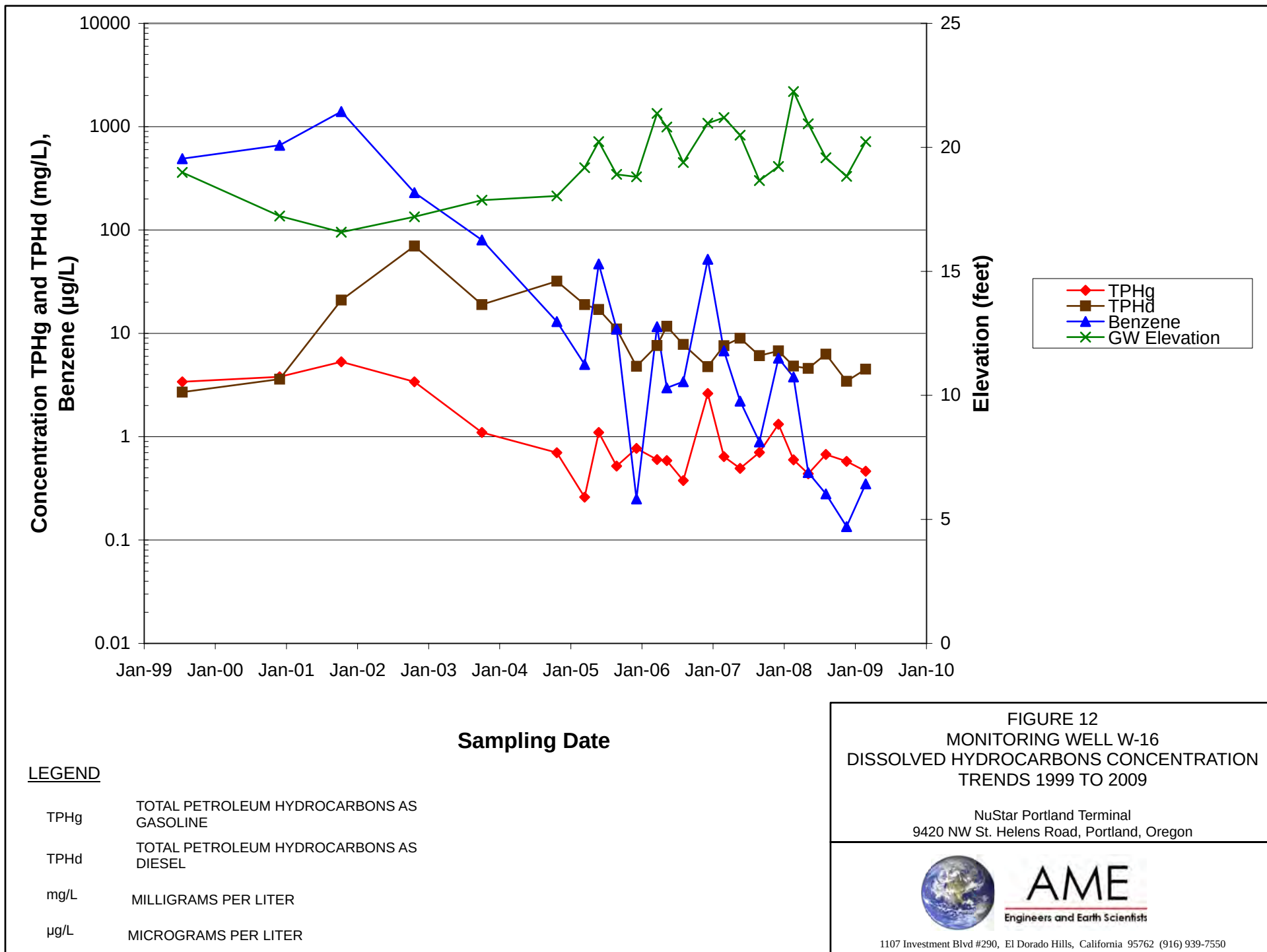
FIGURE 11
MONITORING WELL KMW35
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 2005 TO 2009

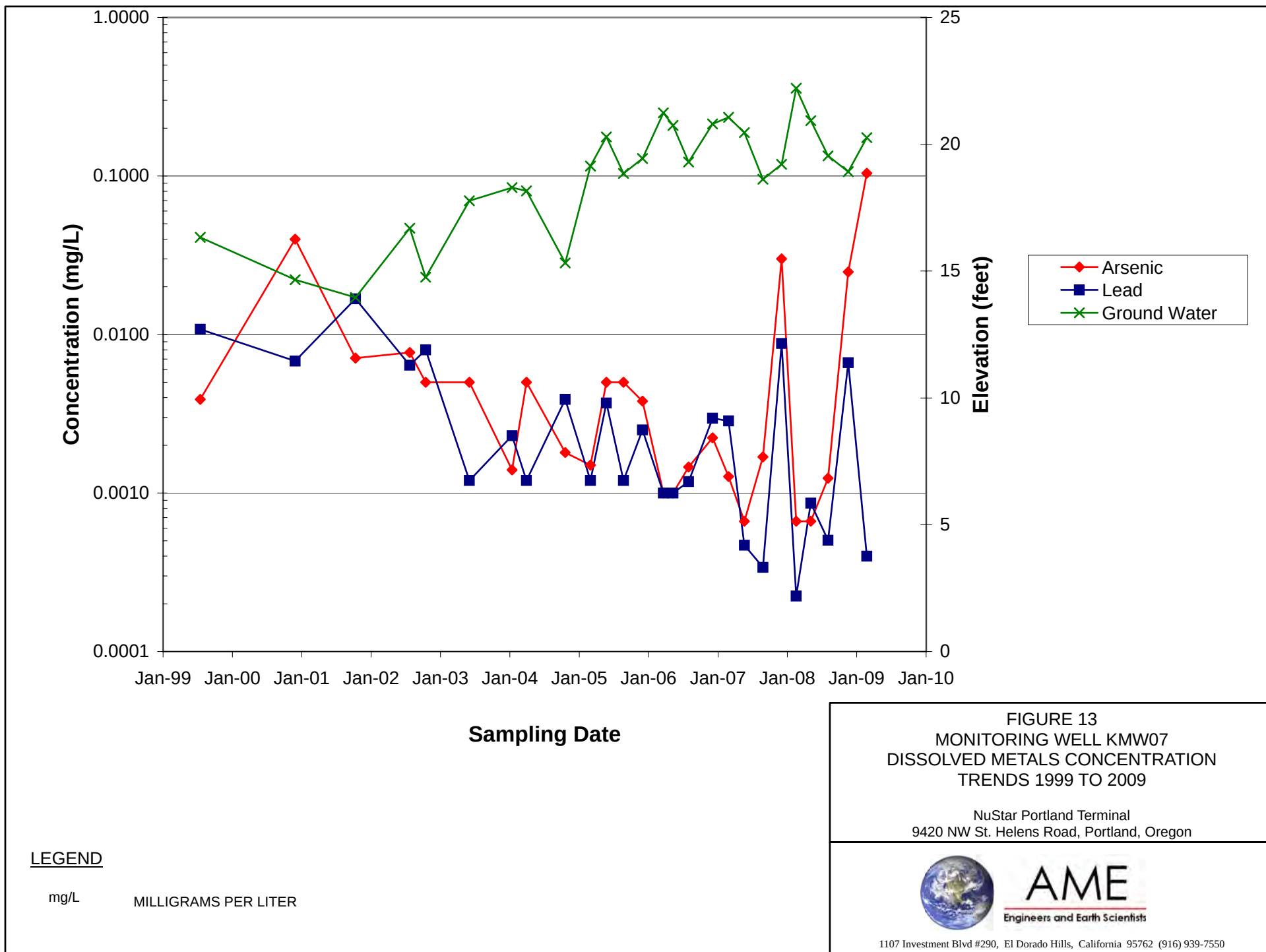
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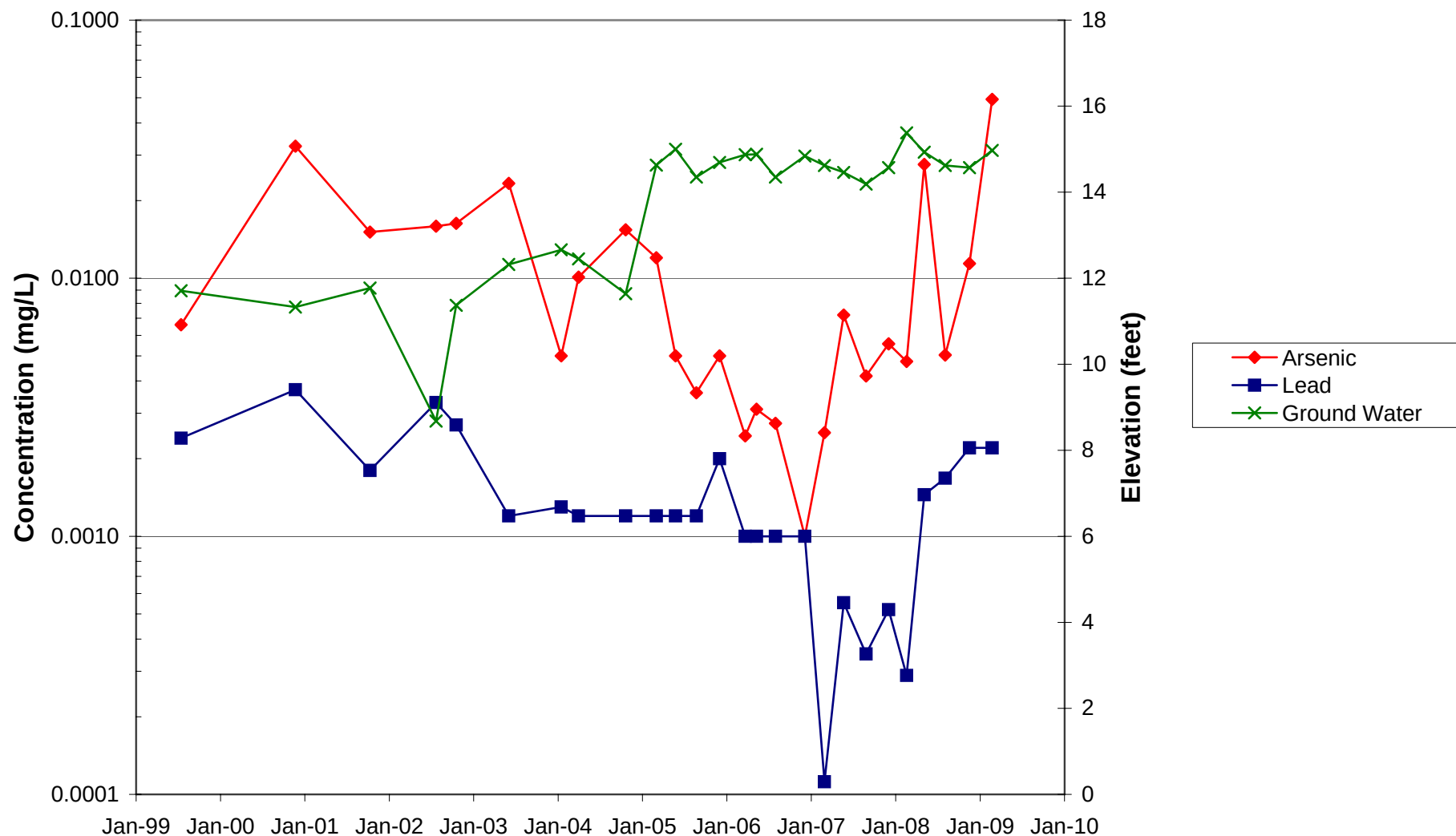


FIGURE 14
MONITORING WELL KMW11
DISSOLVED METALS CONCENTRATION
TRENDS 1999 TO 2009

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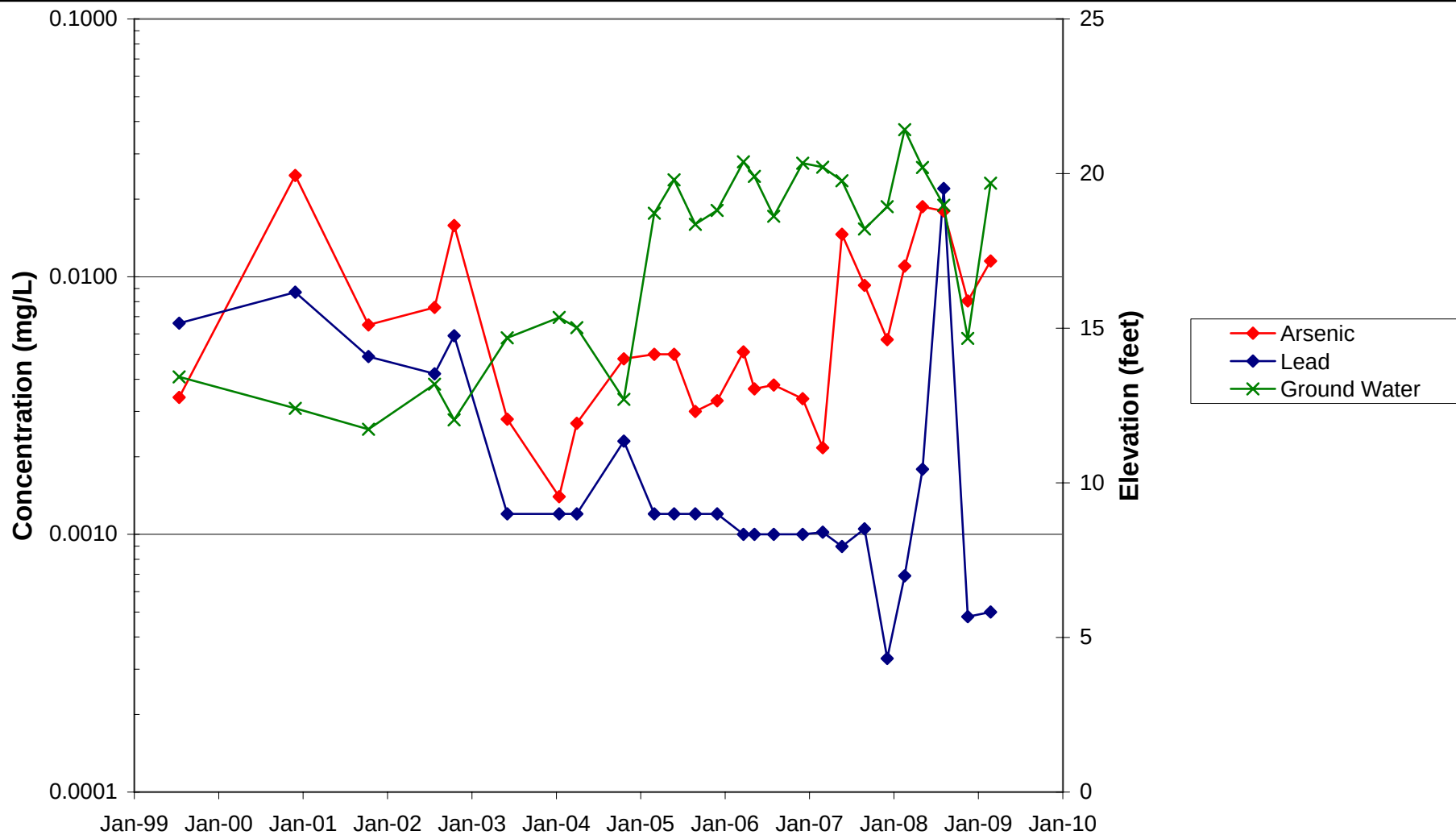


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LEGEND

mg/L MILLIGRAMS PER LITER



LEGEND

mg/L MILLIGRAMS PER LITER

FIGURE 15
MONITORING WELL KMW18
DISSOLVED METALS CONCENTRATION
TRENDS 1999 TO 2009

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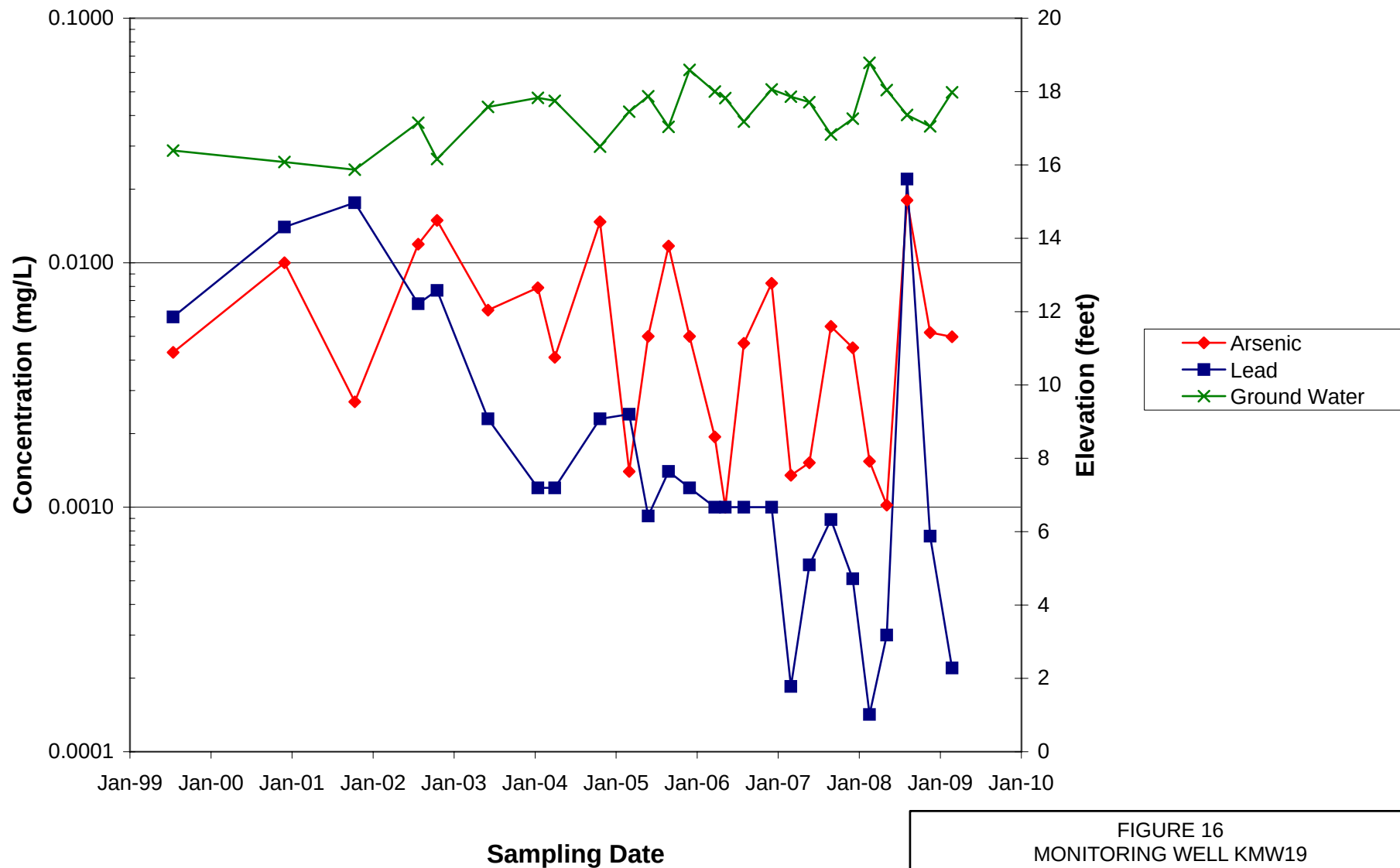


FIGURE 16
MONITORING WELL KMW19
DISSOLVED METALS CONCENTRATION
TRENDS 1999 TO 2009

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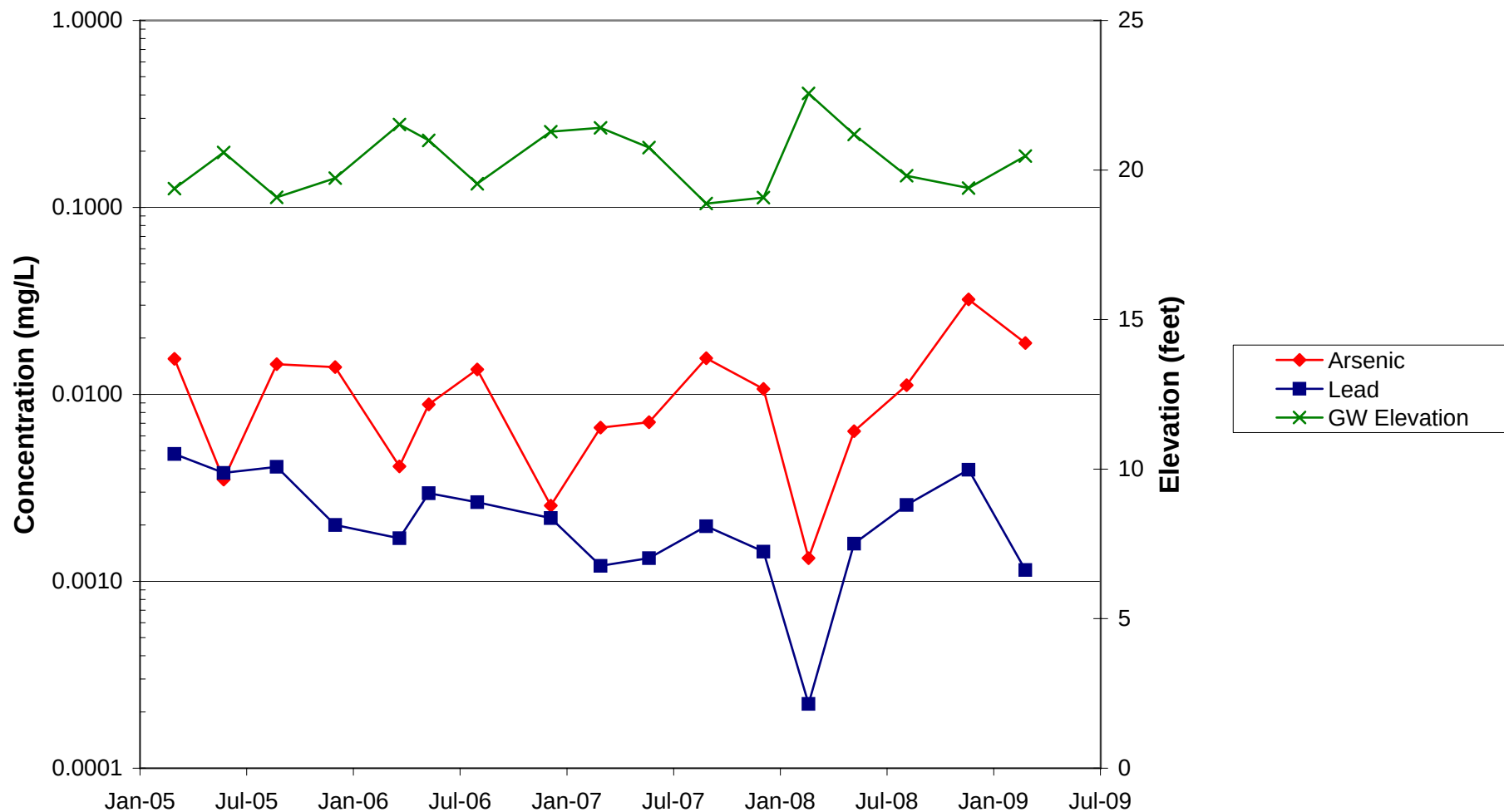


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LEGEND

mg/L MILLIGRAMS PER LITER



Sampling Date

LEGEND

mg/L MILLIGRAMS PER LITER

FIGURE 17
MONITORING WELL KMW35
DISSOLVED METALS CONCENTRATION
TRENDS 2005 TO 2009

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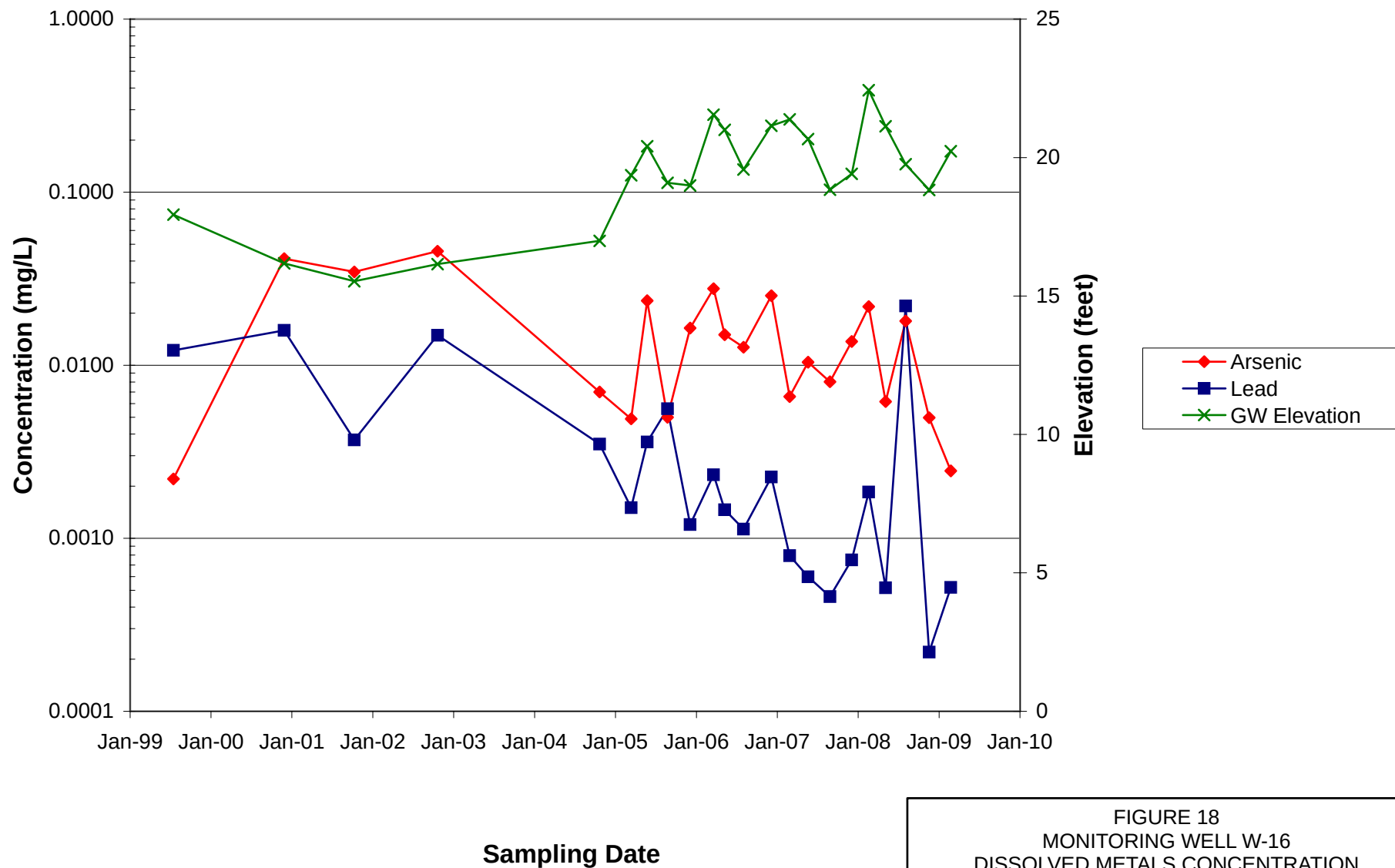


FIGURE 18
MONITORING WELL W-16
DISSOLVED METALS CONCENTRATION
TRENDS 1999 TO 2009

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LEGEND

mg/L MILLIGRAMS PER LITER

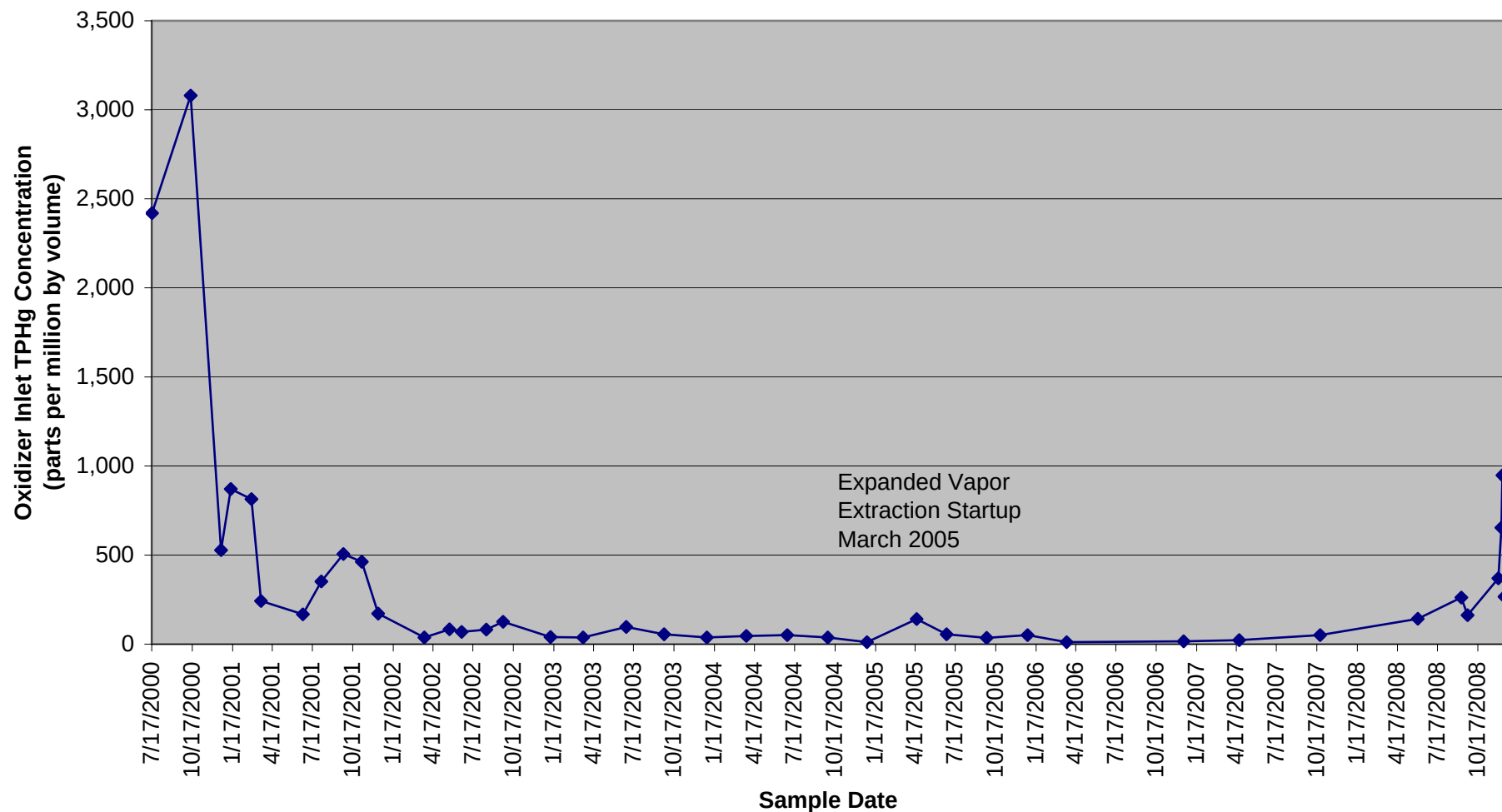


FIGURE 19
SOIL VAPOR CONCENTRATION OF
TOTAL PETROLEUM HYDROCARBONS AS
GASOLINE (TPHg), 2000 THROUGH 2008

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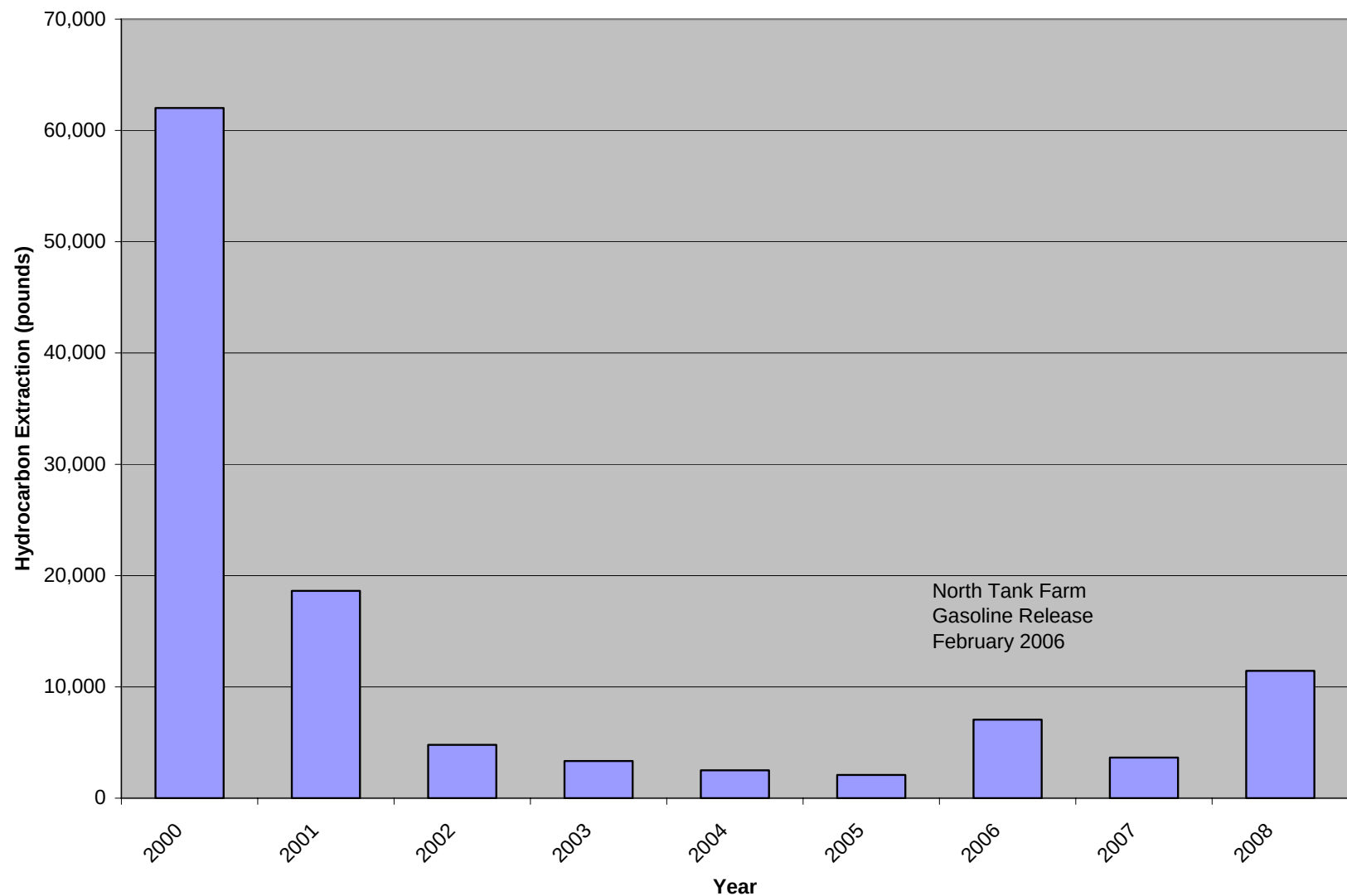


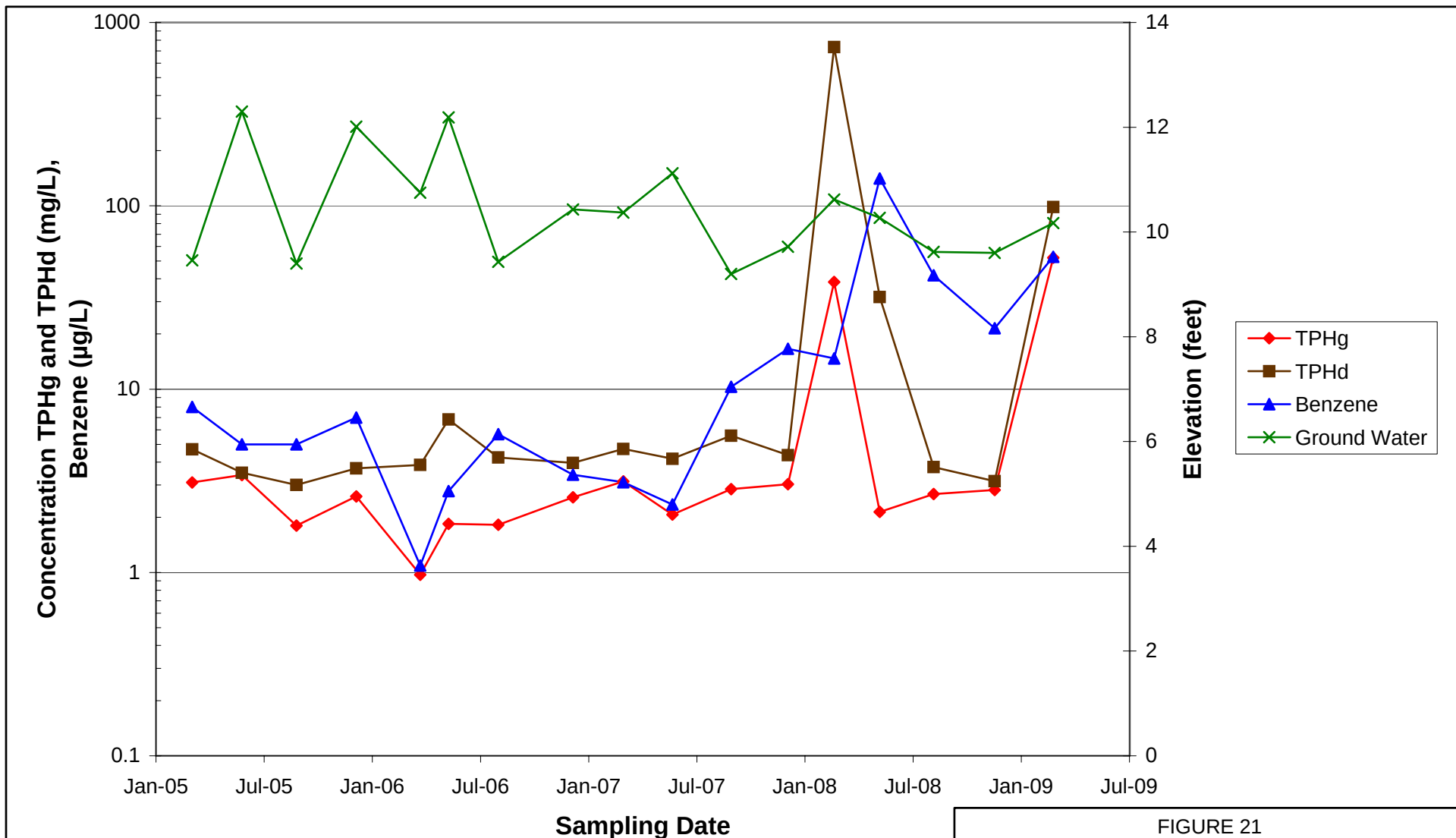
FIGURE 20
ANNUAL MASS EXTRACTION OF HYDROCARBONS
2000 THROUGH 2008

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LEGEND

TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
mg/L	MILLIGRAMS PER LITER
µg/L	MICROGRAMS PER LITER

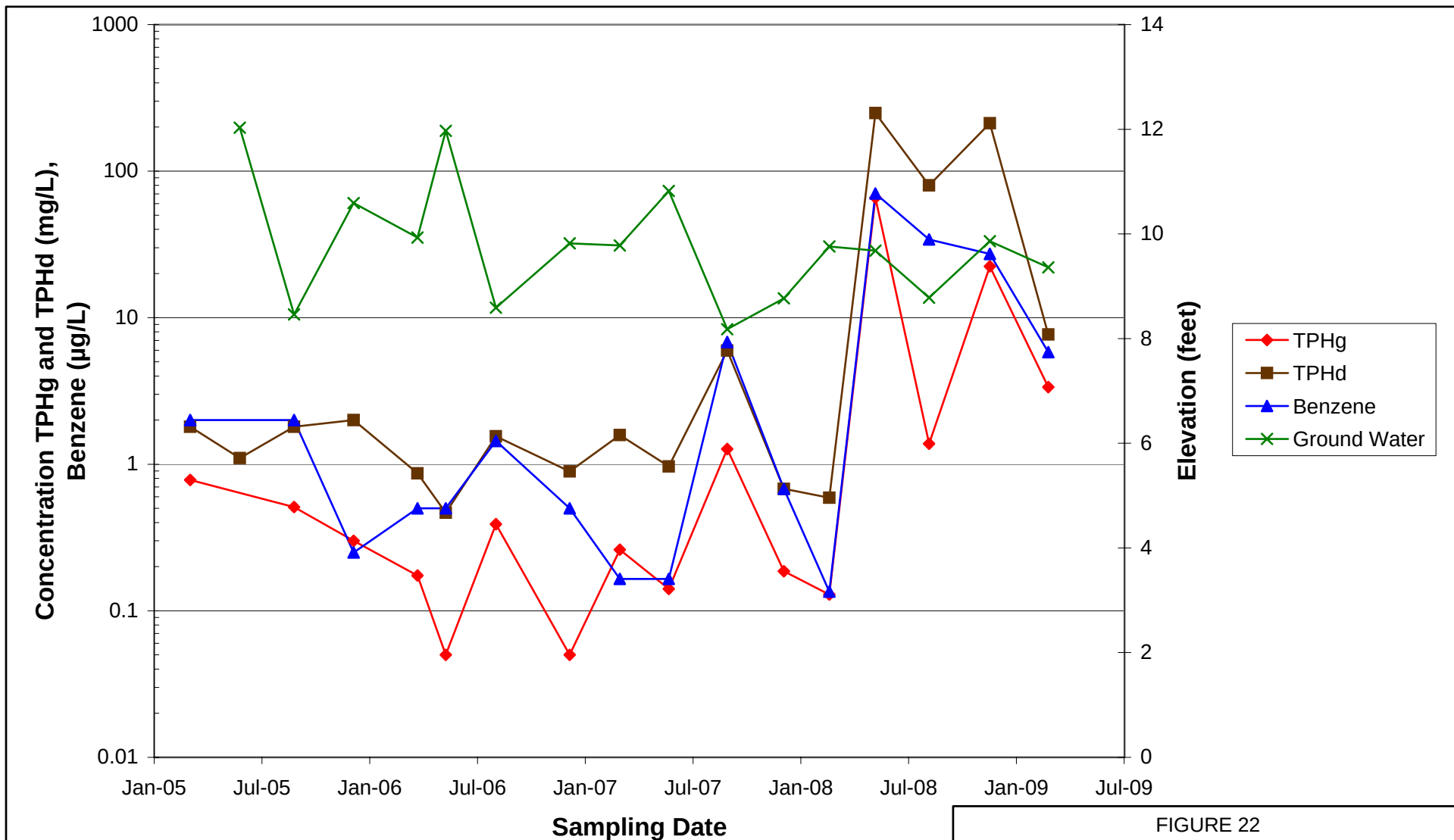
FIGURE 21
MONITORING WELL KMW29
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 2005 TO 2009

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LEGEND

TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
mg/L	MILLIGRAMS PER LITER
µg/L	MICROGRAMS PER LITER

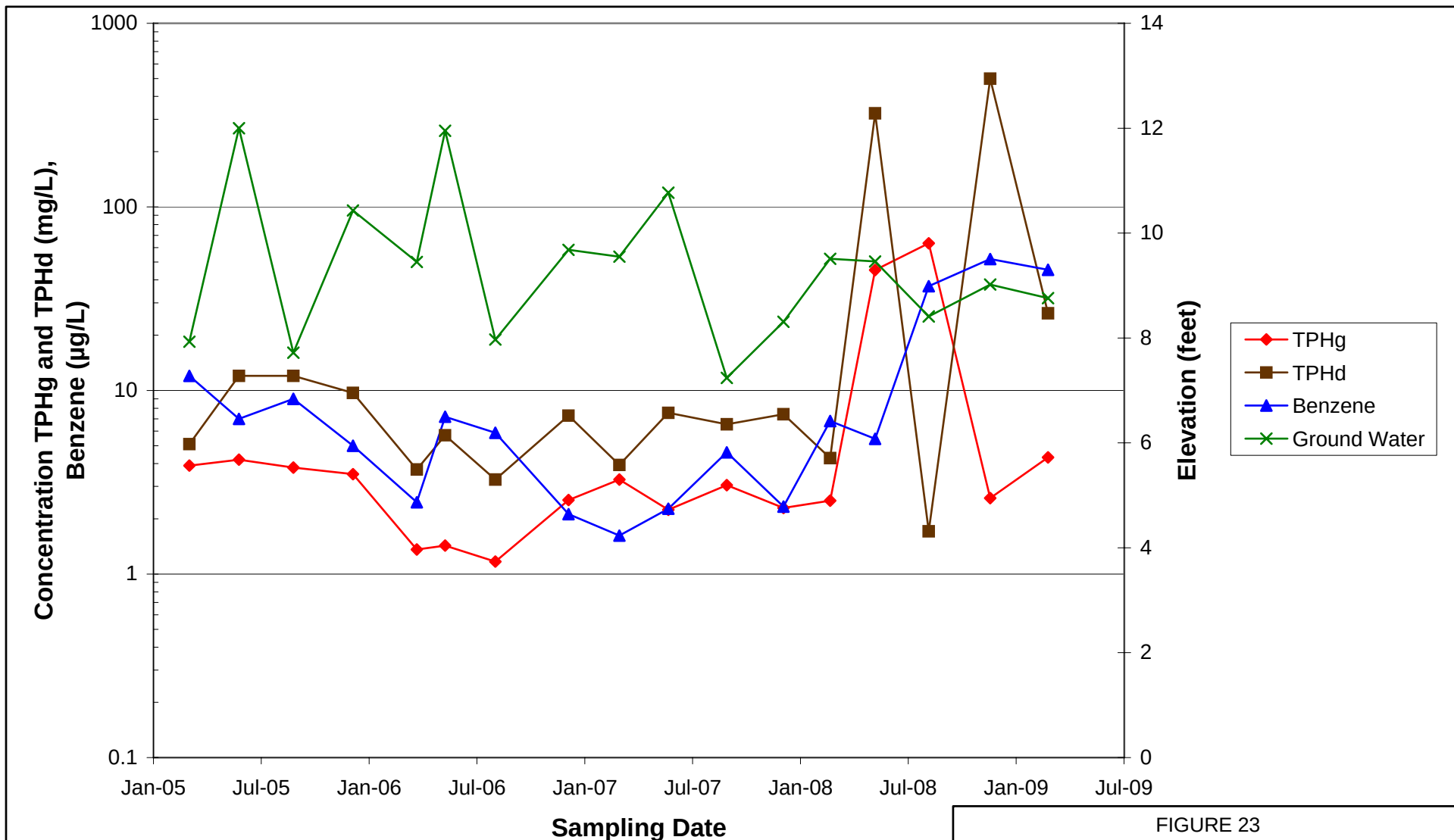
FIGURE 22
MONITORING WELL KMW30
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 2005 TO 2009

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LEGEND

TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
mg/L	MILLIGRAMS PER LITER
µg/L	MICROGRAMS PER LITER

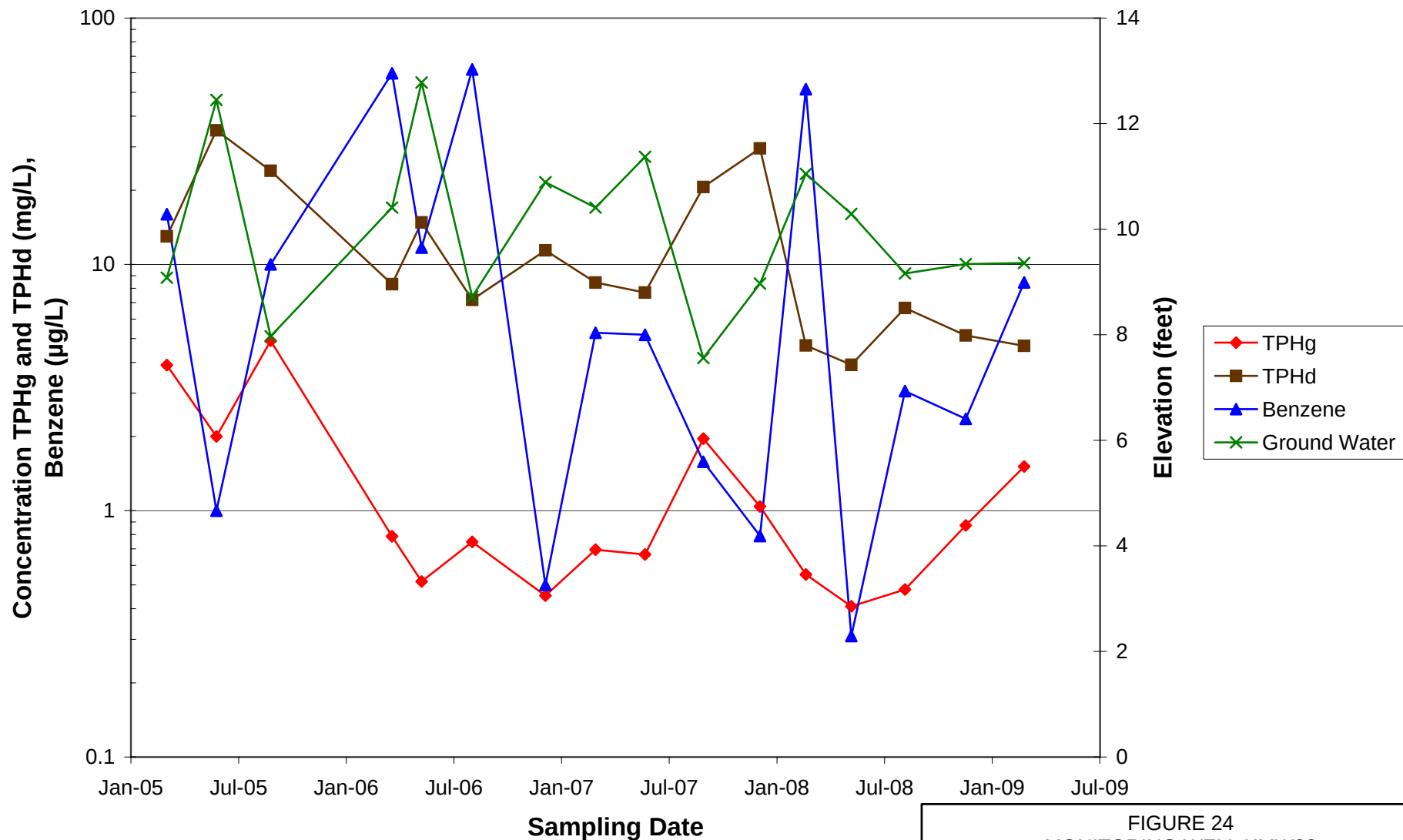
FIGURE 23
MONITORING WELL KMW31
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 2005 TO 2009

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LEGEND

TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
mg/L	MILLIGRAMS PER LITER
µg/L	MICROGRAMS PER LITER

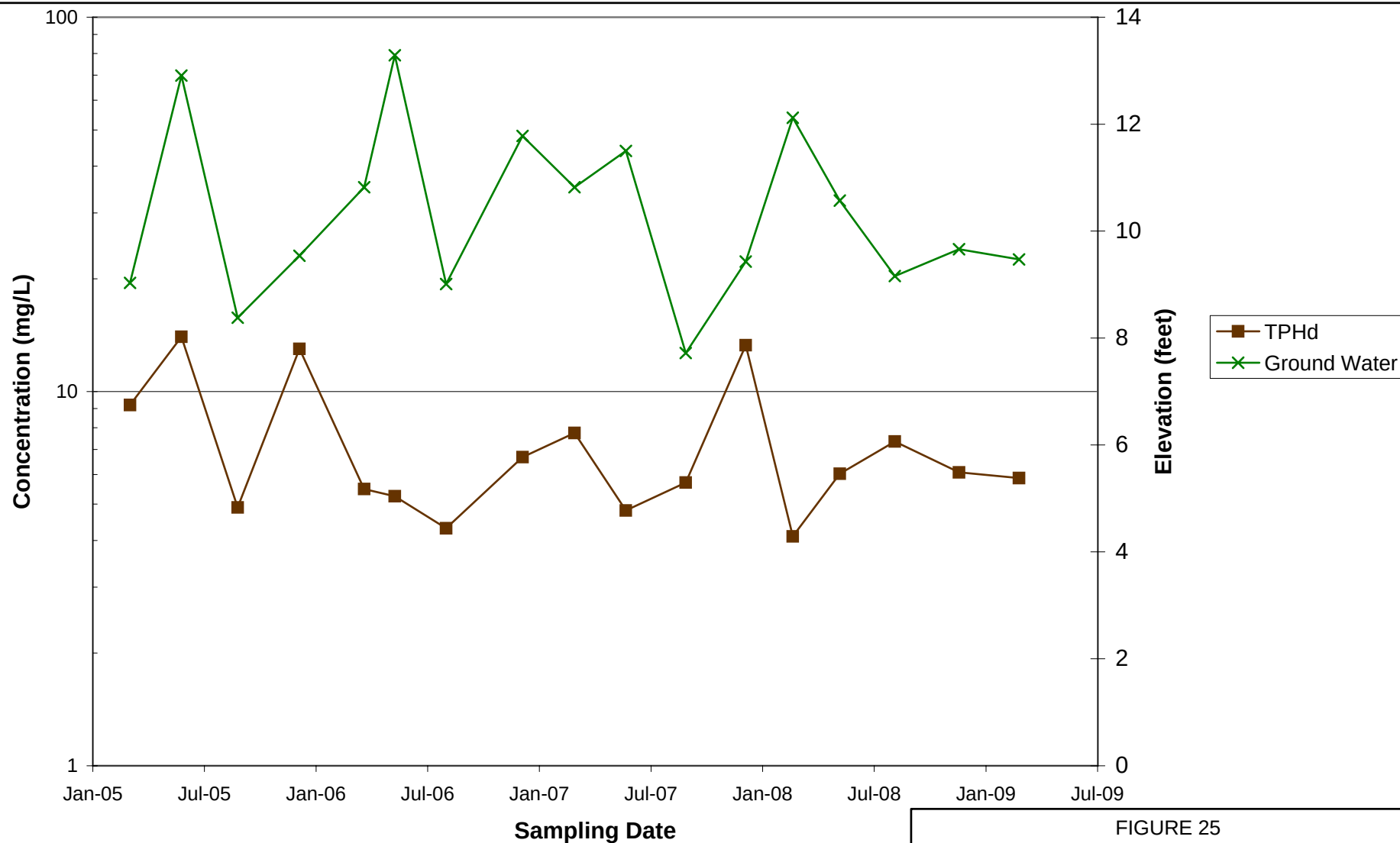
FIGURE 24
MONITORING WELL KMW32
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 2005 TO 2009

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LEGEND

TPHd TOTAL PETROLEUM HYDROCARBONS AS DIESEL

mg/L MILLIGRAMS PER LITER

FIGURE 25
MONITORING WELL KMW33
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 2005 TO 2009

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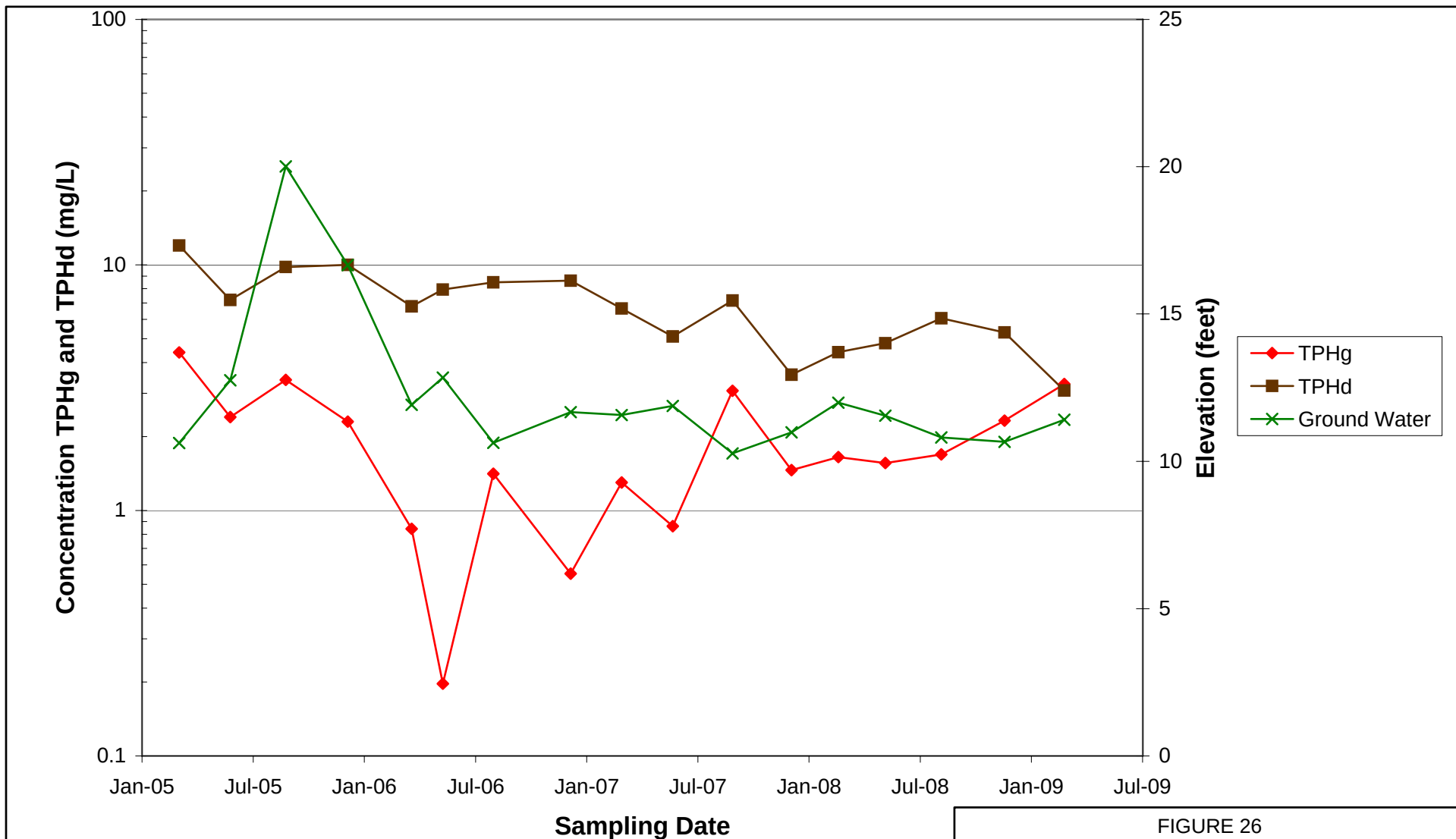


FIGURE 26
MONITORING WELL KMW37
DISSOLVED HYDROCARBONS CONCENTRATION
TRENDS 2005 TO 2009

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LEGEND

TPHg TOTAL PETROLEUM HYDROCARBONS AS GASOLINE

TPHd TOTAL PETROLEUM HYDROCARBONS AS DIESEL

mg/L MILLIGRAMS PER LITER

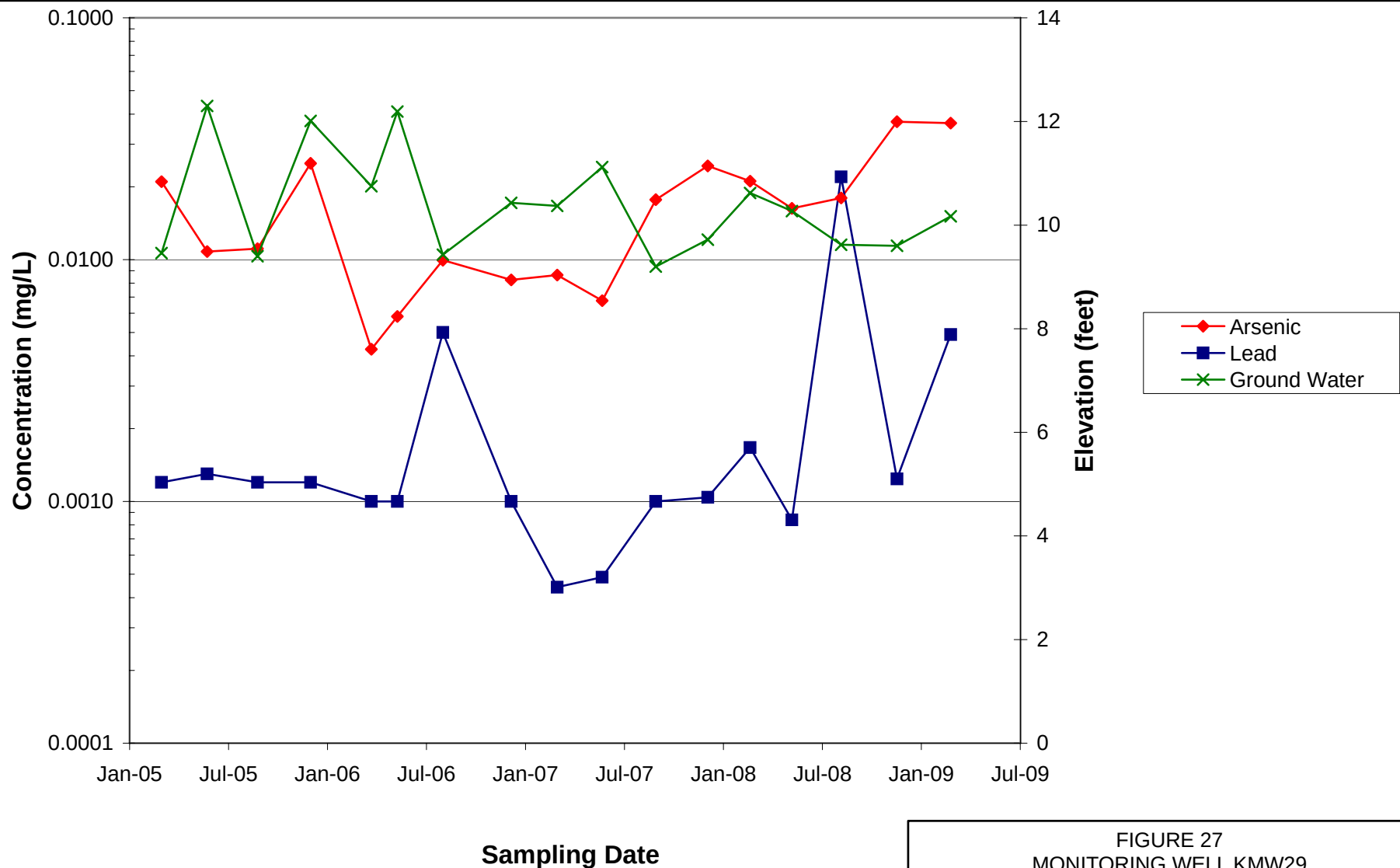


FIGURE 27
MONITORING WELL KMW29
DISSOLVED METALS CONCENTRATION
TRENDS 2005 TO 2009

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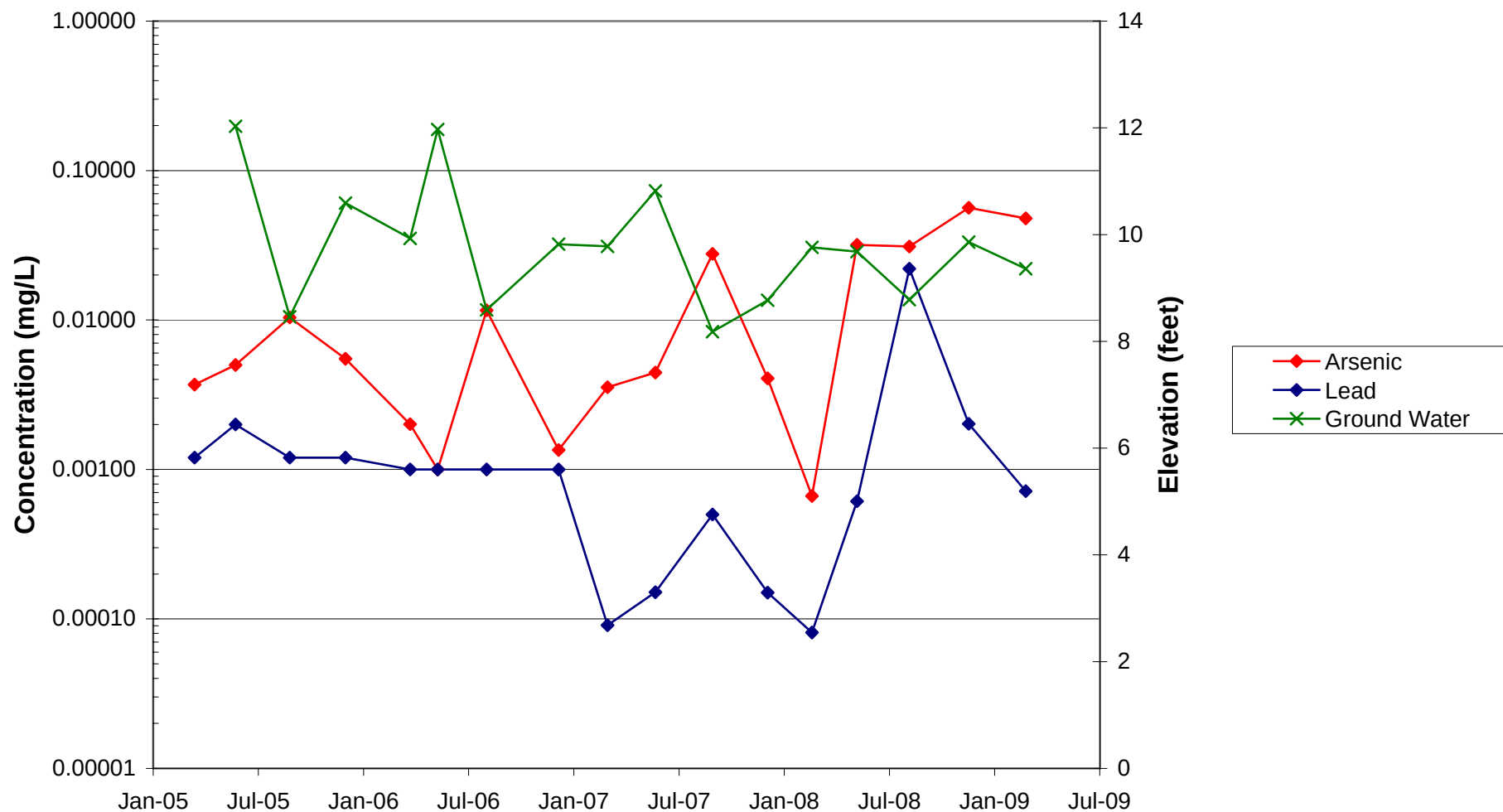


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LEGEND

mg/L MILLIGRAMS PER LITER



Sampling Date

LEGEND

mg/L MILLIGRAMS PER LITER

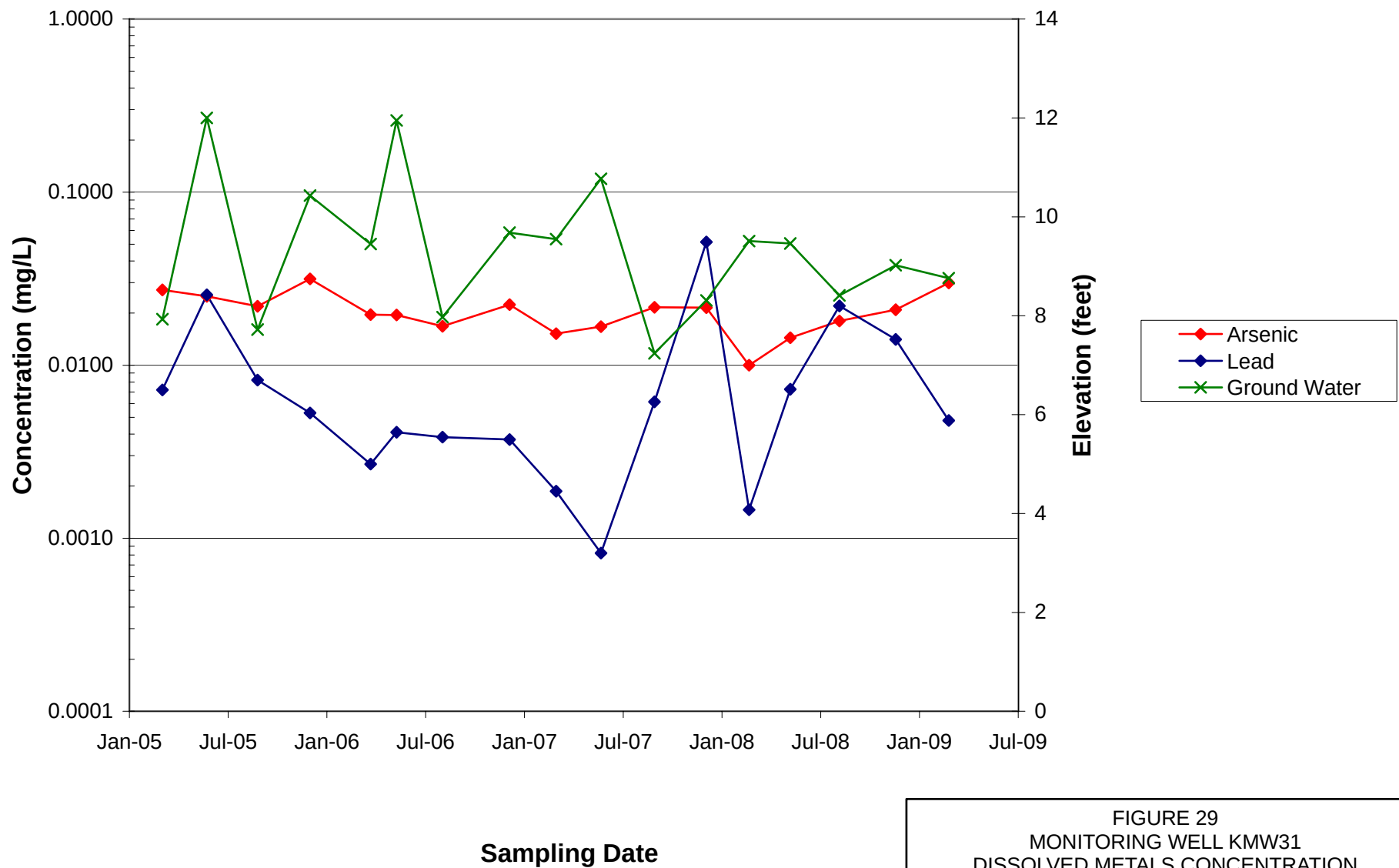
FIGURE 28
MONITORING WELL KMW30
DISSOLVED METALS CONCENTRATION
TRENDS 2005 TO 2009

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LEGEND

mg/L MILLIGRAMS PER LITER

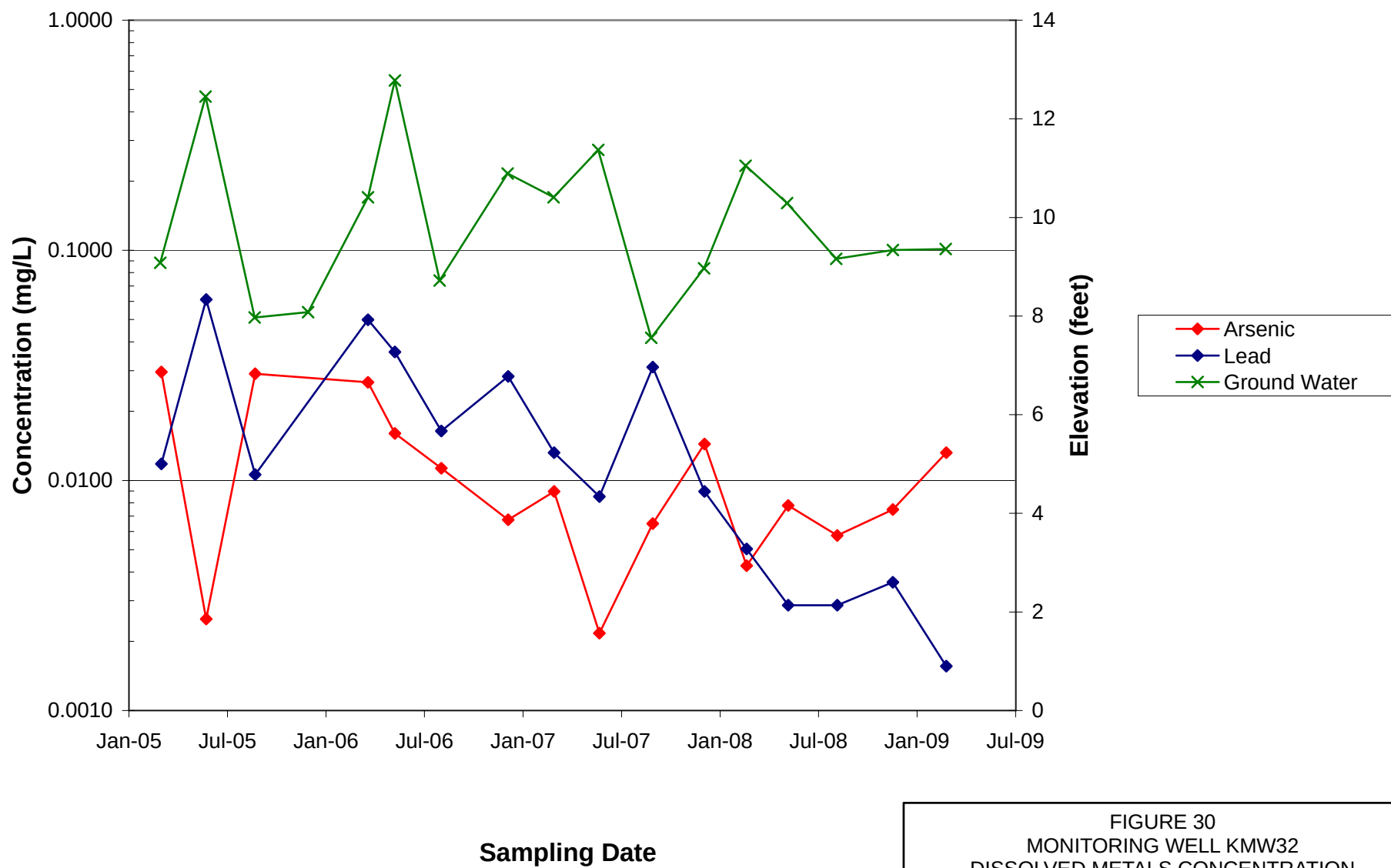
FIGURE 29
MONITORING WELL KMW31
DISSOLVED METALS CONCENTRATION
TRENDS 2005 TO 2009

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LEGEND

mg/L MILLIGRAMS PER LITER

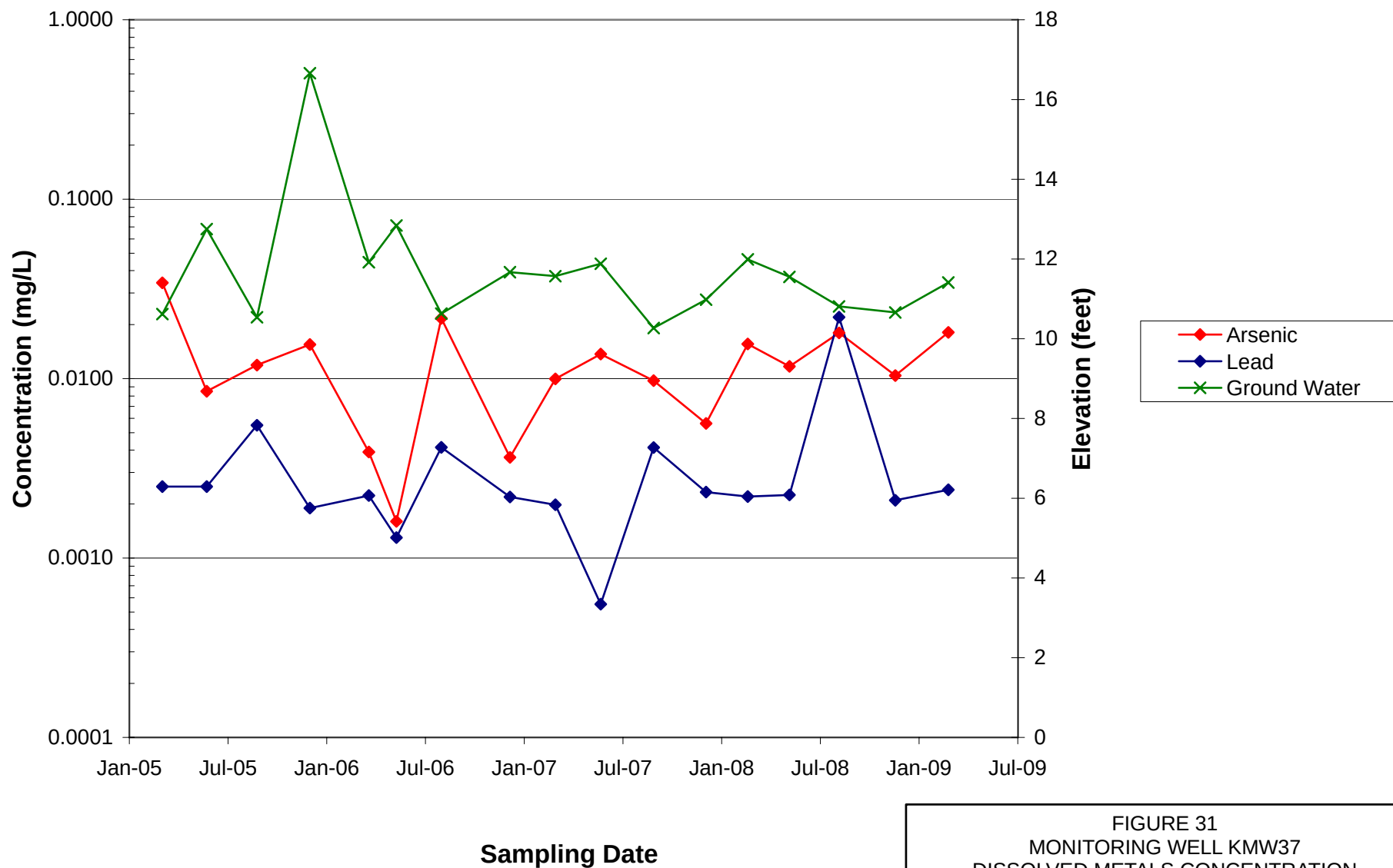
FIGURE 30
MONITORING WELL KMW32
DISSOLVED METALS CONCENTRATION
TRENDS 2005 TO 2009

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LEGEND

mg/L MILLIGRAMS PER LITER

FIGURE 31
MONITORING WELL KMW37
DISSOLVED METALS CONCENTRATION
TRENDS 2005 TO 2009

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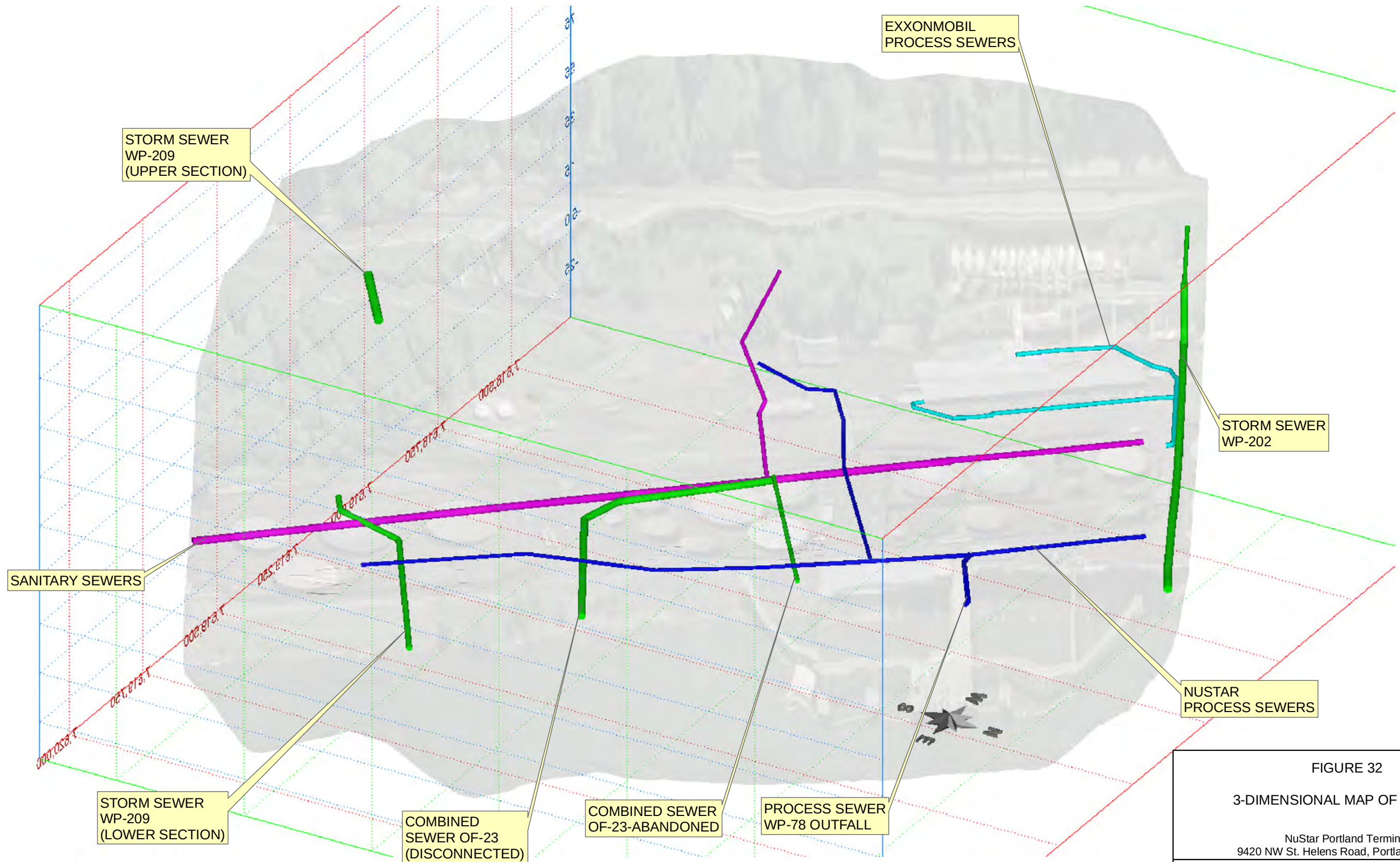


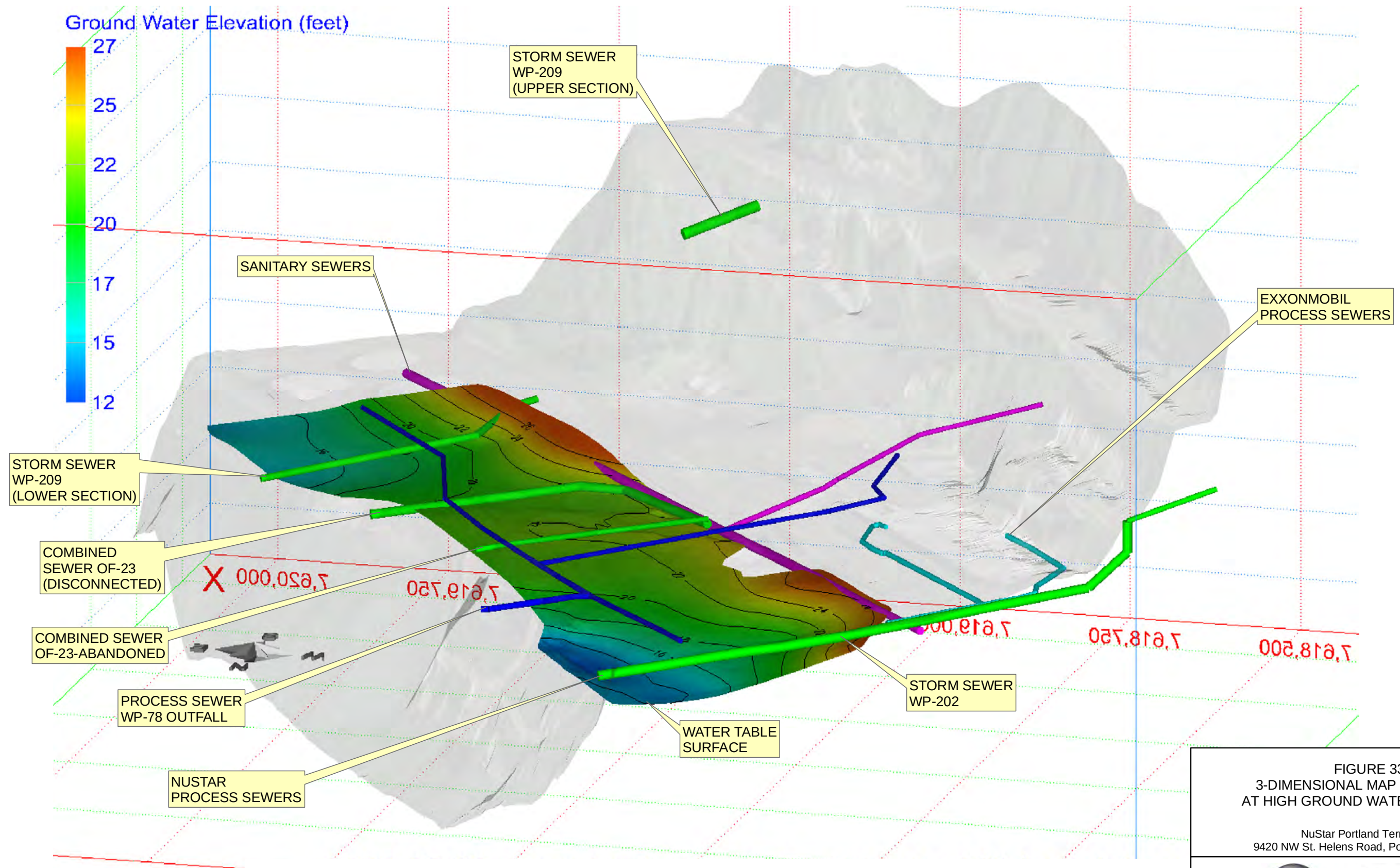
FIGURE 32
3-DIMENSIONAL MAP OF SEWERS

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- Notes:
1. Ground water elevations from measurements obtained May 9 to 11, 2006.
 2. The ground water table surface is shown for the upper sand fill.

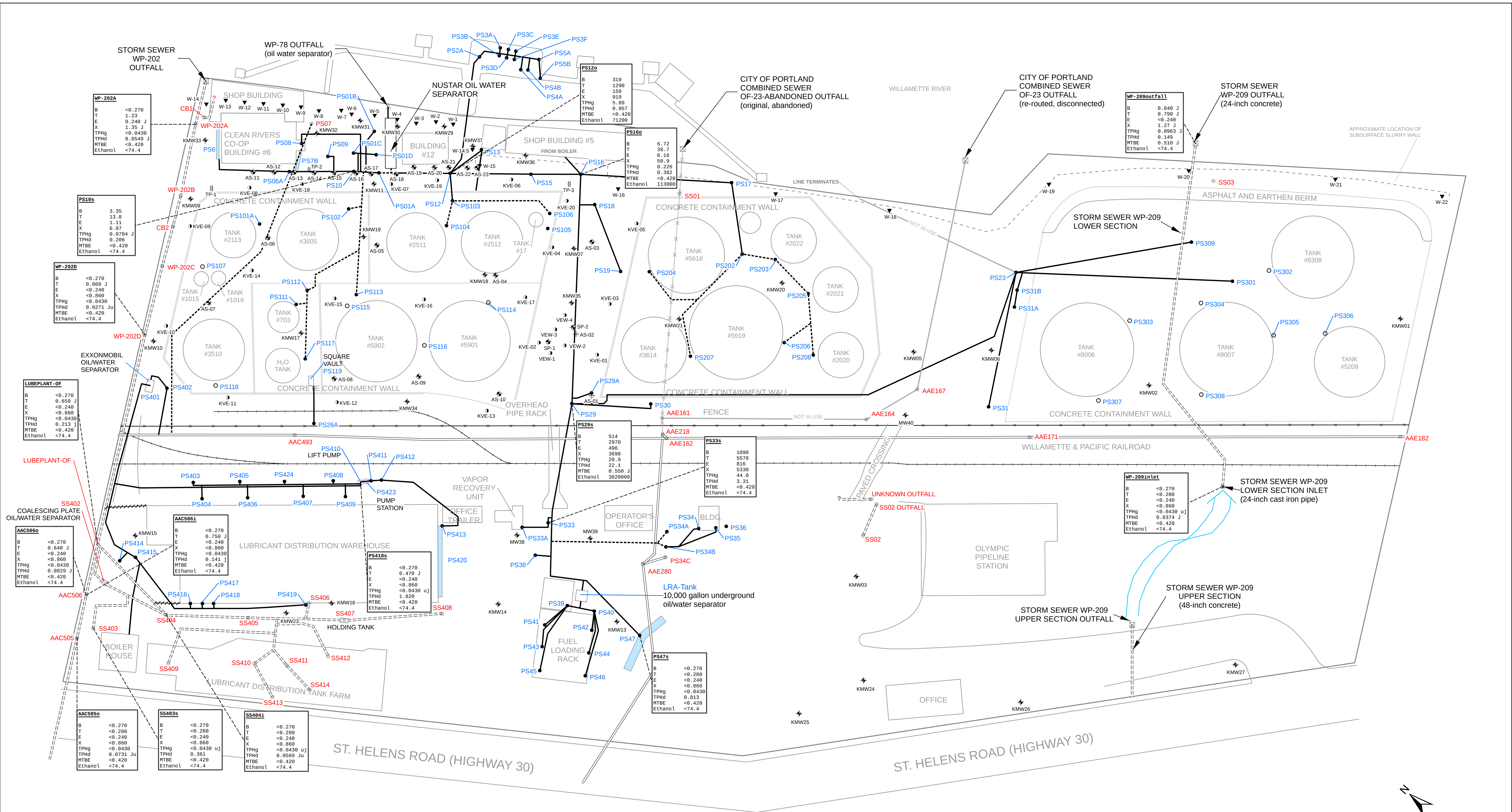
FIGURE 33
3-DIMENSIONAL MAP OF SEWERS
AT HIGH GROUND WATER ELEVATION

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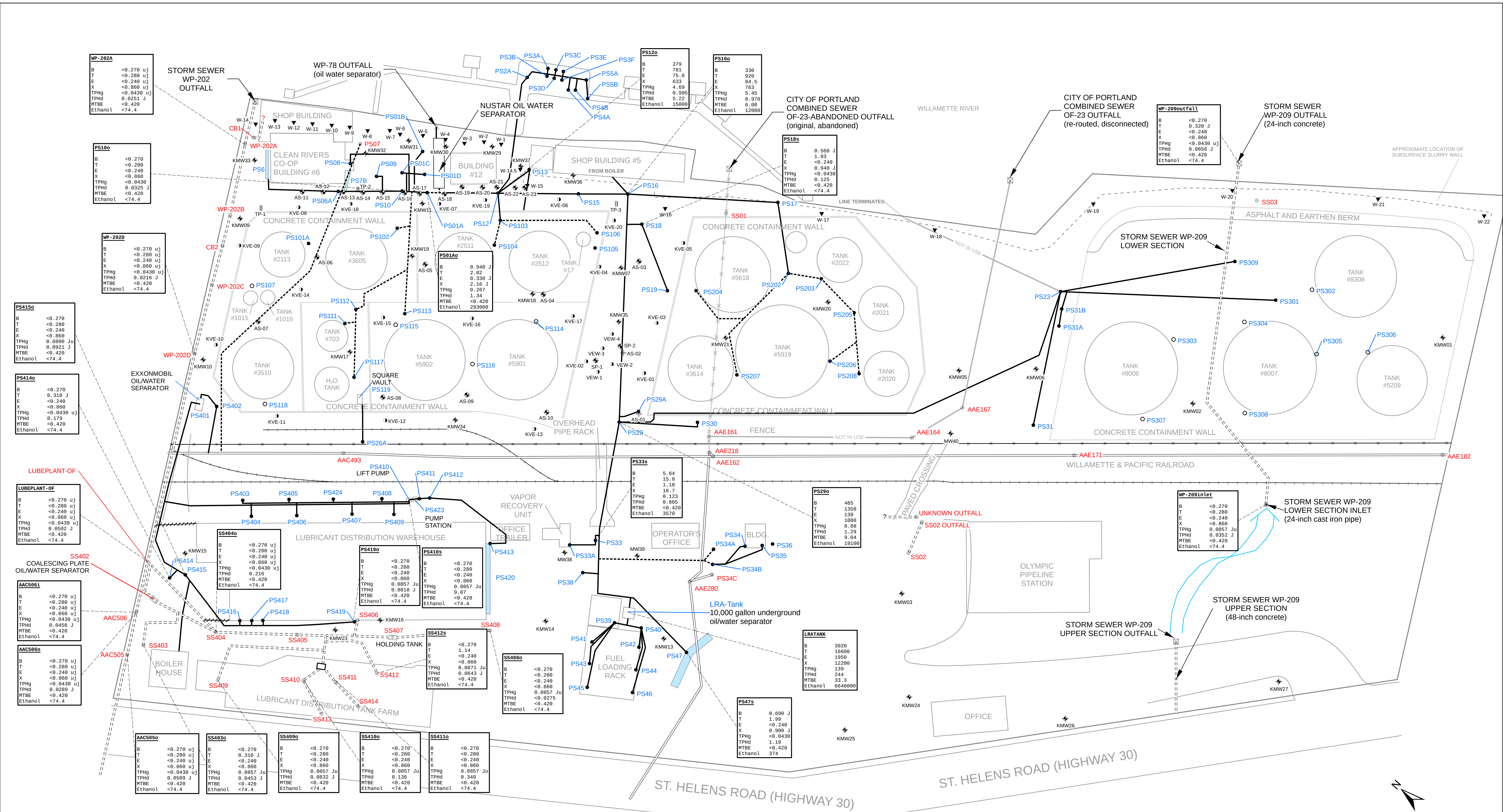
LEGEND			
●	CATCH BASIN / MANHOLE LOCATION SANITARY / STORM SEWER LINE	B	BENZENE IN MICROGRAMS PER LITER
○	CATCH BASIN / MANHOLE LOCATION PROCESS SEWER LINE	T	TOLUENE IN MICROGRAMS PER LITER
○	CATCH BASIN / MANHOLE LOCATION PROCESS SEWER LINE (NOT IN USE)	E	ETHYLBENZENE IN MICROGRAMS PER LITER
⊗	OUTFALL	X	TOTAL XYLENES IN MICROGRAMS PER LITER
⊗	INLET	MTBE	METHYL TERTIARY BUTYL ETHER IN MICROGRAMS PER LITER
+	MONITORING WELL LOCATION	TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL IN MILLIGRAMS PER LITER
+	AIR SPARGING WELL LOCATION	TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE IN MILLIGRAMS PER LITER
+	VAPOR EXTRACTION WELL LOCATION	Ethanol	ETHANOL IN MICROGRAMS PER LITER
+	GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)	1.23	CONCENTRATION VALUE
+	TEMPORARY VAPOR MONITORING WELL LOCATION		
+	AIR SPARGING WELL NOT CONNECTED TO REMEDIATION SYSTEM		
+		J	ESTIMATED VALUE (LABORATORY QUALIFIER)
+		j	ESTIMATED VALUE (DATA VALIDATION QUALIFIER)
+		u	NOT DETECTED (DATA VALIDATION QUALIFIER)
+		uj	NOT DETECTED WITH DETECTION LIMIT ESTIMATED (DATA VALIDATION QUALIFIER)
+		<	LESS THAN METHOD DETECTION LIMIT
+		NA	NOT ANALYZED
+		i	INFLOW
+		o	OUTFLOW
+		s	SUMP
+		—X—X—	ABANDONED SEWER LINE
+		—	SEWER LINE NOT IN USE
+		—	PROCESS SEWER LINE
+		—	ROOF DRAIN LINE
+		—	SANITARY SEWER LINE
+		—	STORM SEWER LINE
+		---	UNCONFIRMED SEWER LINE
+		—	TRENCH DRAIN

NOTES:
1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.
3. COMBINED SEWER OF-23 DISCONNECTED AT MANHOLE AAE161.

FIGURE 34
DRY SEASON SEWER SAMPLING ANALYTICAL
RESULTS, OCTOBER 2008

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LEGEND

●	CATCH BASIN / MANHOLE LOCATION SANITARY / STORM SEWER LINE	B	BENZENE IN MICROGRAMS PER LITER	J	ESTIMATED VALUE (LABORATORY QUALIFIER)
○	CATCH BASIN / MANHOLE LOCATION PROCESS SEWER LINE	T	TOLUENE IN MICROGRAMS PER LITER	—	SEWER LINE NOT IN USE
○	CATCH BASIN / MANHOLE LOCATION PROCESS SEWER LINE (NOT IN USE)	E	ETHYLBENZENE IN MICROGRAMS PER LITER	—	PROCESS SEWER LINE
⊠	OUTFALL	X	TOTAL XYLENES IN MICROGRAMS PER LITER	----	ROOF DRAIN LINE
△	INLET	TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE IN MILLIGRAMS PER LITER	----	SANITARY SEWER LINE
+	MONITORING WELL LOCATION	TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL IN MILLIGRAMS PER LITER	----	STORM SEWER LINE
+	AIR SPARGING WELL LOCATION	MTBE	METHYL TERTIARY BUTYL ETHER IN MICROGRAMS PER LITER	----	UNCONFIRMED SEWER LINE
+	VAPOR EXTRACTION WELL LOCATION	Ethanol	ETHANOL IN MICROGRAMS PER LITER	----	TRENCH DRAIN
+	GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)				
	TEMPORARY VAPOR MONITORING WELL LOCATION				
+	AIR SPARGING WELL NOT CONNECTED TO REMEDIATION SYSTEM				

B	BENZENE IN MICROGRAMS PER LITER	J	ESTIMATED VALUE (LABORATORY QUALIFIER)
T	TOLUENE IN MICROGRAMS PER LITER	—	SEWER LINE NOT IN USE
E	ETHYLBENZENE IN MICROGRAMS PER LITER	—	PROCESS SEWER LINE
X	TOTAL XYLENES IN MICROGRAMS PER LITER	----	ROOF DRAIN LINE
TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE IN MILLIGRAMS PER LITER	----	SANITARY SEWER LINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL IN MILLIGRAMS PER LITER	----	STORM SEWER LINE
MTBE	METHYL TERTIARY BUTYL ETHER IN MICROGRAMS PER LITER	----	UNCONFIRMED SEWER LINE
Ethanol	ETHANOL IN MICROGRAMS PER LITER	----	TRENCH DRAIN

B	BENZENE IN MICROGRAMS PER LITER	J	ESTIMATED VALUE (LABORATORY QUALIFIER)
T	TOLUENE IN MICROGRAMS PER LITER	—	SEWER LINE NOT IN USE
E	ETHYLBENZENE IN MICROGRAMS PER LITER	—	PROCESS SEWER LINE
X	TOTAL XYLENES IN MICROGRAMS PER LITER	----	ROOF DRAIN LINE
TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE IN MILLIGRAMS PER LITER	----	SANITARY SEWER LINE
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL IN MILLIGRAMS PER LITER	----	STORM SEWER LINE
MTBE	METHYL TERTIARY BUTYL ETHER IN MICROGRAMS PER LITER	----	UNCONFIRMED SEWER LINE
Ethanol	ETHANOL IN MICROGRAMS PER LITER	----	TRENCH DRAIN

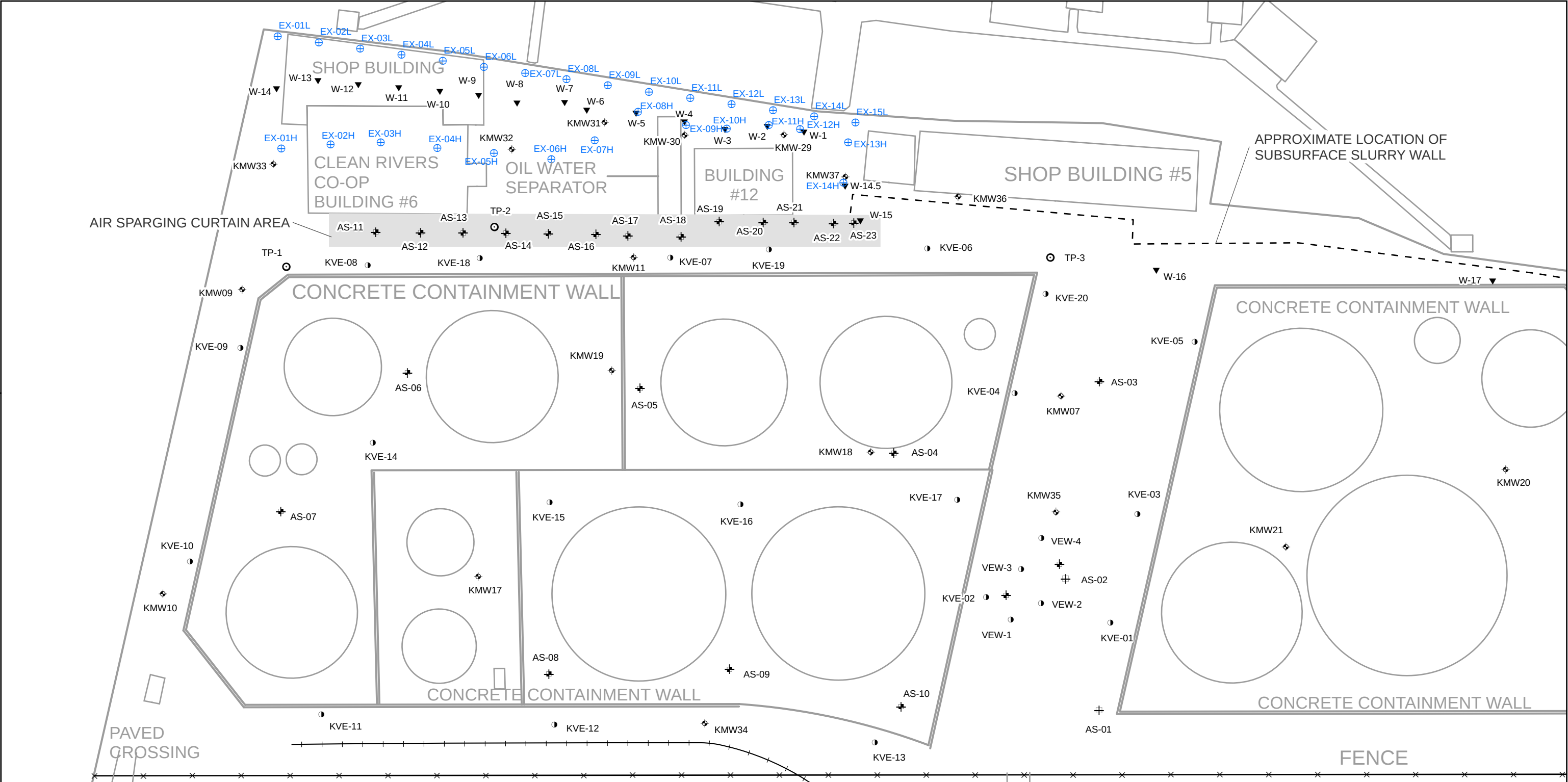
NOTES:

- ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
- SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.
- COMBINED SEWER OF-23 DISCONNECTED AT MANHOLE AAE161.

FIGURE 35
WET SEASON SEWER SAMPLING ANALYTICAL RESULTS, JANUARY TO APRIL 2009

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LEGEND

- KMW11 MONITORING WELL LOCATION AND DESIGNATION
- AS-05 AIR SPARGING WELL LOCATION AND DESIGNATION
- KVE-01 VAPOR EXTRACTION WELL LOCATION AND DESIGNATION
- W-11 GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)
- TP-1 TEMPORARY VAPOR MONITORING WELL LOCATION AND DESIGNATION
- EX-01L CONCEPTUAL EXTRACTION WELL
- AS-01 AIR SPARGING WELL NOT CONNECTED TO REMEDIATION SYSTEM

NOTES

- 1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
- 2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.

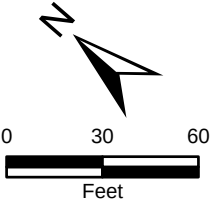


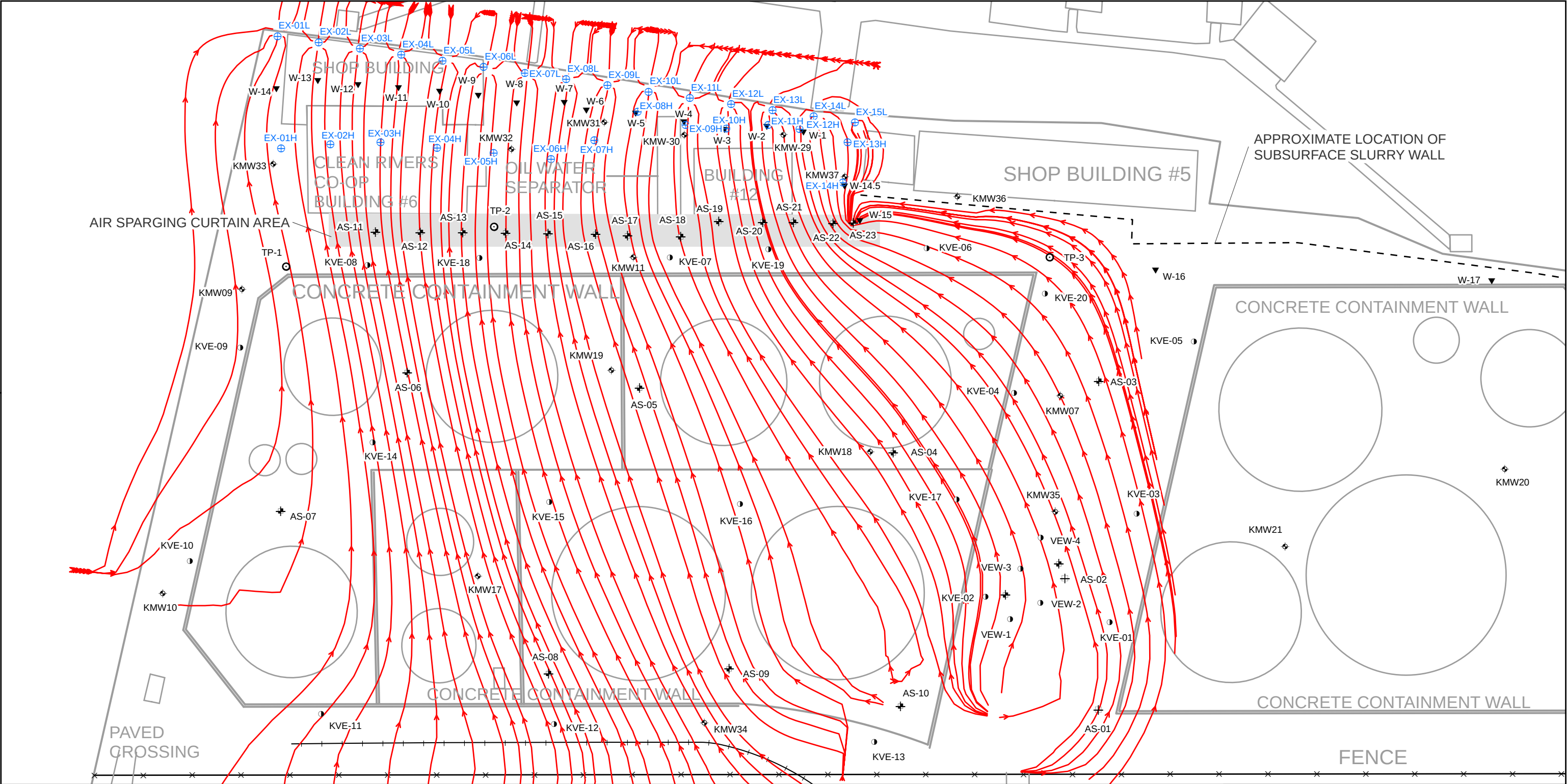
FIGURE 36
CONCEPTUAL ALTERNATIVE WITH
TWO SETS OF WELLS FOR EXTRACTION
AT LOW AND HIGH WATER CONDITIONS

NuStar Portland Terminal
9420 NW St. Helens Road, Portland, Oregon



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LEGEND

- KMW11 MONITORING WELL LOCATION AND DESIGNATION
- AS-05 AIR SPARGING WELL LOCATION AND DESIGNATION
- KVE-01 VAPOR EXTRACTION WELL LOCATION AND DESIGNATION
- W-11 GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)
- TP-1 TEMPORARY VAPOR MONITORING WELL LOCATION AND DESIGNATION
- EX-01L CONCEPTUAL EXTRACTION WELL
- AS-01 AIR SPARGING WELL NOT CONNECTED TO REMEDIATION SYSTEM

SIMULATED GROUND WATER PATH LINE

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.

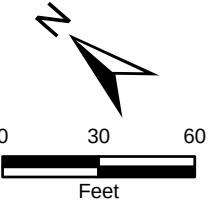


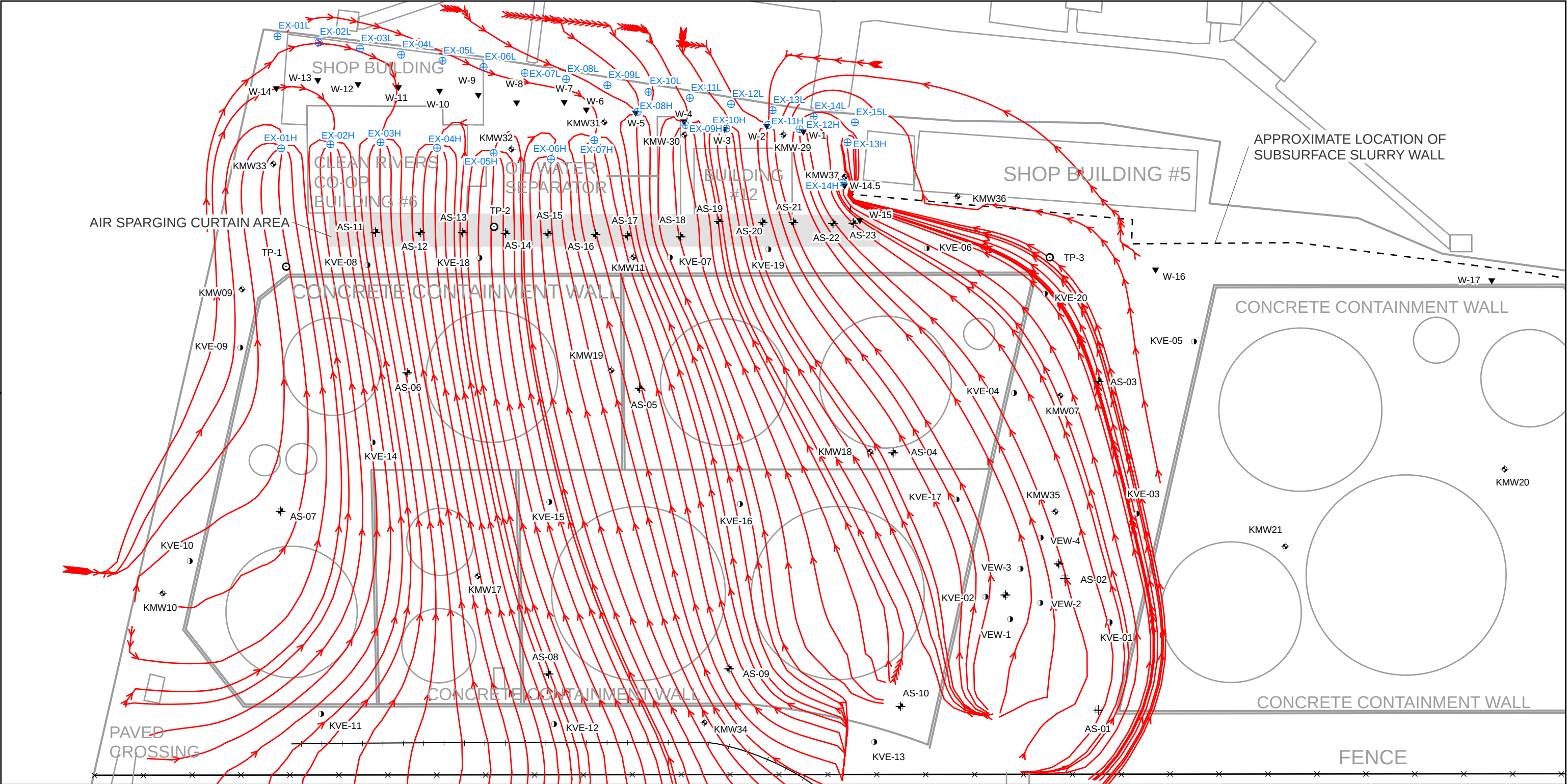
FIGURE 37
GROUND WATER FLOW MODEL RESULTS FOR
OPERATION OF EXTRACTION WELLS AT THE
RIVERFRONT DURING LOW RIVER STAGES

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LEGEND

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- KVE-01 VAPOR EXTRACTION WELL LOCATION AND DESIGNATION
- W-11 GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)
- TP-1 TEMPORARY VAPOR MONITORING WELL LOCATION AND DESIGNATION
- EX-01L CONCEPTUAL EXTRACTION WELL
- AS-01 AIR SPARGING WELL NOT CONNECTED TO REMEDIATION SYSTEM

SIMULATED GROUND WATER PATH LINE

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.

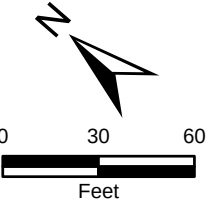


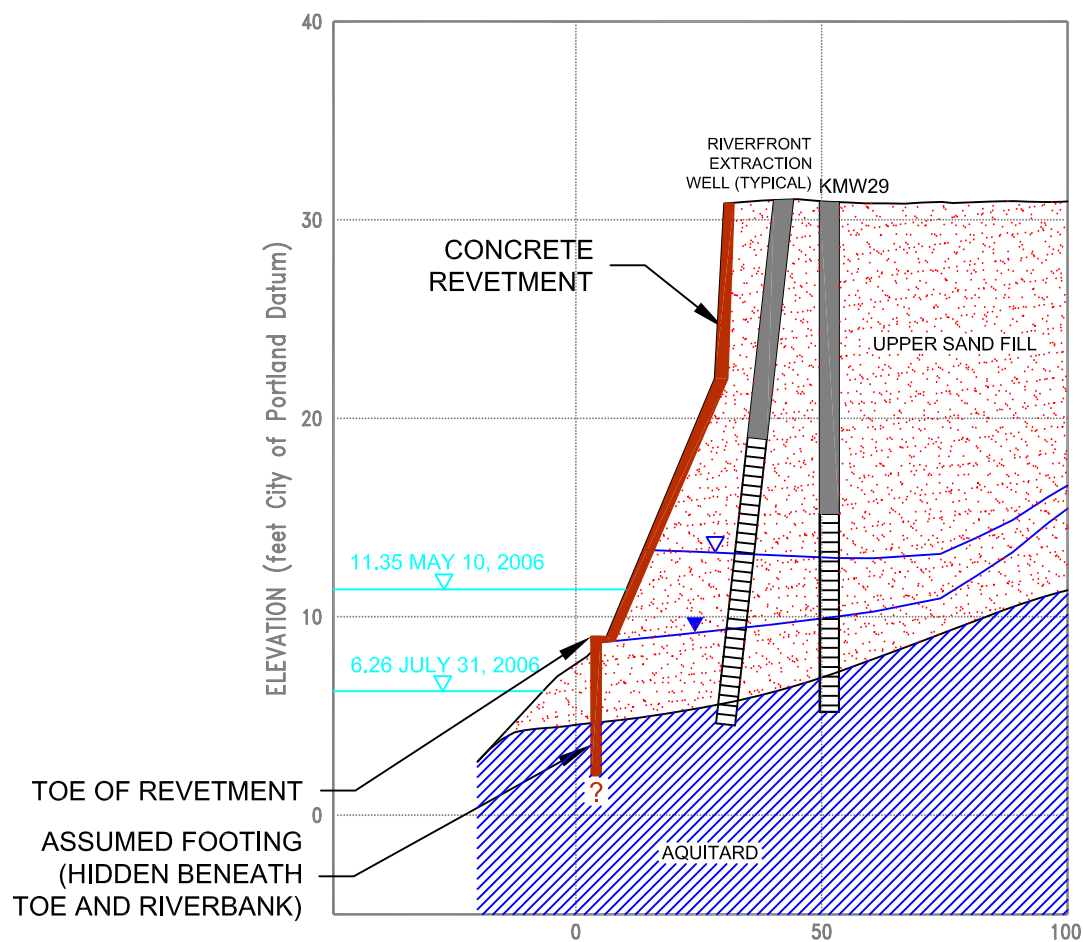
FIGURE 38
GROUND WATER FLOW MODEL RESULTS FOR
OPERATION OF EXTRACTION WELLS SET BACK
FROM THE RIVER AT HIGH RIVER STAGES

NuStar Portland Terminal
9420 NW St. Helens Road, Portland, Oregon



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EXPLANATION:

	LOW PLASTICITY CLAY (CL)		HYDROSTRATIGRAPHIC CONTACT
	POORLY GRADED SAND (SP)		AQUITARD
	WELL SCREEN INTERVAL		RIVER ELEVATION
	INFERRED GROUND WATER ELEVATION, MAY 9-11, 2006		GROUND WATER ELEVATION
	INFERRED GROUND WATER ELEVATION, JULY 31, 2006		

NOTE:
HYDROSTRATIGRAPHIC UNIT CONTACTS
FROM THREE-DIMENSIONAL MODEL OF SITE.

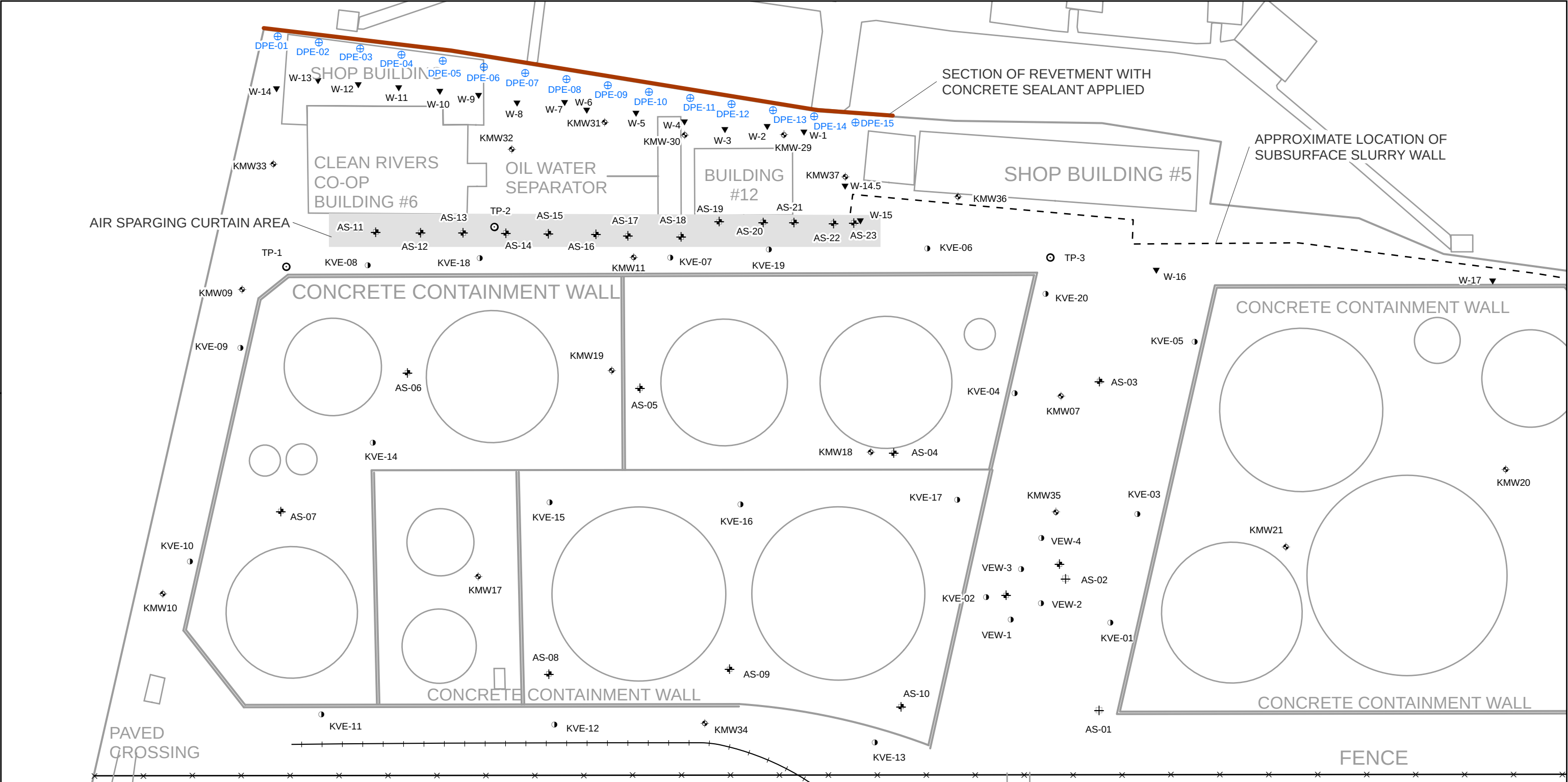
FIGURE 39
CONCEPTUAL RIVERFRONT
EXTRACTION WELL INSTALLATION

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LEGEND

- KMW11 MONITORING WELL LOCATION AND DESIGNATION
- AS-05 AIR SPARGING WELL LOCATION AND DESIGNATION
- KVE-01 VAPOR EXTRACTION WELL LOCATION AND DESIGNATION
- W-11 GROUND WATER EXTRACTION WELL LOCATION AND DESIGNATION (CURRENTLY USED FOR MONITORING ONLY)
- TP-1 TEMPORARY VAPOR MONITORING WELL LOCATION AND DESIGNATION
- DPE-01 CONCEPTUAL DUAL PHASE EXTRACTION WELL
- AS-01 AIR SPARGING WELL NOT CONNECTED TO REMEDIATION SYSTEM

NOTES

- ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
- SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.

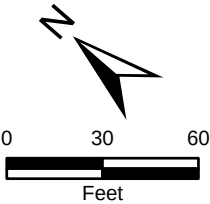


FIGURE 40
CONCEPTUAL CONCRETE SEALANT APPLIED TO
THE REVETMENT WITH DUAL PHASE EXTRACTION

NuStar Portland Terminal
9420 NW St. Helens Road, Portland, Oregon



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ATTACHMENT E

*AME (2011). Work Plan for Slurry Wall Repairs, NuStar Portland
Terminal, 9420 NW St. Helens Road, Portland, Oregon*

September 16, 2011



September 16, 2011

Mr. Tom Gainer, P.E.
Oregon Department of Environmental Quality
Northwest Region
2020 SW 4th Avenue, Suite 400
Portland, Oregon 97201

13041.27/7

**Subject: *Work Plan for Slurry Wall Repairs*
NuStar Portland Terminal
9420 NW. St. Helens Road, Portland, Oregon**

Dear Mr. Gainer:

This *Work Plan for Slurry Wall Repairs* was prepared for ExxonMobil Environmental Services Company on behalf of ExxonMobil Oil Corporation (ExxonMobil), for the NuStar Energy, L.P. (NuStar) Terminal in Portland, Oregon (site; **Figures 1 and 2**), which was previously owned and operated by ExxonMobil and its predecessors. The site includes the NuStar Terminal, an ExxonMobil lubricant distribution facility, and an Olympic Pipe Line Company (Olympic) delivery facility. ExxonMobil conducts ground water monitoring and remediation at the site in accordance with the Voluntary Cleanup Agreement No. ECVC-NWR-01015 between ExxonMobil and the State of Oregon, Department of Environmental Quality.

The May 28, 2009 *Updated Focused Feasibility Study* (Acton • Mickelson • Environmental, Inc. [AME] 2009) provided results of investigations conducted in 2008 and 2009 to develop an additional remedial action alternative for the air sparging (AS) curtain area. The recommended alternative was installation of a dual phase extraction system in the AS curtain area. A further recommendation was that the areas of the existing subsurface slurry wall where leakage is inferred (around sewers OF-23-Abandoned and WP-209) be upgraded by jet grouting of cement-bentonite slurry.

BACKGROUND

Slurry Wall

Past remedial measures at the site have included installation of a subsurface slurry wall (**Figure 2**) and upgradient ground water extraction wells during the 1980s to act as a barrier to migration of petroleum-impacted ground water to the Willamette River. Based on survey dates listed on as-built drawings for the slurry wall, it was constructed in late 1981 and/or January and February 1982 (Pettijohn Engineering 1982). Different sections of the slurry wall were

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constructed using soil and bentonite or cement and bentonite: 596 linear feet of soil-bentonite slurry wall were emplaced between the south tank farm and the river, and 785 linear feet of cement-bentonite slurry wall were emplaced between the central tank farm and the river and also between the north tank farm and Shop Building #5. Ground water extraction was discontinued in the 1990s (AME 2009).

Sewers

Sewers at the site include storm sewers, process sewers, sanitary sewers, and combined sewers (**Figure 2**). The process sewers include one system related to NuStar operations and another system related to ExxonMobil operations. Combined sewers OF-23-Abandoned and OF-23 have been abandoned or disconnected; presently, only storm sewers WP-202 and WP-209 actively discharge to the Willamette River (not including discharge from the NuStar process sewer system and oil/water separator [WP-78]).

WP-209: Storm sewer WP-209 consists of an upper section and a lower section. The upper section conveys and discharges drainage from offsite to an area south and west of the Olympic facility. Stormwater then flows overland to the inlet of the lower section of storm sewer WP-209 located adjacent to the railroad tracks. The lower section conveys surface flow to the river. The location of storm sewer WP-209 is shown on **Figure 2**.

Subsurface utility locating methods employed during January 2009 resolved the routing of the lower section of storm sewer WP-209. The storm sewer was located using a sonde at the end of a fiberglass rod, which was inserted into the storm sewer at the inlet adjacent to the railroad tracks. This method successfully traced the storm sewer past the second bend in the line near monitoring well KMW02 between Tanks #8006 and #8007 (**Figure 2**).

The location of the outfall for WP-209 is based on a survey performed for AME in 2008. At the outfall, the sewer consists of a 2-foot-diameter concrete pipe, with an invert elevation of 12.25 feet City of Portland Datum. Attempts to document the construction and state of storm sewer WP-209 by in-sewer video camera (Kleinfelder 2003, AME 2007) were unsuccessful because of obstructions inside of and sediment deposited on the bottom of the sewer line.

OF-23-Abandoned A City of Portland (City) sanitary sewer main runs generally north-to-south through the approximate center of the site, and parallel to and south of the railroad right-of-way. A City combined sewer branch line enters the site from the west and ties into the sanitary sewer main.

The combined sewer originally discharged to the Willamette River at the OF-23 outfall, but the OF-23 outfall was abandoned in 1989 and the sewer re-routed to discharge at the re-routed OF-23 outfall. The re-routed OF-23 outfall has since been abandoned, and the sanitary sewer main now conveys combined flows off the site. The City sewers and previous outfalls are shown on **Figure 2** (AME 2008). The original combined sewer, which formerly passed beneath the center tank farm, was a wood box culvert (Kleinfelder 1991).



Sampling of beach sediments and water flowing from the former drain was conducted by Kleinfelder in 1991. Following the sampling, the storm drain was abandoned by Mobil in cooperation with the City. The abandonment reportedly consisted of pumping 21 cubic yards of grout into the storm drain from the eastern side (Kleinfelder 1991). Subsequent to the abandonment of the storm drain, surface seepage has been observed at this location. Presumably, a gap exists in the slurry wall because the slurry wall was constructed after the storm drain.

Manhole SS01 does not appear to be connected to the former OF-23-Abandoned sewer line, because only a relatively shallow small-diameter outfall is present. During field inspection by AME personnel in 2008, an outfall consisting of a 12-inch-diameter corrugated pipe (CMP) was observed, which had an invert elevation of approximately 6.2 feet below ground surface (bgs). The outfall, which was dry at the time of the observation, was visible from the dock as an opening in the riprap embankment (apparently the end of the CMP has broken off). The bottom of the manhole was measured at approximately 9 feet bgs. Manhole SS01 is not depicted on a 1975 site plan that includes sanitary sewers and process sewers.

OF-23 The former combined sewer line that passes between the center tank farm and south tank farm was constructed to replace the original OF-23 when it was abandoned in 1989. In 1991, the re-routed sewer line was reportedly sealed and the combined sewer was tied into the sanitary sewer main. The line leading to OF-23 was blocked off from the combined sewer at AAE218. Based on a field inspection by AME personnel in 2008, the former combined sewer is constructed of approximately 30-inch-diameter concrete pipe.

Ground Water Movement

The potentiometric gradient of the underlying ground water system is generally northeast toward the river (**Figure 3**). As such, ground water movement across the site is to the river. In the center and south tank farms, the ground water gradient is relatively flat due to the permeability of the upper sand fill and the effect of the subsurface slurry wall adjacent to the river. In the AS curtain area, the ground water gradient is approximately 0.05. The ground water gradient is steep in the southwestern portion of the site in response to the lower permeability of the basalt and an increase in topography.

Ground water discharges to the Willamette River, predominately in the AS curtain area. However, small gaps in the slurry wall may also produce ground water seeps to the river. In particular, a ground water low at monitoring well W-20 adjacent to where storm drain WP-209 intersects the slurry wall may result from ground water flow through a gap in the slurry wall. In addition, a ground water seep has been observed near the location of former City combined sewer outfall OF-23, just upstream of Shop Building #5 (Kleinfelder 1991), which may also correspond to a gap in the slurry wall. (The original outfall OF-23 was in use until 1989, 7 years after construction of the slurry wall [AME 2008].)



Ground Water Quality

WP-209 Vicinity Former extraction well W-20 is located adjacent to where the WP-209 sewer crosses the slurry wall (**Figure 2**). In the ground water sample collected from well W-20 during the first half 2011 sampling event, reported concentrations were less than the site Record of Decision Ground Water Cleanup Goals (Cleanup Goals) and the Portland Harbor Joint Source Control Strategy Screening Level Values (JSCS SLVs) for most chemicals of concern (COCs), which included total petroleum hydrocarbons as gasoline (TPHg), diesel (TPHd), and motor oil (TPHo), benzene, toluene, ethylbenzene and xylenes (BTEX), polynuclear aromatic hydrocarbons (PAHs), and the metals copper, lead, and zinc. Reported concentrations of these COCs were also less than the Cleanup Goals and the JSCS SLVs over the preceding 4 years (**Tables 1 and 2**).

Ground water samples obtained from well W-20 have exceeded the JSCS SLV for dissolved arsenic; however, reported concentrations have been greater in upgradient monitoring wells. In the sample obtained in the second quarter of 2010, the reported concentration of total arsenic was above the JSCS SLV (0.000180 estimated [J] milligrams per liter [mg/L] in the sample versus 0.000045 mg/L for the JSCS SLV and 0.005 mg/L for the Cleanup Goal). During the prior 3 years, 3 samples out of 12 contained reported arsenic concentrations greater than Method Detection Limit (MDL) and thus greater than JSCS SLV (**Table 2**). However, over the same 3-year period, six of seven samples from upgradient monitoring wells KMW24, KMW25, and KMW26 were greater than the MDL and thus greater than the JSCS SLV (**Table 3**). In samples collected during the first half 2011 from monitoring wells KMW24 and KMW26, reported arsenic concentrations were greater than the JSCS SLV in both samples and greater than the Cleanup Goal in the latter sample. Reported concentrations of dissolved arsenic have ranged up to 0.0105 mg/L (KMW24, September 2009 sample). Monitoring wells KMW24, KMW25, and KMW26 are located in the southwestern portion of the site and are upgradient of site industrial operations (**Figure 3**).

In 2008 and 2009, samples were obtained of storm drain discharge at the WP-209 outfall. Reported concentrations of TPHg, TPHd, TPHo, and BTEX were less than JSCS SLVs in these samples (**Table 4**).

OF-23-Abandoned Monitoring wells located upgradient of the point where the OF-23-Abandoned sewer crosses the slurry wall include KMW20 and KMW21 (**Figure 3**). These wells are sampled annually during the third quarter. In samples from monitoring well KMW21 collected during 2007 through 2011, reported concentrations of TPHd have exceeded the Cleanup Goals (**Table 5**). (The JSCS SLV and Cleanup Goal for TPHd are the same, 1 mg/L.) Reported concentrations of some PAHs have been greater than the JSCS SLVs. Reported dissolved arsenic concentrations in both wells over the same 3-year period have been greater than the JSCS SLV, and reported concentrations in samples from monitoring well KMW20 have also been greater than the Cleanup Goal (**Table 6**).

GROUND PENETRATING RADAR SURVEY

On September 28, 2010, ground penetrating radar (GPR) surveys were performed at the locations shown on **Figure 2**. The objectives of GPR surveys were to:

- Verify the location of utility lines (including the target sewers) or the trenches for these lines (depending on the effective depth of the GPR)
- Map the location of slurry wall, which was known approximately

In advance of the GPR survey, the locations of the slurry wall and sewer lines were estimated using available maps and marked on the ground.

The GPR surveys were performed by Pacific Geophysics of Portland, Oregon using a GSSI SIR 2000 GPR unit equipped with a 270-megahertz antenna in general accordance with +American Society for Testing and Materials (ASTM) Standard D6432 *Standard Guide for Using the Surface Ground Penetrating Radar Method for Subsurface Investigation*. To supplement the GPR, hand-held instruments (Aqua-Tronics A6 Tracer and Radio Detection RD8000PDL Cable and Pipe locator) were used to verify the locations of underground metal pipes.

Figures 4 and **5** summarize the results of the GPR surveys, and details are provided in the enclosed report from Pacific Geophysics (Enclosure A). The GPR surveys included a series of profiles perpendicular to the slurry wall. Each profile was between 14 and 30 feet long and consisted of recording GPR data as the unit was towed along a line. The GPR surveys followed an observational approach, in that the location and number of profiles were adjusted based on field observations. Data were viewed as a two-dimensional cross section of the subsurface, with horizontal units of distance and vertical units of apparent depth, which are derived from two-way reflection times. At each survey location, a longer profile was obtained along the inferred center line of the slurry wall.

The GPR detected a reflector consistent with the top of the slurry wall at both locations at a depth of approximately 0.5 or 0.9 meters (1.6 or 3 feet). The apparent slurry wall locations were confirmed to approximately correspond with the locations indicated on the 1982 survey map. Nearby utilities (pipes and electrical conduits) were also visible on the profiles. At each of the locations, the GPR survey showed an apparent gap in the slurry wall where the storm drains were projected to cross the slurry wall; specifically, approximately 10 feet at OF-23 Abandoned (**Figure 4**) and approximately 6 feet at WP-209 (**Figure 5**). The depth of penetration of the radar signal was estimated to be 4 to 5 feet.

The center line of the slurry wall was marked on the ground using paint (OF-23 Abandoned) and PK nails (WP-209). The locations of the features were measured relative to fixed site features (e.g., monitoring wells, containment walls, and fire hydrants) and the locations mapped using a global positioning system unit.



REMEDIATION WORK PLAN

General Remediation Approach

The area of the existing subsurface slurry wall where leakage is inferred around sewer OF-23-Abandoned will be upgraded by jet grouting of cement-bentonite slurry. Based on the GPR results, five injection borings are anticipated necessary to fill the apparent gap. Before the grouting is initiated, measures will be put in place to protect the river against the possible leakage of grout from the embankment. Also prior to grouting, a confirmation boring will be advanced in the approximate center of the apparent gap to the depth of the aquitard surface, and two potholes will be excavated on each side of the apparent gap to confirm location of the slurry wall.

Continued ground water monitoring is recommended for the WP-209 sewer. Reported concentrations of COCs in ground water samples obtained from well W-20 adjacent to where the WP-209 sewer crosses the slurry wall have generally been less than the Cleanup Goals and JSCS SLVs. In the case of dissolved arsenic, the reported concentrations are attributable to background, because reported concentrations have been greater in samples from monitoring wells KMW24, KMW25, and KMW26, which are located in the upgradient portion of the site.

Permitting/Notification

As this project constitutes repair of existing development and is not an excavation or fill greater than 50 cubic yards, it is exempt from Greenway review of the City of Portland. AME contacted the United States Coast Guard (USCG) regarding the scope of work, and was informed that the USCG has no permit requirement for the project (USCG 2011).

Grout Injection Scope of Work

The work to upgrade the slurry wall adjacent to OF-23 Abandoned will be as follows:

- Obtain a permit from the State of Oregon, Water Resources Department, to install a soil boring (the confirmation soil boring).
- Review the GPR survey results and mark the utilities shown on **Figure 4** and in the Pacific Geophysics report (Enclosure A) on the ground; also, mark the location of the slurry wall center line and the apparent gap on the ground. Mark the locations of the confirmation soil boring and the five grout injection borings on the ground, plus the two pothole locations on the slurry wall center line on each side of the apparent gap.
- Notify the Oregon Utility Notification Center at least 72 hours prior to scheduled drilling.
- Core 8-inch-diameter holes in the paving surface at the six marked boring locations (one confirmation boring and five grout injection borings).



- Using vacuum excavation techniques, remove soil from the two pothole locations on the slurry wall center line on each side of the apparent gap to verify the presence of the cement-bentonite slurry wall at approximately 3 feet bgs.
- Using vacuum excavation techniques, clear the six boring locations to a depth of 8 feet bgs.
- Using a direct push drilling technique, advance one nominal 2-inch-diameter confirmation soil boring within the gap to approximately 20 to 25 feet bgs to confirm the depth to the silt-clay aquitard. In order to maintain the boring within the upper sand fill, drilling will be performed with a dual-tube system consisting of an outer probe rod and a smaller-diameter inner probe rod equipped with a soil core sample liner. Obtain continuous soil samples to total depth using a core sampler fitted with 4-foot-long acrylic tubes. Classify recovered soil samples according to the Unified Soil Classification System.
- Using a rotary drilling technique, advance five borings along the gap in the slurry wall and along the slurry wall center line down to the top of the aquitard, and inject cement-bentonite grout as the drill rods are retracted to approximately 12 feet bgs, or until grout begins to fill the 8-inch-diameter boring that has been cleared by vacuum excavation.
- Restore the surface pavement at each boring location.

Protection of River during Grout Injection

Measures for protection of the river will be in place during the grouting work to address potential surface spills or surfacing of grout along the riprap embankment adjacent to the work site. Protective measures will include:

- Containment boom deployed in the river adjacent to the landward work area
- Watch personnel stationed in a boat during grout injection work to observe for grout emanating from the embankment
- Absorbent materials on hand and ready to deploy to capture grout observed emanating from the embankment
- Pumps, hoses, and tankage on hand and ready to pump fluids from the containment area

Schedule

ExxonMobil anticipates completing the work during October 2011 to coincide with the relatively low river stages. Vacuum excavation work and the confirmation boring have been tentatively scheduled for the week beginning October 3, 2011. The jet grouting contractor is tentatively scheduled to begin work the week of October 17, 2011.



Mr. Tom Gainer, P.E.
September 16, 2011
Page 8 of 9

Please contact Joe Abel of ExxonMobil at (401) 434-7356 or Jim Twiford at (916) 939-7550 or jtwiford@ameinc.net if you have any questions regarding this report.

Very truly yours,

ACTON • MICKELSON • ENVIRONMENTAL, INC.



James C. Twiford, P.E.
Senior Project Manager



Jeffrey R. Heglie, R.P.G.
Oregon Registered Professional Geologist #G1913

Enclosures

cc: Mr. Joe Abel, ExxonMobil
Mr. Joe Aldridge, NuStar (electronic only)
Mr. Ricky Hudiburgh, NuStar
Ms. Kristine Koch, United States Environmental Protection Agency
Ms. Amanda Spencer, Ash Creek Associates (electronic only)

REFERENCES

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Mr. Tom Gainer, P.E.

September 16, 2011

Page 9 of 9

Pettijohn Engineering Company, Inc. 1982. *Sketch for Monitoring of Mobil Oil Seepage Control System, N.W. St. Helens Rd. Portland, Ore.* Portland, Oregon. March 10, 1982; last annotation date on map April 19, 1982.

USCG. 2011. Telephone conversation between Dan Sweet of AME and Jeremy Majinot, USCG Portland Station, Planning Division. August 16.



TABLE 1
MONITORING WELL W-20 GROUND WATER ANALYTICAL DATA
2007 THROUGH FIRST HALF 2011
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL¹
NuStar Portland Terminal, Portland, Oregon

Sample Date	Ground Water Elevation (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naphthalene (µg/L)	Ethanol (µg/L)
Record of Decision Ground Water Clean Goal				1.0	1.0	1.0	40					347	
Portland Harbor JSCS SLVs				1.0	1.0	1.0	1.2	9.8	7.3	200	37	0.2	
W-20	Screen Elevation (feet): to												
2/28/2007	14.31	NP	Primary	<0.0430	0.29	0.0787 J	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
5/24/2007	14.25	NP	Primary	<0.0430	0.316	0.349	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/30/2007	12.43	NP	Primary	<0.0430	0.855	0.257	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/5/2007	12.97	NP	Primary	<0.0430	0.861	0.185	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
2/19/2008	14.72	NP	Primary	0.0678 Ju	0.22	0.314	<0.270	<0.280	<0.240	<0.860	<0.420	<0.540	SNA
5/6/2008	14.1	NP	Primary	0.0578 J	0.248	0.148	<0.270	0.400 J	<0.240	<0.860	<0.420	<0.540 uj	SNA
8/5/2008	13.44	NP	Primary	0.0777 Ju	0.374	0.13	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0375	SNA
11/19/2008	12.89	NP	Primary	<0.0430 uj	0.0808 J	0.0602 Ju	<0.270 uj	<0.280	<0.240	<0.860	<0.420	<0.0382	SNA
2/25/2009	13.2	NP	Primary	0.25	0.486	0.284 u	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0490	SNA
5/13/2009	14.07	NP	Primary	0.0560 J	0.178	0.120 u	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0500	SNA
9/23/2009	12.04	NP	Primary	NA	0.771	0.394	NA	NA	NA	NA	NA	<0.0275	SNA
10/13/2009	NM	NM	Primary	<0.0400	NA	NA	<0.410 uj	<0.350	<0.350	<0.730	<0.320	NA	SNA
11/17/2009	12.31	NP	Primary	<0.0400	0.911	0.369	<0.410 uj	<0.350	<0.350 uj	<0.730 uj	<0.320	<0.0269	SNA
2/3/2010	14.27	NP	Primary	<0.0400	0.211	0.0631 Ju	<0.410	<0.350	<0.350 uj	<0.730	<0.320	<0.0280	SNA
5/4/2010	14.17	NP	Primary	<0.0400	0.158	0.0552 J	<0.410	<0.350	<0.350	<0.730	<0.320	<0.0280	SNA
8/17/2010	13.46	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/24/2011	14.91	NP	Primary	<0.0330 uj	0.155	0.472	<0.270	<0.330	<0.320	<0.870	<0.320	0.0882 J	SNA

TABLE 1
MONITORING WELL W-20 GROUND WATER ANALYTICAL DATA
2007 THROUGH FIRST HALF 2011
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL¹
 NuStar Portland Terminal, Portland, Oregon

Sample Date	Ground Water Elevation (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naphthalene (µg/L)	Ethanol (µg/L)
Record of Decision Ground Water Clean Goal				1.0	1.0	1.0	40					347	
Portland Harbor JSCS SLVs				1.0	1.0	1.0	1.2	9.8	7.3	200	37	0.2	

Notes

¹ TPH gasoline by Method NWTPH-Gx, TPH diesel and motor oil by NWTPH-Dx, benzene, toluene, ethylbenzene, xylenes, MTBE, and naphthalene analyzed by EPA Method 8260B, except naphthalene by EPA Method 8270C beginning August 2008.

Portland Harbor JSCS SLVs = 2007 Portland Harbor Joint Source Control Strategy Screening Level Values.

Bolded values exceed Portland Harbor JSCS SLVs, and shaded cells indicate values exceed Record of Decision Ground Water Cleanup Goals.

Ground water elevation is corrected for the observed LPH thickness. LPH density of 0.81 used beginning 12/04.

Reference elevation is in City of Portland Datum.

“<” = concentration as reported by analytical laboratory is less than the method detection limit.

µg/L = microgram(s) per liter

mg/L = milligrams(s) per liter

EPA = United States Environmental Protection Agency

LPH = liquid phase hydrocarbons

MTBE = methyl tertiary butyl ether

NA = not analyzed, sample bottle broken during shipment

NM = depth to water not measured

NP = no product encountered

NS = not sampled

SNA = sampled, but ethanol not analyzed

TPH = total petroleum hydrocarbons by northwest methods, with samples for diesel and motor oil range analyses prepared by silica gel cleanup

Quality Assurance/Quality Control Data Qualifiers

U or u – reported analyte was not detected

J or j – reported result is an estimated value

UJ or uj – reported analyte was not detected and reporting limit is an estimated value

R or r – reported result is rejected and unusable

Flags shown with capital letters are qualifiers by the analytical laboratory, and flags with lower -case letters are from the data validation process.

TABLE 2

MONITORING WELL W-20 GROUND WATER ANALYTICAL DATA
2007 THROUGH FIRST HALF 2011
TOTAL AND DISSOLVED METALS
 NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Record of Decision Ground Water Cleanup Goal						0.005	0.012	0.0032	
Portland Harbor JSCS SLVs		0.000045	0.0027	0.00054	0.036	0.000045	0.0027	0.00054	0.036
W-20	2/28/2007	0.000970 J	0.00156 J	0.000750 J	0.0564	<0.000664	0.000856 J	<0.0000553	0.00541
	5/24/2007	<0.000664	0.00102 J	0.0000984 J	0.00747	<0.000664	0.00276	<0.0000553	0.0111
	8/30/2007	0.000727 J	0.00131 J	0.000142 J	0.0396	0.000790 J	0.00156 J	0.000160 Ju	0.0329
	12/5/2007	<0.000664	0.000740 J	<0.0000553	0.0124	<0.000664	<0.000133	0.0000800 J	0.00886
	2/19/2008	<0.000664	0.000347 J	<0.0000553	0.00738	<0.000664	0.000399 J	<0.0000553	0.00818
	5/6/2008	0.000299 J	0.000489 J	<0.000220	0.00480 J	<0.000664	0.00119 J	0.0000720 Ju	0.00407 J
	8/5/2008	<0.000180	0.000895 J	<0.000220	0.0174	<0.0180	<0.0270	<0.0220	<0.0700
	11/19/2008	0.000184 J	0.00538	<0.000220 uj	0.00367 Ju	<0.000180 uj	0.000481 J	<0.000220 uj	0.00202 Ju
	2/25/2009	0.000350 J	0.000420 J	<0.000220	0.00678	<0.000180	0.000300 J	<0.000220	0.00326 J
	5/13/2009	0.000220 J	0.000345 J	<0.000220	0.00215 J	<0.000180	0.000276 J	<0.000220	0.00238 J
	9/23/2009	0.00281	0.000340 J	<0.000220	NA	0.000900 J	<0.000270 uj	<0.000220	NA
	10/13/2009	NA	NA	NA	NA	NA	NA	NA	NA
	11/17/2009	0.00146	0.000860 J	<0.000111	NA	0.000710 J	<0.000526	<0.000111	NA
	2/3/2010	0.000290 J	<0.000526	0.000250 J	NA	<0.000130	<0.000526	<0.000111	NA
	5/4/2010	0.000170 J	<0.000526	<0.000111	NA	0.000180 J	<0.000526	<0.000111	NA
	8/17/10	NS	NS	NS	NS	NS	NS	NS	NS
	2/24/11	0.00033u	0.0011u	0.00026u	NA	0.00022u	0.00262 J	0.00015u	NA

TABLE 2

MONITORING WELL W-20 GROUND WATER ANALYTICAL DATA
2007 THROUGH FIRST HALF 2011
TOTAL AND DISSOLVED METALS
 NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Record of Decision Ground Water Cleanup Goal						0.005	0.012	0.0032	
Portland Harbor JSCS SLVs		0.000045	0.0027	0.00054	0.036	0.000045	0.0027	0.00054	0.036

Notes

Arsenic, copper, lead, and zinc analyzed by EPA Method 6020.

Portland Harbor JSCS SLVs = 2007 Portland Harbor Joint Source Control Strategy Screening Level Values.

Bolded values exceed Portland Harbor JSCS SLVs, and shaded cells indicate values exceed Record of Decision Ground Water Cleanup Goals.

"<" = concentration as reported by analytical laboratory is less than the method detection limit.

mg/L = milligram(s) per liter

EPA = United States Environmental Protection Agency

NA = not analyzed

NS = not sampled

Quality Assurance/Quality Control Data Qualifiers

U or u - reported analyte was not detected

J or j - reported result is an estimated value

UJ or uj - reported analyte was not detected and reporting limit is an estimated value

R or r - reported result is rejected and unusable

Flags shown with capital letters are qualifiers by the analytical laboratory, and flags with lower -case letters are from the data validation process.

TABLE 3

BACKGROUND MONITORING WELLS KMW24 THROUGH KMW26 GROUND WATER ANALYTICAL DATA

2007 THROUGH FIRST HALF 2011

TOTAL AND DISSOLVED METALS

NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Record of Decision Ground Water Cleanup Goal						0.005	0.012	0.0032	
Portland Harbor JSCS SLVs		0.000045	0.0027	0.00054	0.036	0.000045	0.0027	0.00054	0.036
KMW24	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	0.00743	0.000900 J	0.000310 J	0.0127	0.00856	0.00122 J	0.0000800 J	0.0108
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	0.00786	<0.000270	0.000980 J	0.00985	0.00852	<0.000270	<0.000220	0.00837
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
	5/11/2009	NS	NS	NS	NS	NS	NS	NS	NS
	9/22/2009	0.0104	0.000280 J	0.00107	NA	0.0105	<0.000270uj	0.000390 J	NA
	11/16/2009	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/10	NS	NS	NS	NS	NS	NS	NS	NS
	5/4/10	NS	NS	NS	NS	NS	NS	NS	NS
	2/22/11	0.00287	0.00123u	0.00229	NA	0.00219	0.00049 J	0.00041u	NA
KMW25	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	<0.000664	0.00135 J	0.000360 J	0.00383 J	<0.000664	0.00256	0.000120 J	0.00541
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	0.000345 J	<0.000270	0.000222 J	0.00260 Ju	0.000181 J	<0.000270	<0.000220	0.00264 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
	5/11/2009	NS	NS	NS	NS	NS	NS	NS	NS
	9/22/2009	<0.000180	<0.000270	<0.000220	NA	0.000210 J	<0.000270uj	<0.000220	NA
	11/16/2009	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 3

BACKGROUND MONITORING WELLS KMW24 THROUGH KMW26 GROUND WATER ANALYTICAL DATA

2007 THROUGH FIRST HALF 2011

TOTAL AND DISSOLVED METALS

NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Record of Decision Ground Water Cleanup Goal						0.005	0.012	0.0032	
Portland Harbor JSCS SLVs		0.000045	0.0027	0.00054	0.036	0.000045	0.0027	0.00054	0.036
KMW-25 (Cont.)	2/1/10	NS	NS	NS	NS	NS	NS	NS	NS
	5/4/10	NS	NS	NS	NS	NS	NS	NS	NS
	2/22/2011	NS	NS	NS	NS	NS	NS	NS	NS
KMW26	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/27/2007	0.00248	0.0106	0.00151	0.0256	NA	NA	NA	NA
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/7/2008	NA	NA	NA	NA	NA	NA	NA	NA
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
	5/11/2009	NS	NS	NS	NS	NS	NS	NS	NS
	9/22/2009	0.00574	0.00856	0.00502	NA	0.00152	0.00335 j	<0.000220	NA
	11/16/2009	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/10	NS	NS	NS	NS	NS	NS	NS	NS
	5/4/10	NS	NS	NS	NS	NS	NS	NS	NS
	2/22/11	0.00823	0.0089	0.00285	NA	0.00605	0.00274 J	0.00103u	NA

TABLE 3

BACKGROUND MONITORING WELLS KMW24 THROUGH KMW26 GROUND WATER ANALYTICAL DATA

2007 THROUGH FIRST HALF 2011

TOTAL AND DISSOLVED METALS

NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Record of Decision Ground Water Cleanup Goal						0.005	0.012	0.0032	
Portland Harbor JSCS SLVs		0.000045	0.0027	0.00054	0.036	0.000045	0.0027	0.00054	0.036

Notes

Arsenic, copper, lead, and zinc analyzed by EPA Method 6020.

Portland Harbor JSCS SLVs = 2007 Portland Harbor Joint Source Control Strategy Screening Level Values.

Bolded values exceed Portland Harbor JSCS SLVs, and shaded cells indicate values exceed Record of Decision Ground Water Cleanup Goals.

"<" = concentration as reported by analytical laboratory is less than the method detection limit.

mg/L = milligram(s) per liter

EPA = United States Environmental Protection Agency

NA = not analyzed

NS = not sampled

Quality Assurance/Quality Control Data Qualifiers

U or u - reported analyte was not detected

J or j - reported result is an estimated value

UJ or uj - reported analyte was not detected and reporting limit is an estimated value

R or r - reported result is rejected and unusable

Flags shown with capital letters are qualifiers by the analytical laboratory, and flags with lower -case letters are from the data validation process.

TABLE 4

STORM SEWER WP-209 SAMPLING ANALYTICAL RESULTS, 2008 AND 2009

NuStar Portland Terminal, Portland, Oregon

Sample Identification	Sample Location	Sample Date	Benzene µg/L	Toluene µg/L	Ethyl- benzene µg/L	Total Xylenes µg/L	MTBE µg/L	Naph- thalene µg/L	TPH Gasoline mg/L	TPH Diesel mg/L	TPH Motor Oil mg/L
Record of Decision Ground Water Cleanup Goal			40					347	1.0	1.0	1.0
Portland Harbor JSCS SLVs			1.2	9.8	7.3	200	37	0.2	1.0	1.0	1.0
WP209outfall-102908	WP-209 Outfall	10/29/2008	0.840J	0.790J	<0.240	1.27J	0.510J	<0.0375	0.0963J	0.149	0.0470J _u
WP209outfall-040109	WP-209 Outfall	4/1/2009	<0.270	0.320J	<0.240	<0.860	<0.420	<0.0526	<0.043 _{uj}	0.0656J	0.173

*Notes**µg/L = micrograms per liter**MTBE = methyl tertiary butyl ether**Portland Harbor JSCS SLVs = 2007 Portland Harbor Joint Source Control Strategy Screening Level Values.**TPH = total petroleum hydrocarbons*

TABLE 5
MONITORING WELLS KMW20 AND KMW21 GROUND WATER ANALYTICAL DATA
2007 THROUGH FIRST HALF 2011
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL¹
 NuStar Portland Terminal, Portland, Oregon

Sample Date	Ground Water Elevation (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naphthalene (µg/L)	Ethanol (µg/L)
Record of Decision Ground Water Clean Goal				1.0	1.0	1.0	40					347	
Portland Harbor JSCS SLVs				1.0	1.0	1.0	1.2	9.8	7.3	200	37	0.2	
KMW20	Screen Elevation (feet): 26.97 to 16.97												
2/27/2007	22.8	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	21.97	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/29/2007	20.85	NP	Primary	<0.0430	0.216	0.0756 Ju	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
8/29/2007	20.85	NP	Duplicate	<0.0430	0.248	<0.0363	<0.330	<0.420	<0.420	<0.450	<0.310	<0.650	SNA
12/3/2007	22.23	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	23.05	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	22.24	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/5/2008	21.22	NP	Primary	<0.0430	0.286	0.164	<0.270	<0.280	<0.240	<0.860	<0.420	<0.0390	SNA
11/17/2008	21.71	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	21.74	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/11/2009	22.19	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
9/23/2009	20.98	NP	Primary	0.0578 J	0.35	0.183 u	<0.410	<0.350	<0.350	<0.730	<0.320	<0.0267	SNA
11/16/2009	21.93	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/1/2011	22.95	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/4/2011	22.84	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2011	23.5	NP	Primary	0.0799 J	0.184	0.104 u	<0.270	<0.330	<0.320	<0.870	<0.320	<0.0250	SNA
KMW21	Screen Elevation (feet): 26.56 to 11.56												
2/27/2007	22.09	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/21/2007	21.13	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/29/2007	18.99	NP	Primary	0.485	2.42	0.394	<0.330	<0.420	<0.420	<0.450	92.7	3.81 J	SNA
12/3/2007	19.97	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/18/2008	22.94	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/5/2008	21.53	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8/5/2008	20.01	NP	Primary	0.341 j	2.04	0.227	<0.270	<0.280	<0.240	<0.860	79.9	<0.0390	SNA
11/17/2008	19.58	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2009	20.72	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/11/2009	20.92	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
9/23/2009	18.84	NP	Primary	NA	1.96	0.313 u	NA	NA	NA	NA	NA	0.235	SNA
10/13/2009	NM	NM	Primary	0.484	NA	NA	<0.410uj	<0.350	<0.350	<0.730	165	NA	SNA

TABLE 5
MONITORING WELLS KMW20 AND KMW21 GROUND WATER ANALYTICAL DATA
2007 THROUGH FIRST HALF 2011
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL¹
 NuStar Portland Terminal, Portland, Oregon

Sample Date	Ground Water Elevation (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Record of Decision Ground Water Clean Goal				1.0	1.0	1.0	40					347	
Portland Harbor JSCS SLVs				1.0	1.0	1.0	1.2	9.8	7.3	200	37	0.2	
KMW21	Screen Elevation (feet): 26.56 to 11.56												
11/16/2009	19.96	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/1/2011	22.51	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5/4/2011	22.36	NP	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/23/2011	23.23	NP	Primary	0.340	1.07	0.104 u	<0.270	<0.330	<0.320	<0.870	32.4	<0.0250	SNA

TABLE 5
MONITORING WELLS KMW20 AND KMW21 GROUND WATER ANALYTICAL DATA
2007 THROUGH FIRST HALF 2011
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, DIESEL, AND MOTOR OIL, BENZENE, TOLUENE, ETHYLBENZENE, XYLENES,
METHYL TERTIARY BUTYL ETHER, NAPHTHALENE AND ETHANOL¹
 NuStar Portland Terminal, Portland, Oregon

Sample Date	Ground Water Elevation (feet)	LPH Thick-ness (feet)	Sample Type	TPH Gasoline (mg/L)	TPH Diesel (mg/L)	TPH Motor Oil (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Naph-thalene (µg/L)	Ethanol (µg/L)
Record of Decision Ground Water Clean Goal				1.0	1.0	1.0	40					347	
Portland Harbor JSCS SLVs				1.0	1.0	1.0	1.2	9.8	7.3	200	37	0.2	

Notes

¹ TPH gasoline by Method NWTPH-Gx, TPH diesel and motor oil by NWTPH-Dx, benzene, toluene, ethylbenzene, xylenes, MTBE, and naphthalene analyzed by EPA Method 8260B, except naphthalene by EPA Method 8270C beginning August 2008.

Portland Harbor JSCS SLVs = 2007 Portland Harbor Joint Source Control Strategy Screening Level Values.

Bolded values exceed Portland Harbor JSCS SLVs, and shaded cells indicate values exceed Record of Decision Ground Water Cleanup Goals.

Ground water elevation is corrected for the observed LPH thickness. LPH density of 0.81 used beginning 12/04.

Reference elevation is in City of Portland Datum.

“<” = concentration as reported by analytical laboratory is less than the method detection limit.

µg/L = microgram(s) per liter

mg/L = milligrams(s) per liter

EPA = United States Environmental Protection Agency

LPH = liquid phase hydrocarbons

MTBE = methyl tertiary butyl ether

NA = not analyzed, sample bottle broken during shipment

NM = depth to water not measured

NP = no product encountered

NS = not sampled

SNA = sampled, but ethanol not analyzed

TPH = total petroleum hydrocarbons by northwest methods, with samples for diesel and motor oil range analyses prepared by silica gel cleanup

Quality Assurance/Quality Control Data Qualifiers

U or u – reported analyte was not detected

J or j – reported result is an estimated value

UJ or uj – reported analyte was not detected and reporting limit is an estimated value

R or r – reported result is rejected and unusable

Flags shown with capital letters are qualifiers by the analytical laboratory, and flags with lower -case letters are from the data validation process.

TABLE 6

MONITORING WELLS KMW20 AND KMW21 GROUND WATER ANALYTICAL DATA

2007 THROUGH FIRST HALF 2011

TOTAL AND DISSOLVED METALS

NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Record of Decision Ground Water Cleanup Goal						0.005	0.012	0.0032	
Portland Harbor JSCS SLVs		0.000045	0.0027	0.00054	0.036	0.000045	0.0027	0.00054	0.036
KMW20	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/29/2007	0.0117	0.000455 J	<0.0000553	0.00376 J	0.0119	0.000140 J	<0.0000553	0.00243 J
	8/29/2007 (Dup)	0.0116	0.000380 J	<0.0000553	0.00288 J	0.0118	0.000340 J	0.0000700 J	0.00200 J
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/5/2008	<0.0180	<0.0270	<0.0220	<0.0700	0.0104	<0.000270	<0.000220	0.00152 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
	5/11/2009	NS	NS	NS	NS	NS	NS	NS	NS
	9/23/2009	0.0131	0.00173 J	<0.000220	NA	0.0116	<0.000270uj	<0.000220	NA
	11/16/2009	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/11	NS	NS	NS	NS	NS	NS	NS	NS
	5/4/11	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/11	0.0137	0.00421	<0.00009	NA	0.00519	0.0008 J	0.00012 u	NA
KMW21	2/27/2007	NS	NS	NS	NS	NS	NS	NS	NS
	5/21/2007	NS	NS	NS	NS	NS	NS	NS	NS
	8/29/2007	0.00374	0.000972 J	0.000247 J	0.00490 J	0.00362	0.00152 J	0.0000600 J	0.00368 J
	12/3/2007	NS	NS	NS	NS	NS	NS	NS	NS
	2/18/2008	NS	NS	NS	NS	NS	NS	NS	NS
	5/5/2008	NS	NS	NS	NS	NS	NS	NS	NS
	8/5/2008	<0.0180	0.101 J	<0.0220	<0.0700	0.00347	<0.000270	<0.000220	0.00477 Ju
	11/17/2008	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/2009	NS	NS	NS	NS	NS	NS	NS	NS
	5/11/2009	NS	NS	NS	NS	NS	NS	NS	NS
	9/23/2009	0.00309	<0.000270	<0.000220	NA	0.00307	<0.000270uj	<0.000220	NA

TABLE 6

MONITORING WELLS KMW20 AND KMW21 GROUND WATER ANALYTICAL DATA

2007 THROUGH FIRST HALF 2011

TOTAL AND DISSOLVED METALS

NuStar Portland Terminal, Portland, Oregon

Well Number	Sample Date	Total Arsenic (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)	Dissolved Arsenic (mg/L)	Dissolved Copper (mg/L)	Dissolved Lead (mg/L)	Dissolved Zinc (mg/L)
Record of Decision Ground Water Cleanup Goal						0.005	0.012	0.0032	
Portland Harbor JSCS SLVs		0.000045	0.0027	0.00054	0.036	0.000045	0.0027	0.00054	0.036
KMW21 (Cont.)	10/13/2009	NA	NA	NA	NA	NA	NA	NA	NA
	11/16/2009	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/11	NS	NS	NS	NS	NS	NS	NS	NS
	5/4/11	NS	NS	NS	NS	NS	NS	NS	NS
	2/23/11	0.00169	<0.0003	<0.00009	NA	0.00161	<0.0003	<0.00009	NA

Notes

Arsenic, copper, lead, and zinc analyzed by EPA Method 6020.

Portland Harbor JSCS SLVs = 2007 Portland Harbor Joint Source Control Strategy Screening Level Values.

Bolded values exceed Portland Harbor JSCS SLVs, and shaded cells indicate values exceed Record of Decision Ground Water Cleanup Goals.

“<” = concentration as reported by analytical laboratory is less than the method detection limit.

mg/L = milligram(s) per liter

EPA = United States Environmental Protection Agency

NA = not analyzed

NS = not sampled

Dup = Field Duplicate

Quality Assurance/Quality Control Data Qualifiers

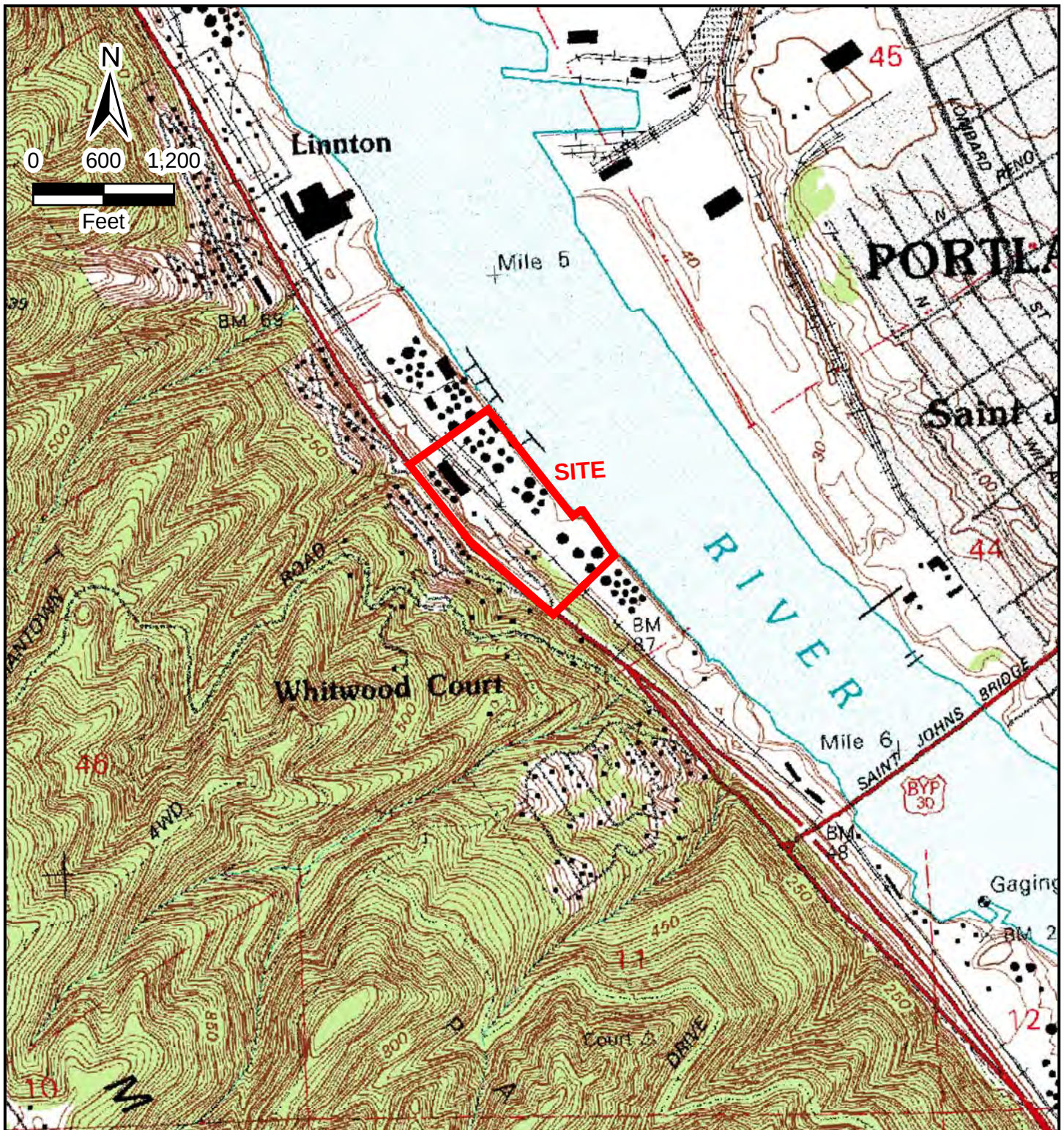
U or u - reported analyte was not detected

J or j - reported result is an estimated value

UJ or uj - reported analyte was not detected and reporting limit is an estimated value

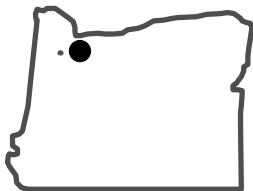
R or r - reported result is rejected and unusable

Flags shown with capital letters are qualifiers by the analytical laboratory, and flags with lower -case letters are from the data validation process.



NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE
2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005.



QUADRANGLE LOCATION

General Notes:
Base Map from U.S.G.S.
Portland, Oregon
7.5 Minute Topographic
Quadrangle

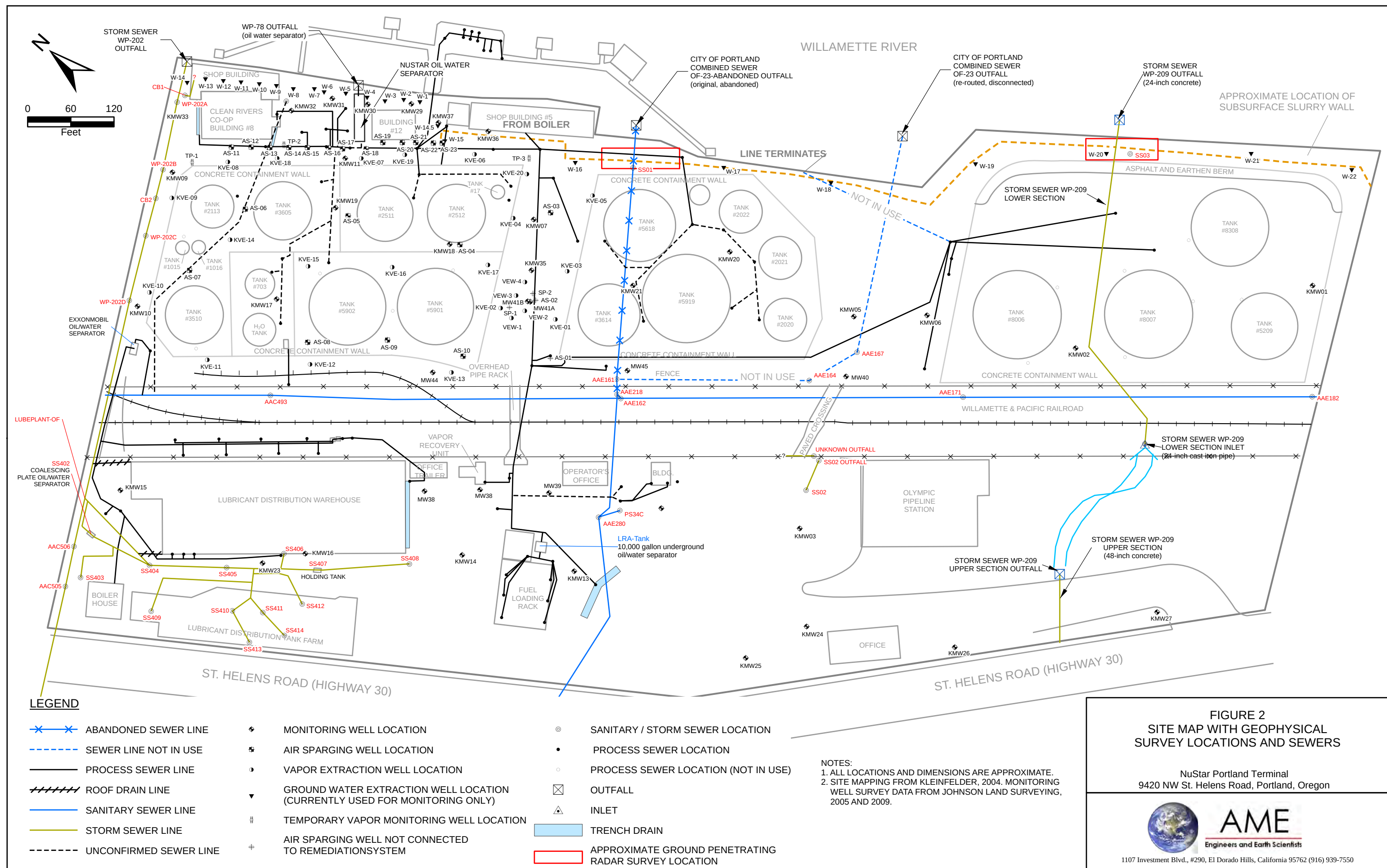
**FIGURE 1
SITE LOCATION MAP**

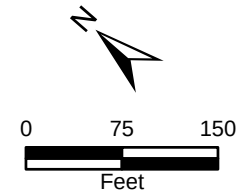
NuStar Portland Terminal
9420 NW St. Helens Road, Portland, Oregon

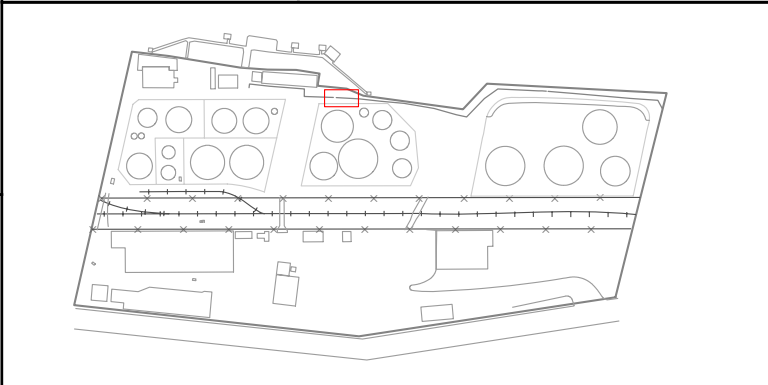
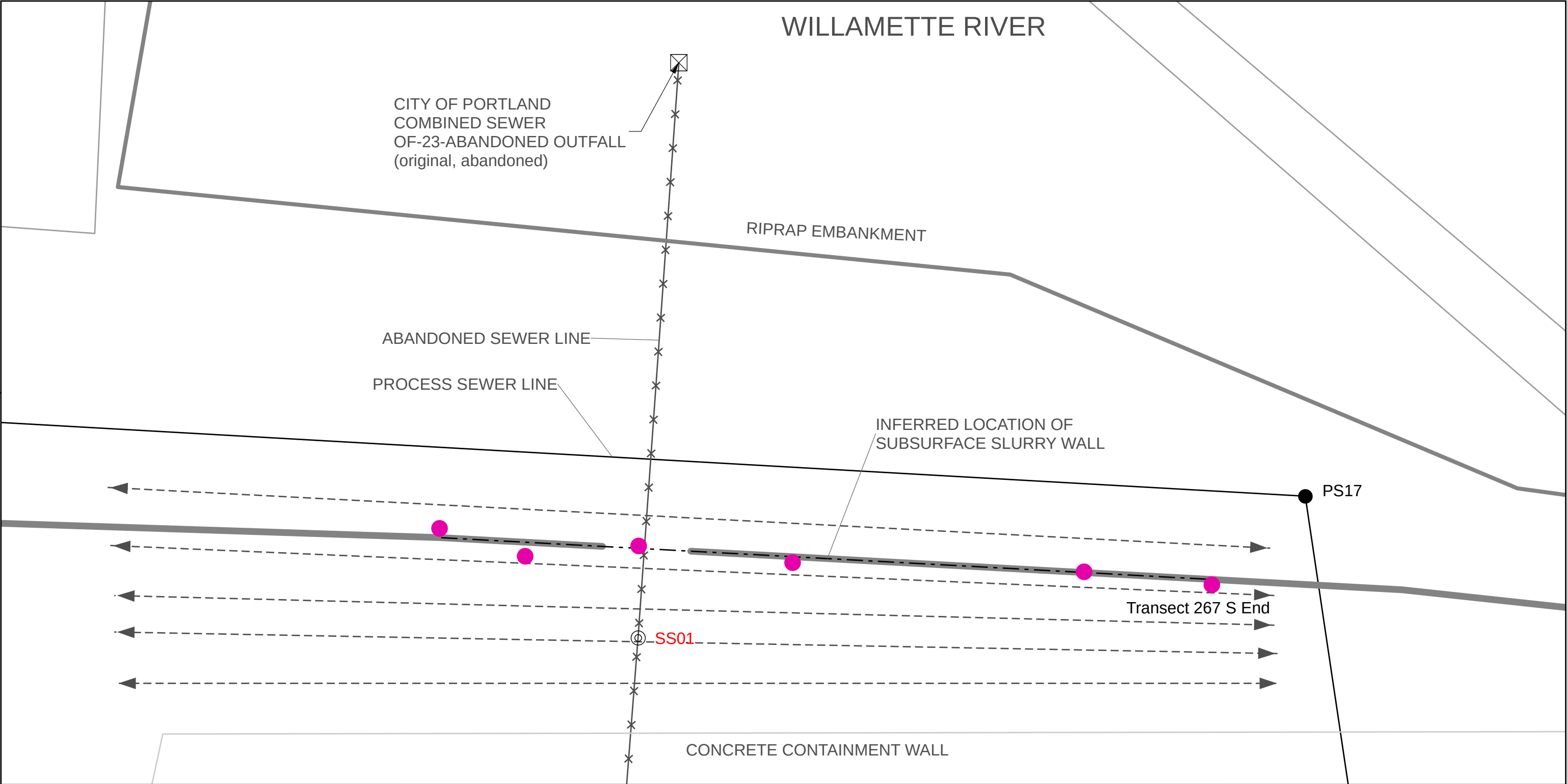


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Engineers and Earth Scientists

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LEGEND

- LOCATION SURVEYED WITH GLOBAL POSITIONING SYSTEM
- ⊠ STORM SEWER OUTFALL
- PROCESS SEWER LOCATION
- ⊙ SANITARY / STORM SEWER LOCATION
- SLURRY WALL
- - - INFERRED CENTER LINE OF SLURRY WALL

- ← - - → UNDERGROUND UTILITY LINE
- PROPERTY LINE

NOTES:
1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005 AND 2009.
3. LOCATIONS SURVEYED WITH GLOBAL POSITIONING SYSTEM ARE ALONG GROOUND PENETRATING RADAR SURVEY TRANSECT UNLESS NOTED. LOCATION ACCURACY APPROXIMATELY 3 FEET.

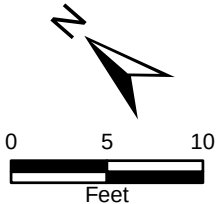


FIGURE 4
GEOPHYSICAL SURVEY RESULTS SUMMARY
OF-23-ABANDONED

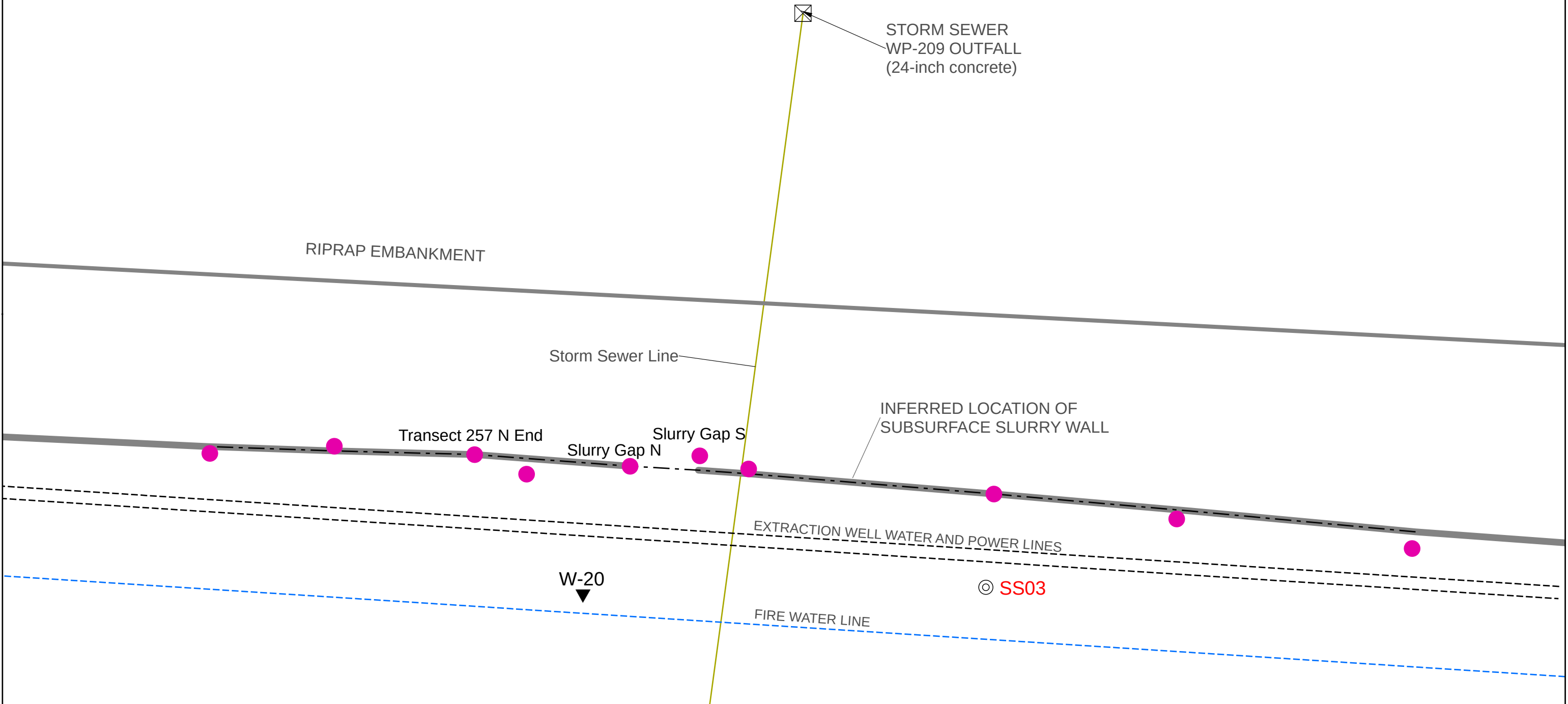
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WILLAMETTE RIVER



LEGEND

- LOCATION SURVEYED WITH GLOBAL POSITIONING SYSTEM
- ▼ GROUND WATER EXTRACTION WELL
- ⊠ STORM SEWER OUTFALL
- ⊙ SANITARY / STORM SEWER LOCATION
- SLURRY WALL
- - - INFERRED CENTER LINE OF SLURRY WALL
- PROPERTY LINE

NOTES:
1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. SITE MAPPING FROM KLEINFELDER, 2004. MONITORING WELL SURVEY DATA FROM JOHNSON LAND SURVEYING, 2005 AND 2009.
3. LOCATIONS SURVEYED WITH GLOBAL POSITIONING SYSTEM ARE ALONG GROOUND PENETRATING RADAR SURVEY TRANSECT UNLESS NOTED. LOCATION ACCURACY APPROXIMATELY 3 FEET.

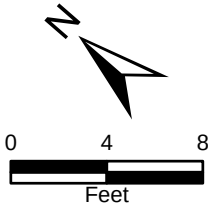


FIGURE 5
GEOPHYSICAL SURVEY RESULTS SUMMARY
WP-209

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