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TECHNICAL MEMORANDUM

Date: June 7, 2010
To: Panjini Balaraju, P.E. – Ecology
From: David Dinkuhn, P.E. – Parametrix *(D-D)*
Subject: Interim Action Report
cc: Thomas Knuckey, P.E. – City of Bremerton
Bill Webb – Parametrix
Project Number: 255-1896-063
Project Name: Former Chevron Property RI/FS and Interim Action

FORMER CHEVRON PROPERTY INTERIM ACTION REPORT

This memorandum presents the results of the Interim Action (IA) performed at the Former Chevron Property site during the summer of 2009. The objective of the IA was to significantly reduce contaminant levels at the site and enhance bioattenuation processes so that cleanup levels are met within a reasonable timeframe. It is anticipated that the restoration timeframe following the IA will be on the order of 2 to 5 years. The IA was conducted according to the Washington State Department of Ecology (Ecology) -approved IA Plan (Parametrix 2009). The IA is one step in the overall cleanup process being conducted at the site under Agreed Order (AO) Number DE-07TCPHQ-5024.

The IA consisted of the removal of site debris, excavation and removal of contaminated soil from several hot spots, and treatment of contaminated site soils by in-situ chemical oxidation (chemox). A detailed description of these activities and the results for confirmation samples is provided below. A discussion of follow-on soil and groundwater confirmation sampling is also provided.

HOT SPOT SOIL REMOVAL

Contaminated soils were excavated and removed from Areas 1, 2, and 3 as shown on Figure 1. Sidewall and bottom soil confirmation samples were collected from each excavation once all apparently contaminated soils were removed. The locations of the confirmation samples are shown on Figure 1. Analytical results summaries are provided in Tables 1 and 2. Note that Area 1 was subdivided into subareas 1A and 1B. Note also that no confirmation samples were collected from Area 3 since this area is located within the soil mixing area and received later treatment during the soil mixing phase.

All confirmation soil concentrations from Areas 1 and 2 were below Ecology Model Toxics Control Act (MTCA) Method A cleanup levels. These levels were established as applicable cleanup levels in the site's Remedial Investigation/Feasibility Study (RI/FS) work plan (Parametrix 2007). Results for samples collected from the Area 3 contaminated soil stockpile are provided in Table 3. No samples were collected from contaminated soil stockpiles from Areas 1 and 2.

TECHNICAL MEMORANDUM (CONTINUED)

A summary of the quantities of contaminated soil removed from each area is provided as follows:

- Area 1 (combined Areas 1A and 1B) – 924 tons. Average depth of excavation: Area 1A – 17 feet, Area 1B – 13 feet. Groundwater encountered at approximately 16 feet. No dewatering was conducted due to a very slow groundwater inflow rate.
- Area 2 – 476 tons. Average depth of excavation: 12 feet. No groundwater encountered.
- Area 3 – 244 tons. This quantity includes grossly contaminated soil excavated during the removal of the nearby wooden bulkhead. Average depth of excavation: 6 feet. No groundwater encountered.

All contaminated soil (1,644 tons total) was transported and disposed at Waste Management's Subtitle D landfill located in Arlington, Oregon. A copy of the certificate of disposal for the contaminated soil is attached. In addition to the contaminated soil, two buried bulkheads (one wooden and one concrete) and miscellaneous concrete debris were removed and disposed of to facilitate soil mixing. Treated timbers from the wooden bulkhead and miscellaneous concrete debris were disposed at the same landfill as the contaminated soil (31.49 tons). A certificate of disposal for this material is attached. Concrete bulkhead debris was observed to be clean and was disposed of at a local concrete recycling facility.

Clean overburden soil removed from Areas 1 and 2 was stockpiled separately and tested to confirm that it was clean (approximately 500 cubic yards). Sample results are provided in Table 4. As shown, cleanup levels were not exceeded in the samples and the clean overburden soil was replaced in the excavations in compacted lifts. Groundwater in Areas 1 and 2 occurs between 3 and 5 feet below the ground surface (bgs). Oxygen Release Compound™ (ORC) was mixed with the clean soil backfill below the depths of 4 feet bgs (corresponding to the anticipated saturated zone) in Areas 1 and 2 to provide an oxygen source for naturally-occurring bacteria. A total of 1,500 pounds of ORC™ was applied at an approximate rate of 1.5 pounds per cubic yard.

SOIL MIXING

Soils located within the soil mixing area (Figure 2) were treated in place by mixing using specialized equipment manufactured by Lang Tool of Beaverton, Michigan. The equipment was used to mix soils between the depths of 8 and 14 feet bgs while simultaneously injecting a slurry containing RegenOx™, ORC™, and water. Refer to the Interim Action Plan for a detailed description of the soil mixing procedure and chemical dosing rates. A total of 57,000 pounds of RegenOx™ and 5,500 pounds of ORC™ were applied during the project.

Following an initial mixing pass, confirmation samples of the treated soil were collected from pre-determined locations. Sample depths were targeted to reproduce the depths of samples collected during RI/FS sampling (Parametrix 2008). Samples were collected using new 2-inch-outside-diameter PVC pipe inserted to the depths required. Soil entering the end of the pipes was trapped in place by placement of tape over the above-ground end, thereby creating a vacuum in the pipe. The pipe was removed from the ground and a sample was placed into appropriate sample containers. Confirmation samples were analyzed on the 7th day following soil treatment to allow time for the majority (estimated at 90 percent) of the oxidation reaction to occur. Confirmation sample locations are shown on Figure 2. Sample results are provided in Table 5.

The goal of the chemox treatment was to achieve at least a 70 percent reduction from pre-treatment concentrations. Pre-treatment concentrations are provided in Table 5 as samples containing "PP-" or "MW-" in the sample number. For each sample station, pre-treatment results are in the left hand column. The right hand column(s) contains the confirmation results. If the initial confirmation sample results did not meet the 70 percent criteria, a second treatment pass was performed and a second confirmation sample was collected and analyzed. The chemox treatment effectiveness is discussed according to individual petroleum fraction below and shown in Table 6.

Gasoline Results

Pre-treatment gasoline concentrations in site soils ranged as high as 5,100 milligrams per kilogram (mg/kg) with an average of 1,441 mg/kg. Post treatment concentrations ranged as high as 1,800 mg/kg and averaged 321 mg/kg. Six of the eleven confirmation sample stations experienced significant reductions in gasoline concentrations. Concentrations increased at the remaining five stations. The increases could have been caused by varying gasoline concentrations within the treatment zone soil (i.e., the confirmation samples could not be collected from the exact spot where pre-treatment samples were collected and gasoline concentrations varied between sample locations), mobilization of gasoline contamination within the treatment area caused by the desorption effects of the RegenOx™, or from longer chain hydrocarbons breaking down into lighter products. According to a Regenesis representative, it is likely that the increase in gasoline concentrations was due to either mobilization or varying concentrations in the treatment zone. While the chemox process does break down long chain hydrocarbons, it does so in a very irregular fashion, and it would be rare for the resulting daughter products to register as gasoline range hydrocarbons. A comparison of results is provided in Table 6. As shown, a calculation of gasoline mass reduction indicates that, on average, a 78 percent reduction in gasoline mass was achieved.

Diesel Results

Diesel concentrations experienced significant declines and an average 88 percent mass reduction was achieved. All remaining concentrations are below the MTCA A cleanup level.

Lube Oil Results

Lube oil concentrations also experienced overall declines and an average 40 percent mass reduction was achieved. Note that all pre-treatment and post-treatment lube oil concentrations are below the MTCA A cleanup level.

Polycyclic Aromatic Hydrocarbons (PAHs) Results

PAHs were generally not analyzed in the pretreatment samples so a detailed comparison cannot be made. However, PAHs concentrations exceeding the cleanup level were reported in several of the confirmation samples.

POST-TREATMENT SOIL SAMPLING AND GROUNDWATER MONITORING

Follow-on soil confirmation sampling was conducted approximately 6 months after completion of the IA to provide an assessment of post-treatment soil conditions. Soil samples were collected from a series of borings located as shown on Figure 3 (PP-30 through PP-36). These borings correspond to locations containing elevated contaminant concentrations based on the IA confirmation samples. Samples were analyzed for the targeted constituents presented in Table 7. In addition to the soil sampling, a total of ten new monitoring wells were installed to provide a well network for groundwater monitoring. The new wells replaced wells decommissioned during the IA and contain an "R" in the well identifier (MW-4R, MW-9R, MW-10R, MW-13R, MW-16R, MW-18R, MW-19R, MW-21R, MW-22R, and MW-26R). Soil samples were also collected from selected well borings to assess contaminant levels (Table 7).

Soil sampling and well installation occurred on December 14, 15, and 29, 2009. Results for all soil samples are presented in Table 8. As shown, several samples contained gasoline, BTEX (benzene, toluene, ethylbenzene, and xylene), and PAHs at concentrations exceeding cleanup levels. In samples where comparisons can be made to previous confirmation sample results, concentrations increased at six of eleven sampling stations. As described above, this trend may be attributable to mobilization or varying concentrations between discrete sample locations.

Replacement wells were configured to be similar to the originals. Due to the soft ground at the site, the replacement wells were installed using a limited access push probe drill rig and are constructed of 3/4-inch-inside-diameter PVC casing installed to a depth of 15 feet with 10-foot-long, pre-packed PVC screens (0.020-inch slot). Surface completion consists of flush monuments. An exception is the replacement for MW-19, which was installed to a depth of 20 feet with a 15-foot-long screen. Soil boring logs showing well details are attached.

TECHNICAL MEMORANDUM (CONTINUED)

A total of three rounds of groundwater sampling will be conducted under the ongoing RI/FS. Tabulated results for the groundwater monitoring will be submitted as they are developed. Formal reporting for all three groundwater sampling events will be provided in the RI/FS report. The analytical program for the groundwater monitoring (as presented in the RI/FS work plan) is provided in Table 7.

All groundwater samples from the wells will be analyzed for gasoline, BTEX, diesel, lube oil, lead, and PAHs. If lead and/or PAHs are not detected at concentration above the practical quantitation level (PQL) for the analytical method used, their removal from the monitoring program will be considered. If they are detected above the PQL, they will remain in the monitoring program.

To provide a baseline for assessing whether bioattenuation is occurring at the site, all groundwater samples will be analyzed for nitrate, sulfate, alkalinity, dissolved ferrous iron, dissolved manganese, methane, temperature, specific conductivity, and biochemical oxygen demand (BOD5). The geochemical indicators dissolved oxygen and redox potential will be measured in the field during well sampling. All groundwater samples will also be analyzed for chloride so that an assessment of tidal influences can be made. A baseline chloride concentration was obtained from a surface water sample collected from Smith Cove during the RI.

REFERENCES

Parametrix. 2009. Technical memorandum, interim action plan, former Chevron Property RI/FS and interim action, Bremerton, Washington. Prepared for the City of Bremerton. March 17.

Parametrix. 2008. Technical memorandum, pilot scale test plan, former Chevron Property RI/FS and interim action, Bremerton, Washington. Prepared for the City of Bremerton. April 18.

Parametrix. 2007. Work plan for remedial investigation/feasibility study, interim action, and shoreline restoration, former Chevron Property, Bremerton, Washington. Prepared for the City of Bremerton. September.

ATTACHMENTS

Figures

Figure 1. Soil Excavation Areas

Figure 2. Soil Mixing Area and Confirmation Sample Results

Figure 3. Well Location Plan and 6-Month Post Treatment Soil Sample Results

Tables

Table 1. Area 1 Excavation Confirmation Sample Results

Table 2. Area 2 Excavation Confirmation Sample Results

Table 3. Area 3 Contaminated Soil Stockpile Sample Results

Table 4. Areas 1 and 2 Clean Soil Stockpile Sample Results

Table 5. Soil Mixing Area Confirmation Sample Results

Table 6. Soil Mixing Results Comparison

Table 7. Soil and Groundwater Post Treatment Sampling Program

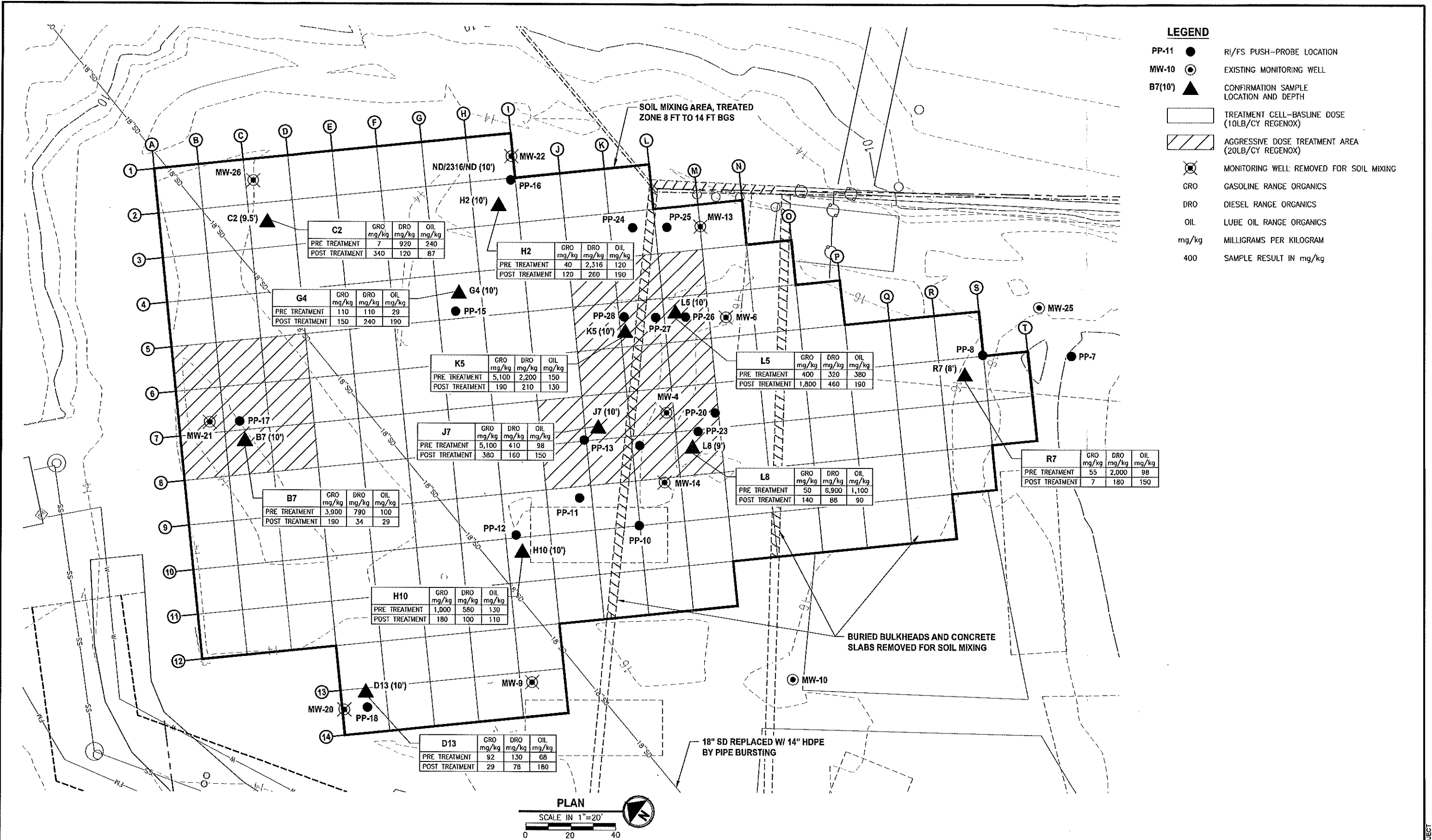
Table 8. 6-Month Post Treatment Soil Sample Results

Certificates of Soil Disposal

Boring Logs

FIGURES

FILE: B1886063P04-PRK-A_C-02
DATE: Apr 15, 2010 - 1:08pm
PLOTTER: peterjd
IMAGES: Chevron Property FCI
REFS: XBR1886063A-SV-070731 | XBR1886063P041301F-BA



REVISIONS				SCALE		FIELD BOOK		CITY OF BREMEROTON DEPARTMENT OF PUBLIC WORKS & UTILITIES ENGINEERING DIVISION			FORMER CHEVRON PROPERTY INTERIM ACTION REPORT SOIL MIXING AREA AND CONFIRMATION SAMPLE RESULTS			FIG. NO. 2		SHEET 2 OF 3	
NO.	DESCRIPTION	DATE	BY	HORIZ.	VERT.	DRAWING NO.	DRAWN BY:	DESIGN BY:	CHECKED BY:	DATE	WASH. P.E. #	DATE	WASH. P.E. #	DATE	DATE	DATE	
				1"=10'	N/A	2	JLP	DLD		4/10		4/10					

TABLES

Table 1. Area 1 Excavation Confirmation Sample Results

		Area 1.A						Area 1.B					
Sample No.		BT01-0120	SW01-0200	BT03-0140	SW03-0120	SW07-0180	SW08-0150	SW13-0150	BT14-0170	BT15-0170	SW16-0150	SW17-0160	SW18-0150
Date Sampled:		6/16/2009	6/16/2009	6/16/2009	6/16/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009
Sample Depth (ft):		12	20	14	12	18	15	15	17	17	15	16	15
MTCA A													
VOLATILE ORGANICS													
Benzene	mg/kg	0.03	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.03	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	mg/kg	7	0.086 U	0.040 U	0.035 U	0.038 U	0.087 U	0.072 U	0.089 U	0.096 U	0.093 U	0.097 U	0.077 U
Ethylbenzene	mg/kg	6	0.12	0.040 U	0.035 U	0.038 U	0.087 U	0.072 U	0.59	0.096 U	0.44	0.26	0.077 U
m,p-Xylene	mg/kg	9	0.26	0.040 U	0.035 U	0.038 U	0.090	0.072 U	0.68	0.096 U	0.58	0.27	0.077 U
o-Xylene	mg/kg	9	0.67	0.040 U	0.035 U	0.038 U	0.087 U	0.072 U	0.74	0.096 U	0.58	0.22	0.077 U
TOTAL PETROLEUM HYDROCARBONS													
Gasoline	mg/kg	100	22 U	4.0 U	3.5 U	3.8 U	8.7 U	7.2 U	8.9 U	9.6 U	9.3 U	9.7 U	7.7 U
Diesel Range	mg/kg	2000	900 Z	44	27 U	28 U	580	27 U	150	27 U	290	28 U	28 U
Lube Oil Range	mg/kg	2000	160 Z	56 U	54 U	55 U	56 U	54 U	56 U	54 U	55 U	56 U	56 U
POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)													
Naphthalene	mg/kg	5	--	--	--	--	0.0074 U	--	--	--	0.013	--	--
2-Methylnaphthalene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.059	--	--
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.28	--	--
Acenaphthylene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0095	--	--
Acenaphthene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.025	--	--
Fluorene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.13	--	--
Phenanthrene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.13	--	--
Anthracene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0096	--	--
Fluoranthene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
Pyrene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
Benzo[a]anthracene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
Chrysene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
Benzo[b]fluoranthene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
Benzo[k]fluoranthene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
Benzo[a]pyrene	mg/kg	0.1	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
Dibenzo[a,h]anthracene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
Benzo[g,h,i]perylene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--
cPAHs (see cPAHs calcs)	mg/kg	0.1	--	--	--	--	0.011	--	--	--	0.011	--	--

Notes:

mg/kg = Milligrams per kilogram.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Z = Hydrocarbons in the diesel range are impacting lube oil results

-- = Not analyzed/not available.

Table 2. Area 2 Excavation Confirmation Sample Results

Sample No.		BT05-0120	SW06-0110	BT09-0110	SW10-0100	SW11-0100	SW12-0090
Date Sampled:		6/16/2009	6/16/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009
Sample Depth (ft):		12	11	11	10	10	9
VOLATILE ORGANICS							
MTCA A							
Benzene	mg/kg	0.03	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	mg/kg	7	0.052 U	0.058 U	0.085 U	0.088 U	0.085 U
Ethylbenzene	mg/kg	6	0.052 U	0.058 U	0.11	0.088 U	0.16
m,p-Xylene	mg/kg	9	0.052 U	0.058 U	0.27	0.088 U	0.47
o-Xylene	mg/kg	9	0.052 U	0.058 U	0.085 U	0.088 U	0.57
TOTAL PETROLEUM HYDROCARBONS							
Gasoline	mg/kg	100	5.2 U	5.8 U	8.5 U	8.8 U	8.5 U
Diesel Range	mg/kg	2000	29 U	28 U	170	300	1700
Lube Oil Range	mg/kg	2000	57 U	55 U	55 U	57 U	89 U
POLYCYCLIC AROMATIC HYDROCARBONS							
Naphthalene	mg/kg	5	--	0.0073 U	--	--	--
2-Methylnaphthalene	mg/kg	--	--	0.0073 U	--	--	--
1-Methylnaphthalene	mg/kg	--	--	0.0073 U	--	--	--
Acenaphthylene	mg/kg	--	--	0.0073 U	--	--	--
Acenaphthene	mg/kg	--	--	0.0073 U	--	--	--
Fluorene	mg/kg	--	--	0.0073 U	--	--	--
Phenanthrene	mg/kg	--	--	0.0073 U	--	--	--
Anthracene	mg/kg	--	--	0.0073 U	--	--	--
Fluoranthene	mg/kg	--	--	0.0073 U	--	--	--
Pyrene	mg/kg	--	--	0.0073 U	--	--	--
Benzo[a]anthracene	mg/kg	--	--	0.0073 U	--	--	--
Chrysene	mg/kg	--	--	0.0073 U	--	--	--
Benzo[b]fluoranthene	mg/kg	--	--	0.0073 U	--	--	--
Benzo[k]fluoranthene	mg/kg	--	--	0.0073 U	--	--	--
Benzo[a]pyrene	mg/kg	0.1	--	0.0073 U	--	--	--
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	0.0073 U	--	--	--
Dibenzo[a,h]anthracene	mg/kg	--	--	0.0073 U	--	--	--
Benzo[g,h,i]perylene	mg/kg	--	--	0.0073 U	--	--	--
cPAHs (see cPAHs calcs)	mg/kg	0.1	--	0.011	--	--	--

Notes:

mg/kg = Milligrams per kilogram.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

-- = Not analyzed/not available.

Table 3. Area 3 Contaminated Soil Stockpile Sample Results

		Sample No. SB01-0000	SB02-0000
		Date Sampled: 6/2/2009	6/2/2009
		Sample Depth (ft): 0.5	0.5
VOLATILE ORGANICS		MTCA A	
Benzene	mg/kg	0.03	4.3
Toluene	mg/kg	7	4.8
Ethylbenzene	mg/kg	6	11
m,p-Xylene	mg/kg	9	68
o-Xylene	mg/kg	9	24
TOTAL PETROLEUM HYDROCARBONS			
Gasoline	mg/kg	100	2100 O
Diesel Range	mg/kg	2000	660 M
Lube Oil Range	mg/kg	2000	330 M
METALS			
Total Lead	mg/kg	250	40

Notes:

Shaded cells = Exceeds MTCA A cleanup levels.

mg/kg = Milligrams per kilogram.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

-- = Not analyzed/not available.

Table 4. Areas 1 and 2 Clean Soil Stockpile Sample Results

Sample No.		SP19-0000	SP20-0000	SP21-0000	SP22-0000	SP-23-0000
Date Sampled:		6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009
Sample Depth (ft):		0.5	0.5	0.5	0.5	0.5
VOLATILE ORGANICS		MTCA A				
Benzene	mg/kg	0.03	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	mg/kg	7	0.045 U	0.088 U	0.048 U	0.044 U
Ethylbenzene	mg/kg	6	0.045 U	0.088 U	0.048 U	0.044 U
m,p-Xylene	mg/kg	9	0.045 U	0.088 U	0.048 U	0.044 U
o-Xylene	mg/kg	9	0.045 U	0.088 U	0.048 U	0.044 U
TOTAL PETROLEUM HYDROCARBONS						
Gasoline	mg/kg	100	4.5 U	8.8 U	4.8 U	4.2 U
Diesel Range	mg/kg	2000	25 U	33	28 U	26 U
Lube Oil Range	mg/kg	2000	50 U	54 U	55 U	53 U

Notes:

mg/kg = Milligrams per kilogram.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Table 5. Soil Mixing Area Confirmation Sample Results

Station No:			B7		C2			D13		H2			H10		G4		
Sample No.:			PP-17	B7-0100	MW-26	C2-0095	C2-2095	PP-18	D13-0100	PP-16	H2-0100	H2-2100	PP-12	H10-0100	PP-15	G4-1100	G4-2100
Date Sampled:			3/6/08	6/4/09	3/7/08	6/5/09	6/16/09	3/6/08	6/9/09	3/6/08	6/5/09	6/16/09	3/6/08	6/9/09	3/6/08	6/11/09	6/16/09
Sample Depth (ft)			10	10	9.5	9.5	9.5	10	10	10	10	10	10	10	10	10	10
MTCA A																	
VOLATILE ORGANICS																	
Benzene	mg/kg	0.03	37	1.4	0.028 U	1.3	2.2	0.33	0.12	5.8	0.18	0.15	3.9	0.67	2.1	0.21	1.4
Toluene	mg/kg	7	2.3	0.31 U	0.14 U	0.32 U	0.63	0.31 U	0.065 U	4 U	0.072 U	0.13 U	0.54 U	0.29	0.50 U	0.15	0.16
Ethylbenzene	mg/kg	6	70	2.6	0.14 U	1.9	4.0	0.31 U	0.097	4 U	0.20	0.31	12	2.3	4.0	0.37	1.1
m,p-Xylene	mg/kg	9	190 E	7.0	0.14 U	4.7	12	0.52	0.19	4.6	0.38	0.46	35	4.8	0.69	0.56	1.2
o-Xylene	mg/kg	9	40	1.4	0.14 U	1.1	3.1	0.31 U	0.065 U	4 U	0.072 U	0.13 U	3.1	1.1	0.50 U	0.24	0.41
TOTAL PETROLEUM HYDROCARBONS																	
Gasoline	mg/kg	30	3900	190	14 U	150 O	340 O	92 O	29 O	80 U1	7.2 U	120 O	1000	180 O	110	140 O	150 O
Diesel Range	mg/kg	2000	790 M	68 U1	920	63 M	120 M	130	78	2316	250	260	580 M	100	110	220	240
Lube Oil Range	mg/kg	2000	100 M	59 U1	240	95 M	87 M	68	180	240 U	170	190	130 M	110	59 U	180	190
POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)																	
Naphthalene	mg/kg	5	--	0.18	--	0.23	0.25	--	0.0087	--	0.12	0.063	--	0.14	--	0.35	3.6
2-Methylnaphthalene	mg/kg	--	--	0.46	--	0.33	0.44	--	0.036	--	0.73	0.26	--	0.34	--	0.87	5.3
1-Methylnaphthalene	mg/kg	--	--	0.23	--	0.31	0.32	--	0.027	--	0.75	0.50	--	0.19	--	1.2	3.2
Acenaphthylene	mg/kg	--	--	0.0078 U	--	0.054	0.033	--	0.029	--	0.14	0.15	--	0.0089 U	--	0.84	1.8
Acenaphthene	mg/kg	--	--	0.022	--	0.098	0.075	--	0.0098	--	0.16	0.11	--	0.014	--	0.38	0.54
Fluorene	mg/kg	--	--	0.033	--	0.087	0.064	--	0.024	--	0.25	0.19	--	0.027	--	0.90	1.6
Phenanthrene	mg/kg	--	--	0.069	--	0.26	0.18	--	0.099	--	0.93	0.59	--	0.068	--	2.9	5.1
Anthracene	mg/kg	--	--	0.0095	--	0.072	0.050	--	0.028	--	0.34	0.18	--	0.012	--	0.99	1.5
Fluoranthene	mg/kg	--	--	0.031	--	0.11	0.079	--	0.074	--	0.53	0.27	--	0.046	--	1.5	1.8
Pyrene	mg/kg	--	--	0.026	--	0.21	0.13	--	0.14	--	0.93	0.51	--	0.047	--	2.9	3.4
Benzo[a]anthracene	mg/kg	--	--	0.0078 U	--	0.065	0.041	--	0.050	--	0.27	0.17	--	0.016	--	0.94	1.0
Chrysene	mg/kg	--	--	0.0078 U	--	0.062	0.040	--	0.053	--	0.22	0.15	--	0.018	--	0.87	0.90
Benzo[b]fluoranthene	mg/kg	--	--	0.0078 U	--	0.035	0.022	--	0.035	--	0.1	0.080	--	0.013	--	0.46	0.39
Benzo[k]fluoranthene	mg/kg	--	--	0.0078 U	--	0.044	0.028	--	0.040	--	0.13	0.096	--	0.012	--	0.61	0.56
Benzo[a]pyrene	mg/kg	0.1	--	0.0078 U	--	0.082	0.047	--	0.073	--	0.26	0.19	--	0.013	--	1.2	1.0
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	0.0078 U	--	0.043	0.025	--	0.034	--	0.098	0.072	--	0.0089 U	--	0.41	0.31
Dibenzo[a,h]anthracene	mg/kg	--	--	0.0078 U	--	0.012	0.0084 U	--	0.011	--	0.082 U	0.024	--	0.0089 U	--	0.14	0.11
Benzo[g,h,i]perylene	mg/kg	--	--	0.0078 U	--	0.077	0.044	--	0.043	--	0.15	0.10	--	0.0094	--	0.52	0.38
cPAHs (see cPAHs calcs)	mg/kg	0.1	--	0.012	--	0.10	0.060	--	0.091	--	0.33	0.24	--	0.019	--	1.5	1.2

(Table Continues)

Table 5. Soil Mixing Area Confirmation Sample Results

Station No.: Sample No.: Date Sampled: Sample Depth (ft)			J7 J7-0100 6/8/09 10			K5 K5-0100 6/8/09 10		L5 L5-0100 6/8/09 10			L8 L8-0090 6/8/09 9			R7 R7-0800 6/10/09 8		
			J7-2100 6/17/09 10			PP-28 8/20/08 10		PP-26 8/20/08 10			PP-23 6/23/08 9			R7-2100 6/22/09 8		
MTCA A																
VOLATILE ORGANICS																
Benzene	mg/kg	0.03	21	1.5	1.2	21 U1	0.63	1.6 U1	1.8	2.2	4.0	0.26	0.095	0.17	0.043	0.064
Toluene	mg/kg	7	39	1.4	1.7	5.2 U1	0.11	0.32 U	2.2	0.31	10 U1	0.060 U	0.75 U1	5.4 U	0.36 U1	0.14 U
Ethylbenzene	mg/kg	6	120 E	3.5	2.8	5.2 U1	0.58	7.6	7.8	8.4	20	1.0	0.17	11 U1	0.53	0.37
m,p-Xylene	mg/kg	9	350 E	11	14	9.2	1.3	24	37	29	40	1.8	0.55	17	0.83	0.84
o-Xylene	mg/kg	9	130 E	4.2	4.8	5.2 U1	0.27	0.48	14	9.5	21 U1	1.5	0.15 U	11 U1	0.79	0.78
TOTAL PETROLEUM HYDROCARBONS																
Gasoline	mg/kg	30	5100	390 O	380 O	5100 O	190 O	400	1300 O	1800 O	100 U	350 O	140 O	110 U1	240 O	14 U
Diesel Range	mg/kg	2000	410 M	160 M	160 M	2200	210 M	320 M	230 M	460 M	6900	120 M	88	2000	96 M	180
Lube Oil Range	mg/kg	2000	98 M	140 M	150 M	150	130 M	380 M	200 M	190 M	1100	73 M	90	98	61 UM	150
POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)																
Naphthalene	mg/kg	5	--	1.1	0.41	--	1.8	--	1.9	0.70	--	0.021	0.011	--	0.0097	0.0079 U
2-Methylnaphthalene	mg/kg	--	--	2.0	0.74	--	0.88	--	2.9	1.3	--	0.087	0.022	--	0.021	0.0079 U
1-Methylnaphthalene	mg/kg	--	--	1.2	0.54	--	0.77	--	1.6	0.81	--	0.15	0.041	--	0.054	0.0079 U
Acenaphthylene	mg/kg	--	--	0.54	0.19	--	0.039	--	0.014	0.021	--	0.030	0.015	--	0.0081 U	0.0079 U
Acenaphthene	mg/kg	--	--	0.18	0.42	--	2.3	--	0.13	0.20	--	0.45	0.24	--	0.0081 U	0.0079 U
Fluorene	mg/kg	--	--	0.35	0.55	--	2.0	--	0.14	0.19	--	0.44	0.22	--	0.025	0.0079 U
Phenanthrene	mg/kg	--	--	1.4	1.5	--	5.9	--	0.27	0.38	--	1.3	0.50	--	0.026	0.0079 U
Anthracene	mg/kg	--	--	0.46	0.49	--	1.4	--	0.15	0.066	--	0.18	0.11	--	0.0081 U	0.0079 U
Fluoranthene	mg/kg	--	--	1.3	0.87	--	3.8	--	0.14	0.18	--	0.68	0.63	--	0.0098	0.0079 U
Pyrene	mg/kg	--	--	2.6	1.1	--	2.7	--	0.12	0.16	--	0.53	0.53	--	0.0096	0.0086
Benzo[a]anthracene	mg/kg	--	--	0.90	0.35	--	0.78	--	0.040	0.047	--	0.16	0.16	--	0.0081 U	0.0079 U
Chrysene	mg/kg	--	--	0.84	0.35	--	0.64	--	0.044	0.046	--	0.15	0.16	--	0.0081 U	0.0079 U
Benzo[b]fluoranthene	mg/kg	--	--	0.43	0.18	--	0.4	--	0.022	0.025	--	0.076	0.078	--	0.0081 U	0.0079 U
Benzo[k]fluoranthene	mg/kg	--	--	0.55	0.20	--	0.38	--	0.021	0.025	--	0.080	0.080	--	0.0081 U	0.0079 U
Benzo[a]pyrene	mg/kg	0.1	--	0.99	0.33	--	0.44	--	0.030	0.035	--	0.099	0.095	--	0.0081 U	0.0079 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	0.37	0.12	--	0.15	--	0.012	0.013	--	0.037	0.035	--	0.0081 U	0.0079 U
Dibenzo[a,h]anthracene	mg/kg	--	--	0.12	0.042	--	0.059	--	0.0079 U	0.0078 U	--	0.014	0.014	--	0.0081 U	0.0079 U
Benzo[g,h,i]perylene	mg/kg	--	--	0.46	0.14	--	0.16	--	0.016	0.016	--	0.041	0.038	--	0.0081 U	0.0079 U
cPAHs (see cPAHs calcs)	mg/kg	0.1	--	1.2	0.42	--	0.62	--	0.041	0.047	--	0.14	0.13	--	0.012	0.012

Notes:

Shaded cells = Exceeds MTCA A cleanup levels.

E = The value reported exceeds the quantification range and is an estimate.

M = Hydrocarbons in the gasoline range are impacting the diesel range results.

O = Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 = The practical quantitation limit is elevated due to interferences present in the sample.

-- = Not analyzed/not available.

Table 6. Soil Mixing Results Comparison

Station No.	Gasoline (mg/kg)		Diesel (mg/kg)		Lube Oil (mg/kg)	
	Pre-Treatment	Post-Treatment	Pre-Treatment	Post-Treatment	Pre-Treatment	Post-Treatment
B7	3900	190	790	34	100	29
C2	7	340	920	120	240	87
D13	92	29	130	78	68	180
H2	40	120	2316	260	120	190
H10	1000	180	580	100	130	110
G4	110	150	110	240	29	190
J7	5100	380	410	160	98	150
K5	5100	190	2200	210	150	130
L5	400	1800	320	460	380	190
L8	50	140	6900	88	1100	90
R7	55	7	2000	180	98	150
Average	1441	321	1516	175	228	136
Average % Reduction ((Pre-Treatment-Post-Treatment)/ Pre-Treatment)	78		88		40	

Notes:

mg/kg = Milligrams per kilogram.

Table 7. Soil and Groundwater Post Treatment Sampling Program

Location	Medium	Sample Depth (ft)	Gasoline/ BTEX	Diesel/ Lube Oil	PAHs	Analysis Lead (total and dissolved)	Chloride	Attenuation Parameters ¹
Push Probes								
PP-30	Soil	10	x	-	x	-	-	-
PP-31	Soil	10	x	-	x	-	-	-
PP-32	Soil	10	x	-	-	-	-	-
PP-33	Soil	10	x	-	x	-	-	-
PP-34	Soil	10	-	x	-	-	-	-
PP-35	Soil	10	-	x	-	-	-	-
PP-36	Soil	8	-	x	-	-	-	-
Monitoring Wells²								
MW-4R	Soil	10	x	-	x	-	-	-
	Groundwater	-	x	x	x	x	x	x
MW-9R	Soil	9	x	x	x	-	-	-
	Groundwater	-	x	x	x	x	x	x
MW-11	Groundwater	-	x	x	x	x	x	x
MW-13R	Groundwater	-	x	x	x	x	x	x
MW-16R	Groundwater	-	x	x	x	x	x	x
MW-18R	Groundwater	-	x	x	x	x	x	x
MW-19R	Groundwater	-	x	x	x	x	x	x
MW-21R	Soil	10	x	-	-	-	-	-
	Groundwater	-	x	x	x	x	x	x
MW-22R	Soil	10	x	-	x	-	-	-
	Groundwater	-	x	x	x	x	x	x
MW-25	Groundwater	-	x	x	x	x	x	x
MW-26R	Soil	6	x	-	-	-	-	-
	Groundwater	-	x	x	x	x	x	x

Notes:

BTEX = Benzene, ethylbenzene, toluene, and xylenes.

PAHs = Polycyclic aromatic hydrocarbons.

R = Replacement well.

¹ = Nitrate, sulfate, alkalinity, ferrous iron (dissolved), manganese (dissolved), methane and BOD5.

² = Monitoring well groundwater samples will be collected for three quarterly events.

- = Not applicable.

Table 8. Six-Month Post Treatment Soil Sample Results

Sample ID:			MW-4R	MW-9R	MW10R	MW-21R	MW-22R	MW-26R	PP-30	PP-31	PP-32	PP-33	PP-34	PP-35	PP-36
Date:			12/29/09	12/15/09	12/29/09	12/15/09	12/29/09	12/29/09	12/15/09	12/29/09	12/29/09	12/15/09	12/15/09	12/15/09	12/29/10
Sample Depth (ft)			10	9	7	10	10	9.5	10	10	10	10	10	10	8
MTCA A															
VOLATILE ORGANICS (mg/kg)															
Benzene	mg/kg	0.03	0.028	1.8	--	2.2	0.87	0.02 U	0.11	0.5	0.12	5.4	0.27	1.5	0.02 U
Toluene	mg/kg	7	0.047 U	0.22	--	0.11	0.12	0.049 U	0.049 U	0.051 U	0.087 U	2.5	--	0.079	--
Ethylbenzene	mg/kg	6	0.047 U	8.2	--	3.7	0.69	0.049 U	0.097	0.26 U1	0.78	20	--	6.4	--
m,p-Xylene	mg/kg	9	0.13	19	--	9.4	2.7	0.049 U	0.17	0.43	1.3	75	--	8.0	--
o-Xylene	mg/kg	9	0.047 U	0.23	--	0.088	0.6 U1	0.049 U	0.049 U	0.26 U1	0.44 U	19	--	0.46 U	--
TOTAL PETROLEUM HYDROCARBONS (mg)															
Gasoline	mg/kg	30	14	540 O	--	270 O	580 O	4.9 U	26 O	130 O	140	1,000 O	--	330 O	
Diesel Range	mg/kg	2000	--	270	29 U	--	--	--	--	--	--	--	--	--	
Lube Oil Range	mg/kg	2000	--	460	260	--	--	--	--	--	--	--	--	--	
PAHs (mg/kg)															
Naphthalene	mg/kg	5	0.55	0.99	--	--	0.35	--	1.3	0.045	--	2.6	--	--	--
2-Methylnaphthalene	mg/kg		1	3.8	--	--	0.25	--	3.5	0.076	--	2.1	--	--	--
1-Methylnaphthalene	mg/kg		0.74	2	--	--	5.2	--	3.5	0.054	--	1.2	--	--	--
Acenaphthylene	mg/kg		0.027	0.031	--	--	0.27	--	2.8	0.01	--	0.15	--	--	--
Acenaphthene	mg/kg		0.17	0.12	--	--	1.2	--	0.5	0.047	--	0.39	--	--	--
Fluorene	mg/kg		0.18	0.12	--	--	1.3	--	2.1	0.054	--	0.35	--	--	--
Phenanthrene	mg/kg		0.33	0.28	--	--	3.5	--	6.6	0.14	--	0.76	--	--	--
Anthracene	mg/kg		0.047	0.074	--	--	0.67	--	2.3	0.065	--	0.19	--	--	--
Fluoranthene	mg/kg		0.15	0.34	--	--	0.84	--	3.4	0.083	--	1.1	--	--	--
Pyrene	mg/kg		0.17	0.29	--	--	1.5	--	5.8	0.091	--	0.87	--	--	--
Benzo[a]anthracene	mg/kg		0.043	0.15	--	--	0.5	--	1.9	0.025	--	0.25	--	--	--
Chrysene	mg/kg		0.044	0.17	--	--	0.42	--	1.7	0.038	--	0.23	--	--	--
Benzo[b]fluoranthene	mg/kg		0.038	0.11	--	--	0.16	--	0.75	0.034	--	0.12	--	--	--
Benzo[k]fluoranthene	mg/kg		0.011	0.08	--	--	0.21	--	0.86	0.012	--	0.12	--	--	--
Benzo[a]pyrene	mg/kg	0.1	0.033	0.11	--	--	0.4	--	2.2	0.026	--	0.18	--	--	--
Indeno(1,2,3-c,d)pyrene	mg/kg		0.014	0.059	--	--	0.12	--	0.63	0.014	--	0.079	--	--	--
Dibenzo[a,h]anthracene	mg/kg		0.0077 U	0.023	--	--	0.049	--	0.22	0.0078 U	--	0.027	--	--	--
Benzo[g,h,i]perylene	mg/kg		0.019	0.072	--	--	0.14	--	0.75	0.018	--	0.095	--	--	--
cPAHs ¹	mg/kg	0.1	0.044	0.17	--	--	0.51	--	2.7	0.035	--	0.24	--	--	--

Notes:

O = Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

PAHs = Polycyclic aromatic hydrocarbons.

Shaded cell = Exceeds MTCA A cleanup levels.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

¹ = Total benzo(a)pyrene using toxicity equivalency method. One-half the detection limit was used for non-detected concentrations.

-- = Not analyzed.

CERTIFICATES OF SOIL DISPOSAL



WASTE MANAGEMENT

17629 Cedar Springs Lane
Arlington, OR 97812
(541) 454-2643
(541) 454-3279 Fax

April 19, 2010

Strider Construction
4721 NW Drive
Bellingham, WA 98226

CERTIFICATE OF DISPOSAL

Waste Management Inc., dba Columbia Ridge Landfill has received NON HAZARDOUS Waste material from Strider Construction via Olympic View Transfer Station (OVTS). The material has been commingled.

Date Received at CRL:	June 12 th through June 23 rd , 2009
Generator:	City of Bremerton
Profile #:	101621WA
Tons Disposed:	1644.40 tons
Waste Description:	PCS

I certify, on behalf of the above listed facility, that to the best of my knowledge the above-described non hazardous waste was managed in compliance with all applicable laws.

Victoria McKinney
Special Waste Billing Department

From everyday collection to environmental protection, Think Green® Think Waste Management.



WASTE MANAGEMENT

17629 Cedar Springs Lane
Arlington, OR 97812
(541) 454-2643
(541) 454-3279 Fax

April 19, 2010

Strider Construction
4721 NW Drive
Bellingham, WA 98226

CERTIFICATE OF DISPOSAL

Waste Management Inc., dba Columbia Ridge Landfill has received NON HAZARDOUS Waste material from Strider Construction via Olympic View Transfer Station (OVTS). The material has been commingled.

Date Received at CRL:	Jun 10 th , 2009
Generator:	City of Bremerton
Profile #:	101628WA
Tons Disposed:	31.49 tons
Waste Description:	Treated Wood and Concrete

I certify, on behalf of the above listed facility, that to the best of my knowledge the above-described non hazardous waste was managed in compliance with all applicable laws.

Victoria McKinney
Special Waste Billing Department

From everyday collection to environmental protection, Think Green® Think Waste Management.

BORING LOGS

Parametrix

Boring Log

Boring ID: MW-10R			Drilling Company:		Sheet 1 of 1	
Project Name: Chevron Interim Action			Drilling Method: Direct Push		Starting Date: 12/29/09	
Project #: 255-1896-063 / 04-1304			Logged by: Lily Vagelatos		Ending Date: 12/29/09	
Location: Bremerton, WA			Checked by: Ingmar Saul, L.G.		Boring Depth: 15 ft	
					Depth to Water: 7 ft	
Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)
			Sample ID	Recovery		
0		Ground Surface				0
		TILL and FILL MATERIAL Silty sand and gravel, brown tan.				
		Damp, starting at approximately 5 ft bgs.		12"		5
		Saturated starting at approximately 7 ft bgs.	CHEV-SO-MW10R-0070	20"		
				20"		10
15		Bottom of boring at 15 feet bgs.				15
						20

Ground Water at 7' bgs

Bentonite Seal from 0 to 5'

0.75" Diameter Casing; 0 to 5'

Well Screen Sand Pack from 5' to 15'

0.75" Diameter Prepacked Well Screen; 5' to 15'

Ground Water at 7' bgs

Bentonite Seal from 0 to 5'
0.75" Diameter Casing; 0 to 5'

Well Screen Sand Pack from 5' to 15'
0.75" Diameter Prepacked Well Screen; 5' to 15'

Parametrix

Boring Log

Boring ID: MW-13R Project Name: Chevron Interim Action Project #: 255-1896-063 / 04-1304 Location: Bremerton, WA		Drilling Company: Drilling Method: Direct Push Logged by: Lily Vagelatos Checked by: Ingmar Saul, L.G.		Sheet 1 of 1 Starting Date: 12/14/09 Ending Date: 12/14/09 Boring Depth: 15 ft Depth to Water: 7 ft			
Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)	
			Sample ID	Recovery			
0		Ground Surface				0	
		MIXED TREATMENT ZONE Sandy silt with gravel, tan brown, very moist.		45"		Bentonite Seal from 0 to 5' 0.75" Diameter Casing; 0 to 5'	5
5				50"			10
10		Silty sand and gravel, tan brown, saturated, at approximately 10 ft bgs.		30"	Ground Water at 7' bgs Well Screen Sand Pack from 5' to 15' 0.75" Diameter Prepacked Well Screen; 5' to 15'	15	
15		Bottom of boring at 15 feet bgs.				20	

Parametrix

Boring Log

Boring ID: MW-16R		Drilling Company:		Sheet 1 of 1	
Project Name: Chevron Interim Action		Drilling Method: Direct Push		Starting Date: 12/29/09	
Project #: 255-1896-063 / 04-1304		Logged by: Lily Vagelatos		Ending Date: 12/29/09	
Location: Bremerton, WA		Checked by: Ingmar Saul, L.G.		Boring Depth: 15 ft	
				Depth to Water: 7 ft	

Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)
			Sample ID	Recovery		
0		Ground Surface				0
5		SILTY GRAVELLY SAND Gray brown, damp, fill.			Bentonite Seal from 0 to 5' 0.75" Diameter Casing; 0 to 5' Well Screen Sand Pack from 5' to 15' 0.75" Diameter Prepacked Well Screen; 5' to 15' Ground Water at 7' bgs	
15		Bottom of boring at 15 feet bgs.				15
20						20

Parametrix

Boring Log

Boring ID: MW-18R			Drilling Company:		Sheet 1 of 1	
Project Name: Chevron Interim Action			Drilling Method: Direct Push		Starting Date: 12/29/09	
Project #: 255-1896-063 / 04-1304			Logged by: Lily Vagelatos		Ending Date: 12/29/09	
Location: Bremerton, WA			Checked by: Ingmar Saul, L.G.		Boring Depth: 15 ft	
					Depth to Water: 5 ft	
Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)
			Sample ID	Recovery		
0		Ground Surface				0
		SILTY GRAVELLY SAND Gray brown, damp, fill.				
5						5
10						10
15		Bottom of boring at 15 feet bgs.				15
20						20

Parametrix

Boring Log

Boring ID: MW-19R			Drilling Company:		Sheet 1 of 1		
Project Name: Chevron Interim Action			Drilling Method: Direct Push		Starting Date: 12/29/09		
Project #: 255-1896-063 / 04-1304			Logged by: Lily Vagelatos		Ending Date: 12/29/09		
Location: Bremerton, WA			Checked by: Ingmar Saul, L.G.		Boring Depth: 15 ft		
					Depth to Water: 4 ft		
Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)	
			Sample ID	Recovery			
0		Ground Surface			Ground Water at 4' bgs Bentonite Seal from 0 to 10' 0.75" Diameter Casing; 0 to 10' Well Screen Sand Pack from 10' to 15' 0.75" Diameter Prepacked Well Screen; 10' to 15'	0	
		SILTY GRAVELLY SAND Gray brown, damp, fill.				5	
5						10	
						15	
10						20	
						25	
15							30
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20							40
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Parametrix

Boring Log

Boring ID: MW-21R			Drilling Company:		Sheet 1 of 1	
Project Name: Chevron Interim Action			Drilling Method: Direct Push		Starting Date: 12/15/09	
Project #: 255-1896-063 / 04-1304			Logged by: Lily Vagelatos		Ending Date: 12/15/09	
Location: Bremerton, WA			Checked by: Ingmar Saul, L.G.		Boring Depth: 15 ft	
					Depth to Water: 7 ft	
Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)
			Sample ID	Recovery		
0		Ground Surface				0
		MIXED TREATMENT ZONE Sandy silt with gravel, tan brown, very moist.		50"		5
5						50"
10		Silty sand and gravel, tan brown, saturated, starting at approximately 10 ft bgs.	CHEV-SO-MW21R-0100	40"	Ground Water at 7' bgs	15
15		Bottom of boring at 15 feet bgs.				20

Ground Water at 7' bgs

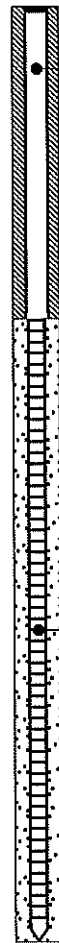


Bentonite Seal from 0 to 5'
0.75" Diameter Casing; 0 to 5'
Well Screen Sand Pack from 5' to 15'
0.75" Diameter Prepacked Well Screen; 5' to 15'

Parametrix

Boring Log

Boring ID: MW-22R			Drilling Company:		Sheet 1 of 1	
Project Name: Chevron Interim Action			Drilling Method: Direct Push		Starting Date: 12/14/09	
Project #: 255-1896-063 / 04-1304			Logged by: Lily Vagelatos		Ending Date: 12/14/09	
Location: Bremerton, WA			Checked by: Ingmar Saul, L.G.		Boring Depth: 15 ft	
					Depth to Water: 10 ft	
Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)
			Sample ID	Recovery		
0		Ground Surface				0
		MIXED TREATMENT ZONE Sandy silt with gravel, tan brown, very moist.		50"		5
5						55"
10		Silty sand and gravel, tan brown, saturated, starting at approximately 10 ft bgs.	CHEV-SO-MW22R-0100		Ground Water at 10' bgs	10
				45"		
15		Bottom of boring at 15 feet bgs.				15
20						20



Parametrix

Boring Log

Boring ID: MW-26R		Drilling Company:	Sheet 1 of 1	
Project Name: Chevron Interim Action		Drilling Method: Direct Push	Starting Date: 12/14/09	
Project #: 255-1896-063 / 04-1304		Logged by: Lily Vagelatos	Ending Date: 12/14/09	
Location: Bremerton, WA		Checked by: Ingmar Saul, L.G.	Boring Depth: 15 ft	
			Depth to Water: 9.5 ft	

Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)
			Sample ID	Recovery		
0		Ground Surface				0
		MIXED TREATMENT ZONE Sandy silt with gravel, tan brown, very moist.		50"		5
5						45"
10		Silty sand and gravel, tan brown, saturated, untreated fill in saturation zone, starting at approximately 10 ft bgs.	CHEV-SO-MW26R-0095	40"	10	
15		Bottom of boring at 15 feet bgs.			15	
20					20	

Parametrix

Boring Log

Boring ID: MW-4R		Drilling Company:		Sheet 1 of 1	
Project Name: Chevron Interim Action		Drilling Method: Direct Push		Starting Date: 12/14/09	
Project #: 255-1896-063 / 04-1304		Logged by: Lily Vagelatos		Ending Date: 12/14/09	
Location: Bremerton, WA		Checked by: Ingmar Saul, L.G.		Boring Depth: 15 ft	
				Depth to Water: 5 ft	

Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)
			Sample ID	Recovery		
0		Ground Surface				0
		MIXED TREATMENT ZONE Sandy silt with gravel, tan brown, very moist.		50"		
5				55"		5
10		Silty sand and gravel, tan brown, saturated, starting at approximately 10 ft bgs.		40"		10
15		Bottom of boring at 15 feet bgs.				15
20						20

Ground Water at 5' bgs

Bentonite Seal from 0 to 5'
0.75" Diameter Casing; 0 to 5'

Well Screen Sand Pack from 5' to 15'
0.75" Diameter Prepacked Well Screen; 5' to 15'

Parametrix

Boring Log

Boring ID: MW-9R

Drilling Company:

Project Name: Chevron Interim Action

Drilling Method: Direct Push

Project #: 255-1896-063 / 04-1304

Logged by: Lily Vagelatos

Location: Bremerton, WA

Checked by: Ingmar Saul, L.G.

Sheet 1 of 1

Starting Date: 12/15/09

Ending Date: 12/15/09

Boring Depth: 15 ft

Depth to Water: 9 ft

Depth (ft)	Lithologic Symbol	Description/Classification of Materials	Sample		Boring Diagram	Depth (ft)
			Sample ID	Recovery		
0		Ground Surface				0
		TOP SOIL with VEGETATION Silty sand				
		MIXED TREATMENT ZONE Sandy silt with gravel, tan brown, very moist.		30"		
5				45"		5
10		Silty sand and gravel, tan brown, saturated, starting at approximately 10 ft bgs.	CHEV-SO-MW9R-0090	24"		10
15		Bottom of boring at 15 feet bgs.				15
20						20

Ground Water at 9' bgs

Bentonite Seal from 0 to 5'
0.75" Diameter Casing; 0 to 5'

Well Screen Sand Pack from 5' to 15'
0.75" Diameter Prepacked Well Screen; 5' to 15'

4660 KITSAP WAY, SUITE A
BREMERTON, WA 98312-2357
T. 360.377.0014 F. 360.479.5961
www.parametrix.com

TECHNICAL MEMORANDUM

Date: November 6, 2009
To: Panjini Balaraju, P.E. - Ecology
From: David Dinkuhn, P.E. - Parametrix 
Subject: Interim Action Report
cc: Thomas Knuckey, P.E. - City of Bremerton
Bill Webb - Parametrix
Project Number: 255-1896-063
Project Name: Former Chevron Property RI/FS and Interim Action

FORMER CHEVRON PROPERTY INTERIM ACTION REPORT

This memorandum presents the results of the Interim Action (IA) performed at the Former Chevron Property site during the summer of 2009. The objective of the IA was to significantly reduce contaminant levels at the site and enhance bioattenuation processes so that cleanup levels are met within a reasonable timeframe. It is anticipated that the restoration timeframe following the IA will be on the order of two to five years. The IA was conducted according to the Washington State Department of Ecology (Ecology) -approved IA Plan (Parametrix 2009). The IA is one step in the overall cleanup process being conducted at the site under Agreed Order (AO) Number DE-07TCPHQ-5024.

The IA consisted of the removal of site debris, excavation and removal of contaminated soil from several hot spots, and treatment of contaminated site soils by in-situ chemical oxidation (chemox). A detailed description of these activities and the results for confirmation samples is provided below. A plan for follow-on soil and groundwater confirmation sampling is also provided.

HOT SPOT SOIL REMOVAL

Contaminated soils were excavated and removed from Areas 1, 2, and 3 as shown on Figure 1. Sidewall and bottom soil confirmation samples were collected from each excavation once all apparently contaminated soils were removed. The locations of the confirmation samples are shown on Figure 1. Analytical results summaries are provided in Tables 1 and 2. Note that Area 1 was subdivided into subareas A1 and A2. Note also that no confirmation samples were collected from Area 3 since this area is located within the soil mixing area and received later treatment during the soil mixing phase.

All confirmation soil concentrations from Areas 1 and 2 were below Ecology Model Toxics Control Act (MTCA) Method A cleanup levels. These levels were established as applicable cleanup levels in the site's Remedial Investigation/Feasibility Study (RI/FS) work plan (Parametrix 2007). Results for samples collected from the Area 3 contaminated soil stockpile are provided in Table 3. No samples were collected from contaminated soil stockpiles from Areas 1 and 2.

TECHNICAL MEMORANDUM (CONTINUED)

A summary of the quantities of contaminated soil removed from each area is provided as follows:

- Area 1 (combined Areas 1A and 1B) - 924 tons. Average depth of excavation, Area 1A - 17 feet, Area 1B - 13 feet. Groundwater encountered at approximately 16 feet. No dewatering conducted due to slow infiltration rate.
- Area 2 - 476 tons. Average depth of excavation 12 feet. No groundwater encountered.
- Area 3 - 244 tons. This quantity includes grossly contaminated soil excavated during the removal of the nearby wooden bulkhead. Average depth of excavation - 6 feet. No groundwater encountered.

Contaminated soil was transported and disposed at Waste Management's Subtitle D landfill located in Arlington, Oregon. Soil disposal certifications are contained in the project files and are available upon request. In addition to the contaminated soil, two buried bulkheads were removed to facilitate soil mixing. The treated timbers from a wooden bulkhead were disposed at the same landfill as the contaminated soil. Concrete bulkhead debris was observed to be clean and was disposed of at a local concrete recycling facility.

Clean overburden soil removed from Areas 1 and 2 was stockpiled separately and tested to confirm that it was clean (approximately 500 cubic yards). Sample results are provided in Table 4. As shown, cleanup levels were not exceeded in the samples and the clean overburden soil was replaced in the excavations in compacted lifts. Oxygen Release Compound™ (ORC) was mixed with the clean soil backfill below the depths of 4 feet below ground surface (bgs) in Areas 1 and 2 to provide an oxygen source for naturally-occurring bacteria. A total of 1,500 pounds of ORC was applied at an approximate rate of 1.5 pounds per cubic yard.

SOIL MIXING

Soils located within the soil mixing area (Figure 2) were treated in place by mixing using specialized equipment manufactured by Lang Tool of Beaverton, Michigan. The equipment was used to mix soils between the depths of 8 and 14 feet bgs while simultaneously injecting a slurry containing RegenOx™, ORC™, and water. Refer to the Interim Action Plan for a detailed description of the soil mixing procedure and chemical dosing rates. A total of 57,000 pounds of RegenOx™ and 5,500 pounds of ORC™ were applied during the project.

Following an initial mixing pass, confirmation samples of the treated soil were collected from pre-determined locations. Sample depths were targeted to reproduce the depths of samples collected during RI/FS sampling (Parametrix 2008). Samples were collected using new 2-inch outside-diameter PVC pipe inserted to the depths required. Soil entering the end of the pipes was trapped in place by placement of tape over the above-ground end, thereby creating a vacuum in the pipe. The pipe was then removed from the ground and a sample was placed into appropriate sample containers. Confirmation samples were analyzed on the 7th day following soil treatment to allow time for the majority (estimated at 90 percent) of the oxidation reaction to occur. Confirmation sample locations are shown on Figure 2. Sample results are provided in Table 5.

The goal of the chemox treatment was to achieve at least a 70 percent reduction from pre-treatment concentrations. Pre-treatment concentrations are provided in Table 5 as samples containing "PP-" or "MW-" in the sample number. For each sample station, these results are in the left hand column. The right hand column(s) contain the confirmation results. If the initial confirmation sample results did not meet the 70 percent criteria, a second treatment pass was performed and a second confirmation sample was collected and analyzed. The chemox treatment effectiveness is discussed according to individual petroleum fraction below and shown in Table 6.

Gasoline

Pre-treatment gasoline concentrations in site soils ranged as high as 5,100 milligrams per kilogram (mg/kg) with an average of 1,441 mg/kg. Post treatment concentrations ranged as high as 1,800 mg/kg and averaged 321 mg/kg. Six of the eleven confirmation sample stations experienced significant reductions in gasoline concentrations. Concentrations increased at the remaining five stations. The increases are likely the result of varying gasoline concentrations within the treatment zone soil (i.e., the confirmation samples could not be collected from the exact spot where pre-treatment samples were collected and gasoline concentrations varied between sample locations). A comparison of results is provided in Table 6. As shown, a calculation of gasoline mass reduction indicates that, on average, a 78 percent reduction in gasoline mass was achieved.

Diesel

Diesel concentrations experienced significant declines and an average 88 percent mass reduction was achieved. All remaining concentrations are below the MTCA A cleanup level.

Lube Oil

Lube oil concentrations also experienced overall declines and an average 40 percent mass reduction was achieved. Note that all pre-treatment and post-treatment lube oil concentrations are below the MTCA A cleanup level.

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs were generally not analyzed in the pretreatment samples so a detailed comparison cannot be made. However, PAHs concentrations exceeding the cleanup level were reported in several of the confirmation samples.

CONFIRMATION GROUNDWATER MONITORING/SOIL SAMPLING

Follow-on soil and groundwater confirmation sampling will be conducted to provide an assessment of post-treatment conditions. Groundwater will be sampled 6-, 9-, and 12-months following the IA to provide an assessment of IA effectiveness and to establish trends in groundwater concentrations. It is anticipated that initial sampling may show concentrations that are elevated above historical results because the chemox treatment acts to desorb contaminants from the soil particles. However, concentration decreases should be seen during subsequent sampling events. A single set of soil samples will be collected at 6-months following the IA concurrent with the installation of new monitoring wells at the site.

A total of eleven monitoring wells will be sampled consisting of MW-4, MW-9, MW-11, MW-13, MW-16, MW-18, MW-19, MW-21, MW-22, MW-25, and MW-26, shown on Figure 3. Note that nine of these wells are located in soil mixing or excavation areas and will be replaced (the original well numbers will be modified with an "R" to designate replacement). The replacement well for MW-4 will be installed between the former locations of MW-4 and MW-14.

Replacement wells will be configured to be similar to the originals. Wells will be constructed of 2-inch I.D. PVC casing installed to a depth of 15 feet with 10-foot long PVC screens (0.020-inch slot). Surface completion will consist of flush monuments. An exception is the replacement for MW-19, which will be installed to a depth of 20 feet with a 15-foot long screen.

Soils from all monitoring well borings will be screened for the presence of contamination using visual and olfactory methods. The results of the screening will be recorded on the well boring logs. A single soil sample will be collected from selected wells located within the soil mixing area (MW-4R, MW-21R, MW-22R, and MW-26R). The soil samples will be analyzed for gasoline and benzene, toluene, ethylbenzene, and total xylenes (BTEX). In addition, locations where PAHs exceeded the cleanup level in the confirmation samples will also be analyzed for PAHs (MW-4R and MW-22R). Soil sample depths will be selected to match the

TECHNICAL MEMORANDUM (CONTINUED)

depths of nearby confirmation soil samples or, if no confirmation sample was collected nearby, the groundwater table depth.

Four soil probes (PP-30 through PP-33) will be installed at the same time the wells are installed for the purpose of assessing gasoline/BTEX and/or PAHs concentrations in areas where these concentrations exceeded the cleanup levels in the confirmation samples (H2, J7, K5, and L5). These samples will be analyzed for gasoline/BTEX and PAHs as appropriate. Soil sample depths will be selected to match the depths of nearby confirmation soil samples.

An additional soil probe (PP-34) will be advanced at location MW-10, where 160,000 milligrams per liter (mg/l) diesel was detected during previous RI/FS sampling (Parametrix 2008). This result is thought to have been biased high due to excessive sediment in the groundwater sample. The sample was collected using a check ball sampler after it was discovered that the well casing was nearly completely filled with sediment, rendering the well unusable. A soil sample will be collected from the probe at a depth corresponding to the groundwater table. A groundwater sample will also be collected from the probe. Both the soil and groundwater sample will be analyzed for diesel and lube oil to confirm or refute the previous data.

All groundwater samples from the wells will be analyzed for gasoline, BTEX, diesel, lube oil, lead, and PAHs. If lead and/or PAHs are not present at concentrations exceeding the cleanup levels during the 6-month sampling event, their removal from the monitoring program will be considered.

To provide a baseline for assessing whether bioattenuation is occurring at the site, all groundwater samples will be also be analyzed for nitrate, sulfate, alkalinity, dissolved ferrous iron, dissolved manganese, methane, temperature, specific conductivity and biochemical oxygen demand (BOD5). The geochemical indicators dissolved oxygen and redox potential will be measured in the field during well sampling. All groundwater samples will also be analyzed for chloride so that an assessment of tidal influences can be made. A baseline chloride concentration was obtained from a surface water sample collected from Smith Cove during the RI.

A summary of the soil and groundwater sampling program is provided in Table 7.

REPORTING

Raw sampling data will be made available upon request as it becomes available. Formal reporting for the soil and groundwater sampling will be contained in the site's RI/FS report currently planned for draft submittal in September 2010.

REFERENCES

- Parametrix. 2009. Technical Memorandum, Interim Action Plan, Former Chevron Property RI/FS and Interim Action, Bremerton, Washington. Prepared for the City of Bremerton. March 17.
- Parametrix. 2008. Technical Memorandum, Pilot Scale Test Plan, Former Chevron Property RI/FS and Interim Action, Bremerton, Washington. Prepared for the City of Bremerton. April 18.
- Parametrix. 2007. Work Plan for Remedial Investigation/Feasibility Study, Interim Action, and Shoreline Restoration, Former Chevron Property, Bremerton, Washington. Prepared for the City of Bremerton. September.
- Parametrix. 2007. Work Plan for Remedial Investigation/Feasibility Study, Interim Action, and Shoreline Restoration, Former Chevron Property, Bremerton, Washington. Prepared for the City of Bremerton. September.

ATTACHMENTS

Figure 1. Soil Excavating Areas

Figure 2. Soil Mixing Area

Figure 3. Well Location Plan

Table 1. Area 1 Excavation Confirmation Sample Results

Table 2. Area 2 Excavation Confirmation Sample Results

Table 3. Area 3 Contaminated Soil Stockpile Sample Results

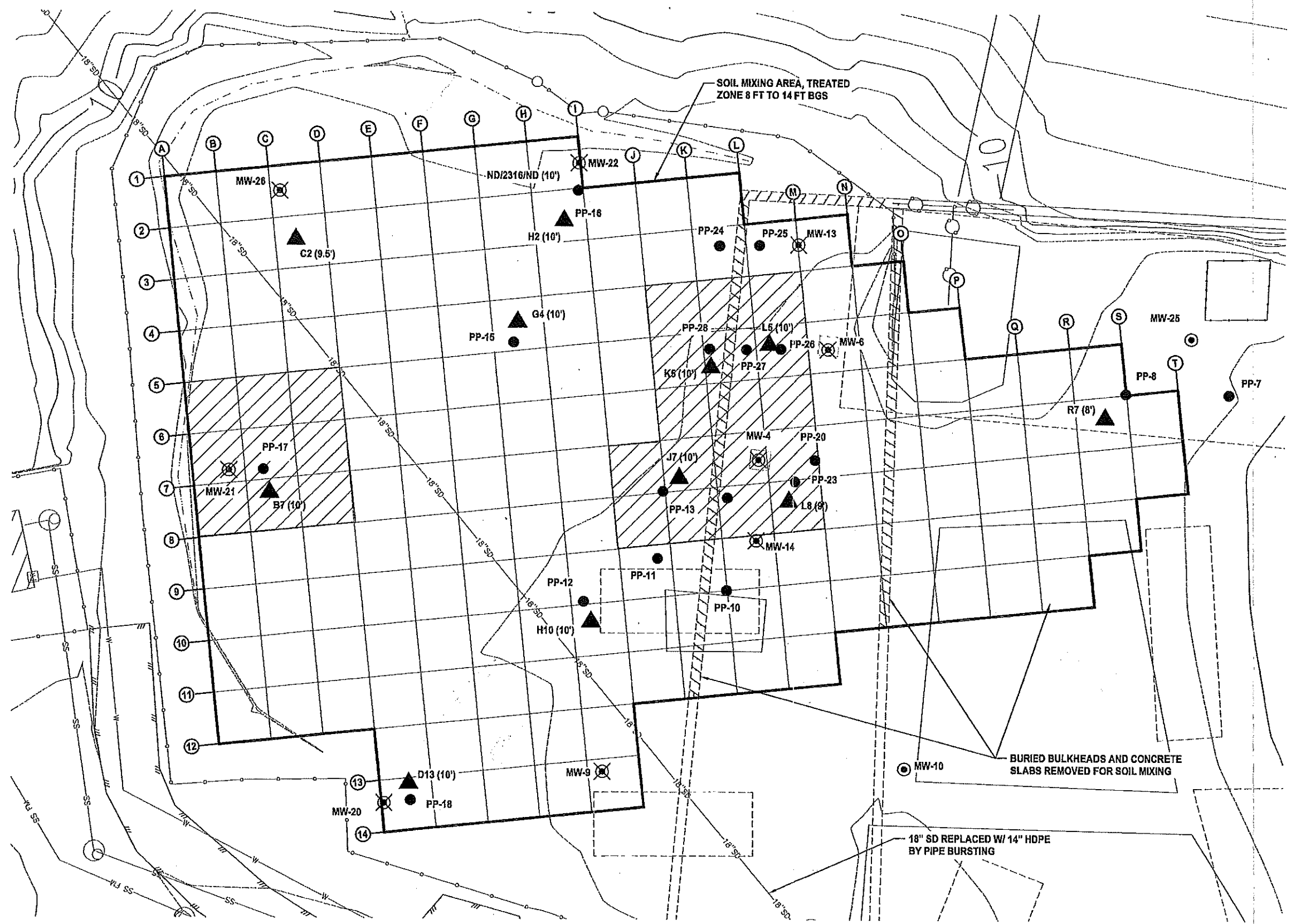
Table 4. Areas 1 and 2 Clean Soil Stockpile Sample Results

Table 5. Soil Mixing Area Confirmation Sample Results

Table 6. Soil Mixing Results Comparison

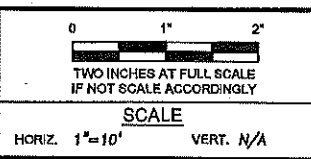
Table 7. Soil and Groundwater Monitoring Program

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MADE: Chevon Property, Inc.
XREF: B0188063004-BA-SV-05/201
XREF: B0188063004-BA-SV-05/201
PLOTED BY: carmelo



- LEGEND**
- PP-11 ● RI/FS PUSH-PROBE LOCATION
 - MW-10 ○ EXISTING MONITORING WELL
 - B7(10') ▲ CONFIRMATION SAMPLE LOCATION AND DEPTH
 - [Hatched Box] TREATMENT CELL-BASLINE DOSE (10LB/CY REGENOX)
 - [Diagonal Lines Box] AGGRESSIVE DOSE TREATMENT AREA (20LB/CY REGENOX)
 - [Crossed Box] MONITORING WELL REMOVED FOR SOIL MIXING

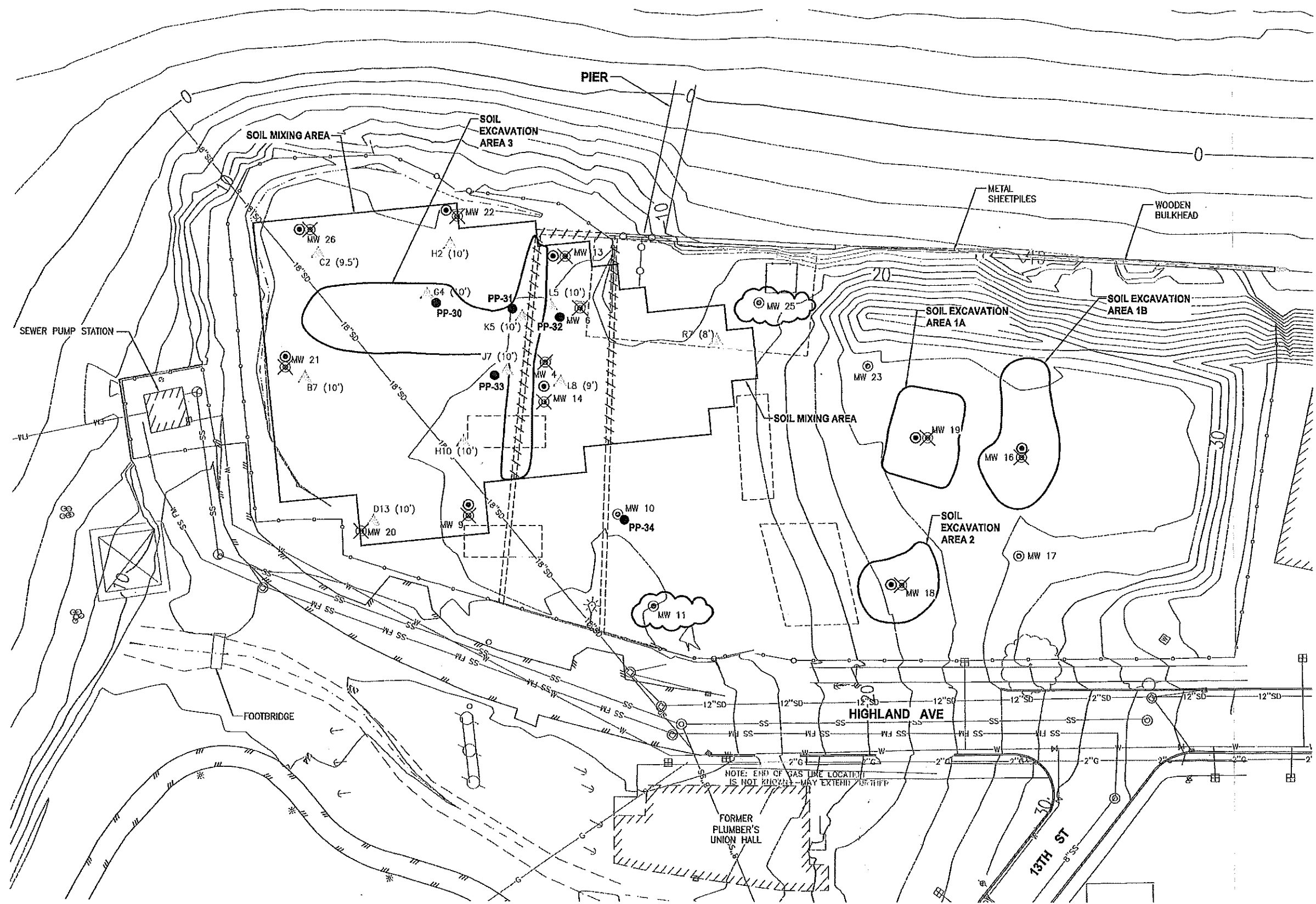
REVISIONS			
NO.	DESCRIPTION	DATE	BY



FIELD BOOK	CITY OF BREMERTON DEPARTMENT OF PUBLIC WORKS & UTILITIES ENGINEERING DIVISION		
DRAWING NO. 2	DRAWN BY: SBR DATE 10/09	DESIGN BY: DLD WASH. P.E. # DATE 10/09	CHECKED BY: WASH. P.E. # DATE

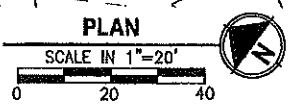
FORMER CHEVRON PROPERTY INTERIM ACTION REPORT SOIL MIXING AREA		FIG. NO. 2	SHEET 2 OF 3
P/N: 255-1885-063		BREMERTON BOARDWALK PROJECT	

FILE: E:\BREMERTON\PRK-A-C-03
DATE: Oct 16, 2008 - 3:18pm PLOTTED BY: rasmuse
PLACES: Chevron Property, FIG. 1
XREFS: XB-BREMERTON-BA-SV-081201 | XB-BREMERTON-BA-SV-081201-BA



- LEGEND**
- EXISTING BUILDING
 - EXISTING CHAIN LINK FENCE
 - EXISTING MONITORING WELL
 - REMOVED MONITORING WELL
 - SOIL MIXING AREA CONFIRMATION SOIL SAMPLE LOCATION (DEPTH)
 - PROPOSED NEW MONITORING WELL LOCATION (9 TOTAL)
 - PROPOSED NEW PUSH-PROBE LOCATION (5 TOTAL)
 - SOIL EXCAVATION AREA
 - EXISTING MONITORING WELL TO BE INCLUDED IN CONFIRMATION GROUNDWATER MONITORING

1. **GENERAL NOTES:**
CONTOUR DATUM NAVD 88



REVISIONS				FIELD BOOK		CITY OF BREMERTON DEPARTMENT OF PUBLIC WORKS & UTILITIES ENGINEERING DIVISION			FORMER CHEVRON PROPERTY INTERIM ACTION REPORT WELL LOCATION PLAN			FIG. NO.	SHEET
NO.	DESCRIPTION	DATE	BY	DRAWING NO.		DESIGN BY: DD	CHECKED BY:					3	3
				3		WASH. P.E. #	DATE 10/09	DATE					
						WASH. P.E. #							

0 1" 2"

TWO INCHES AT FULL SCALE
IF NOT SCALE ACCORDINGLY

SCALE

HORIZ. 1"=20' VERT. N/A

BREMERTON BOARDWALK PROJECT

Table 1. Area 1 Excavation Confirmation Sample Results

		Area 1.A								Area 1.B				
Sample No.		BT01-0120	SW01-0200	BT03-0140	SW03-0120	SW07-0180	SW08-0150	SW13-0150	BT14-0170	BT15-0170	SW16-0150	SW17-0160	SW18-0150	
Date Sampled:		6/16/2009	6/16/2009	6/16/2009	6/16/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	
Sample Depth (ft):		12	20	14	12	18	15	15	17	17	15	16	15	
MTCA A														
VOLATILE ORGANICS														
Benzene	mg/kg	0.03	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.03	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	mg/kg	7	0.086 U	0.040 U	0.035 U	0.038 U	0.087 U	0.072 U	0.089 U	0.096 U	0.093 U	0.097 U	0.077 U	0.091 U
Ethylbenzene	mg/kg	6	0.12	0.040 U	0.035 U	0.038 U	0.087 U	0.072 U	0.59	0.096 U	0.44	0.26	0.077 U	0.091 U
m,p-Xylene	mg/kg	9	0.26	0.040 U	0.035 U	0.038 U	0.090	0.072 U	0.68	0.096 U	0.58	0.27	0.077 U	0.091 U
o-Xylene	mg/kg	9	0.67	0.040 U	0.035 U	0.038 U	0.087 U	0.072 U	0.74	0.096 U	0.58	0.22	0.077 U	0.091 U
TOTAL PETROLEUM HYDROCARBONS														
Gasoline	mg/kg	100	22 U	4.0 U	3.5 U	3.8 U	8.7 U	7.2 U	8.9 U	9.6 U	9.3 U	9.7 U	7.7 U	9.1 U
Diesel Range	mg/kg	2000	900 Z	44	27 U	28 U	580	27 U	150	27 U	290	28 U	28 U	28 U
Lube Oil Range	mg/kg	2000	160 Z	56 U	54 U	55 U	56 U	54 U	56 U	54 U	55 U	56 U	56 U	56 U
POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)														
Naphthalene	mg/kg	5	--	--	--	--	0.0074 U	--	--	--	0.013	--	--	--
2-Methylnaphthalene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.059	--	--	--
1-Methylnaphthalene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.28	--	--	--
Acenaphthylene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0095	--	--	--
Acenaphthene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.025	--	--	--
Fluorene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.13	--	--	--
Phenanthrene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.13	--	--	--
Anthracene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0096	--	--	--
Fluoranthene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
Pyrene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
Benzo[a]anthracene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
Chrysene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
Benzo[b]fluoranthene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
Benzo[k]fluoranthene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
Benzo[a]pyrene	mg/kg	0.1	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
Dibenzo[a,h]anthracene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
Benzo[g,h,i]perylene	mg/kg	--	--	--	--	--	0.0074 U	--	--	--	0.0073 U	--	--	--
cPAHs (see cPAHs calcs)	mg/kg	0.1	--	--	--	--	0.011	--	--	--	0.011	--	--	--

Notes:

mg/kg = Milligrams per kilogram.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Z = Hydrocarbons in the diesel range are impacting lube oil results

-- = Not analyzed/not available.

Table 2. Area 2 Excavation Confirmation Sample Result

		Sample No.	BT05-0120	SW06-0110	BT09-0110	SW10-0100	SW11-0100	SW12-0090
		Date Sampled:	6/16/2009	6/16/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009
		Sample Depth (ft):	12'	11'	11'	10'	10'	9'
		MTCA A						
VOLATILE ORGANICS								
Benzene	mg/kg	0.03	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	mg/kg	7	0.052 U	0.058 U	0.085 U	0.088 U	0.091 U	0.085
Ethylbenzene	mg/kg	6	0.052 U	0.058 U	0.11	0.088 U	0.091 U	0.16
m,p-Xylene	mg/kg	9	0.052 U	0.058 U	0.27	0.088 U	0.12	0.47
o-Xylene	mg/kg	9	0.052 U	0.058 U	0.085 U	0.088 U	0.091 U	0.57
TOTAL PETROLEUM HYDROCARBONS								
Gasoline	mg/kg	100	5.2 U	5.8 U	8.5 U	8.8 U	9.1 U	8.5 U
Diesel Range	mg/kg	2000	29 U	28 U	170	300	270	1700
Lube Oil Range	mg/kg	2000	57 U	55 U	55 U	57	57 U	89 U
POLYCYCLIC AROMATIC HYDROCARBONS								
Naphthalene	mg/kg	5	--	0.0073 U	--	--	--	--
2-Methylnaphthalene	mg/kg	--	--	0.0073 U	--	--	--	--
1-Methylnaphthalene	mg/kg	--	--	0.0073 U	--	--	--	--
Acenaphthylene	mg/kg	--	--	0.0073 U	--	--	--	--
Acenaphthene	mg/kg	--	--	0.0073 U	--	--	--	--
Fluorene	mg/kg	--	--	0.0073 U	--	--	--	--
Phenanthrene	mg/kg	--	--	0.0073 U	--	--	--	--
Anthracene	mg/kg	--	--	0.0073 U	--	--	--	--
Fluoranthene	mg/kg	--	--	0.0073 U	--	--	--	--
Pyrene	mg/kg	--	--	0.0073 U	--	--	--	--
Benzo[a]anthracene	mg/kg	--	--	0.0073 U	--	--	--	--
Chrysene	mg/kg	--	--	0.0073 U	--	--	--	--
Benzo[b]fluoranthene	mg/kg	--	--	0.0073 U	--	--	--	--
Benzo[k]fluoranthene	mg/kg	--	--	0.0073 U	--	--	--	--
Benzo[a]pyrene	mg/kg	0.1	--	0.0073 U	--	--	--	--
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	0.0073 U	--	--	--	--
Dibenzo[a,h]anthracene	mg/kg	--	--	0.0073 U	--	--	--	--
Benzo[g,h,i]perylene	mg/kg	--	--	0.0073 U	--	--	--	--
cPAHs (see cPAHs calcs)	mg/kg	0.1	--	0.011	--	--	--	--

Notes:

mg/kg = Milligrams per kilogram.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Table 3. Area 3 Contaminated Soil Stockpile Sample Results

		Sample No. SB01-0000	SB02-0000
		Date Sampled: 6/2/2009	6/2/2009
		Sample Depth (ft): 0.5	0.5
VOLATILE ORGANICS			
		MTCA A	
Benzene	mg/kg	0.03	4.3
Toluene	mg/kg	7	4.8
Ethylbenzene	mg/kg	6	11
m,p-Xylene	mg/kg	9	68
o-Xylene	mg/kg	9	24
TOTAL PETROLEUM HYDROCARBONS			
Gasoline	mg/kg	100	2100 O
Diesel Range	mg/kg	2000	660 M
Lube Oil Range	mg/kg	2000	330 M
METALS			
Total Lead	mg/kg	250	40

Notes:

Shaded cells = Exceeds MTCA A cleanup levels.

mg/kg = Milligrams per kilogram.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

-- = Not analyzed/not available.

Table 4. Areas 1 and 2 Clean Soil Stockpile Sample Results

Sample No.			SP19-0000	SP20-0000	SP21-0000	SP22-0000	SP-23-0000
Date Sampled:			6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009
Sample Depth (ft):			0.5	0.5	0.5	0.5	0.5
VOLATILE ORGANICS							
			MTCA A				
Benzene	mg/kg	0.03	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	mg/kg	7	0.045 U	0.088 U	0.048 U	0.042 U	0.044 U
Ethylbenzene	mg/kg	6	0.045 U	0.088 U	0.048 U	0.042 U	0.044 U
m,p-Xylene	mg/kg	9	0.045 U	0.088 U	0.048 U	0.042 U	0.044 U
o-Xylene	mg/kg	9	0.045 U	0.088 U	0.048 U	0.042 U	0.044 U
TOTAL PETROLEUM HYDROCARBONS							
Gasoline	mg/kg	100	4.5 U	8.8 U	4.8 U	4.2 U	4.4 U
Diesel Range	mg/kg	2000	25 U	33	28 U	26 U	30
Lube Oil Range	mg/kg	2000	50 U	54 U	55 U	53 U	89

Notes:

mg/kg = Milligrams per kilogram.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Table 5. Soil Mixing Area Confirmation Sample Results

Station No:			B7			C2			D13		H2			H10		G4		
Sample No.:			PP-17	B7-0100		MW-26	C2-0095	C2-2095	PP-18	D13-0100	PP-16	H2-0100	H2-2100	PP-12	H10-0100	PP-15	G4-1100	G4-2100
Date Sampled:			3/6/2008	6/4/2009		3/7/2008	6/5/2009	6/16/2009	3/6/2008	6/9/2009	3/6/2008	6/5/2009	6/16/2009	3/6/2008	6/9/2009	3/6/2008	6/11/2009	6/16/2009
Sample Depth (ft)			10	10		9.5	9.5	9.5	10	10	10	10	10	10	10	10	10	10
MTCA A																		
VOLATILE ORGANICS																		
Benzene	mg/kg	0.03	37	1.4		0.028 U	1.3	2.2	0.33	0.12	5.8	0.18	0.15	3.9	0.67	2.1	0.21	1.4
Toluene	mg/kg	7	2.3	0.31 U		0.14 U	0.32 U	0.63	0.31 U	0.065 U	4 U	0.072 U	0.13 U	0.54 U	0.29	0.50 U	0.15	0.16
Ethylbenzene	mg/kg	6	70	2.6		0.14 U	1.9	4.0	0.31 U	0.097	4 U	0.20	0.31	12	2.3	4.0	0.37	1.1
m,p-Xylene	mg/kg	9	190 E	7.0		0.14 U	4.7	12	0.52	0.19	4.6	0.38	0.46	35	4.8	0.69	0.56	1.2
o-Xylene	mg/kg	9	40	1.4		0.14 U	1.1	3.1	0.31 U	0.065 U	4 U	0.072 U	0.13 U	3.1	1.1	0.50 U	0.24	0.41
TOTAL PETROLEUM HYDROCARBONS																		
Gasoline	mg/kg	30	3900	190		14 U	150 O	340 O	92 O	29 O	80 U1	7.2 U	120 O	1000	180 O	110	140 O	150 O
Diesel Range	mg/kg	2000	790 M	68 U1		920	63 M	120 M	130	78	2316	250	260	580 M	100	110	220	240
Lube Oil Range	mg/kg	2000	100 M	59 U1		240	95 M	87 M	68	180	240 U	170	190	130 M	110	59 U	180	190
POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)																		
Naphthalene	mg/kg	5	--	0.18		--	0.23	0.25	--	0.0087	--	0.12	0.063	--	0.14	--	0.35	3.6
2-Methylnaphthalene	mg/kg	--	--	0.46		--	0.33	0.44	--	0.036	--	0.73	0.26	--	0.34	--	0.87	5.3
1-Methylnaphthalene	mg/kg	--	--	0.23		--	0.31	0.32	--	0.027	--	0.75	0.50	--	0.19	--	1.2	3.2
Acenaphthylene	mg/kg	--	--	0.0078 U		--	0.054	0.033	--	0.029	--	0.14	0.15	--	0.0089 U	--	0.84	1.8
Acenaphthene	mg/kg	--	--	0.022		--	0.098	0.075	--	0.0098	--	0.16	0.11	--	0.014	--	0.38	0.54
Fluorene	mg/kg	--	--	0.033		--	0.087	0.064	--	0.024	--	0.25	0.19	--	0.027	--	0.90	1.6
Phenanthrene	mg/kg	--	--	0.069		--	0.26	0.18	--	0.099	--	0.93	0.59	--	0.068	--	2.9	5.1
Anthracene	mg/kg	--	--	0.0095		--	0.072	0.050	--	0.028	--	0.34	0.18	--	0.012	--	0.99	1.5
Fluoranthene	mg/kg	--	--	0.031		--	0.11	0.079	--	0.074	--	0.53	0.27	--	0.046	--	1.5	1.8
Pyrene	mg/kg	--	--	0.026		--	0.21	0.13	--	0.14	--	0.93	0.51	--	0.047	--	2.9	3.4
Benzo[a]anthracene	mg/kg	--	--	0.0078 U		--	0.065	0.041	--	0.050	--	0.27	0.17	--	0.016	--	0.94	1.0
Chrysene	mg/kg	--	--	0.0078 U		--	0.062	0.040	--	0.053	--	0.22	0.15	--	0.018	--	0.87	0.90
Benzo[b]fluoranthene	mg/kg	--	--	0.0078 U		--	0.035	0.022	--	0.035	--	0.1	0.080	--	0.013	--	0.46	0.39
Benzo[k]fluoranthene	mg/kg	--	--	0.0078 U		--	0.044	0.028	--	0.040	--	0.13	0.096	--	0.012	--	0.61	0.56
Benzo[a]pyrene	mg/kg	0.1	--	0.0078 U		--	0.082	0.047	--	0.073	--	0.26	0.19	--	0.013	--	1.2	1.0
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	0.0078 U		--	0.043	0.025	--	0.034	--	0.098	0.072	--	0.0089 U	--	0.41	0.31
Dibenzo[a,h]anthracene	mg/kg	--	--	0.0078 U		--	0.012	0.0084 U	--	0.011	--	0.082 U	0.024	--	0.0089 U	--	0.14	0.11
Benzo[g,h,i]perylene	mg/kg	--	--	0.0078 U		--	0.077	0.044	--	0.043	--	0.15	0.10	--	0.0094	--	0.52	0.38
cPAHs (see cPAHs calcs)	mg/kg	0.1	--	0.012		--	0.10	0.060	--	0.091	--	0.33	0.24	--	0.019	--	1.5	1.2

(Table Continues)

Table 5. Soil Mixing Area Confirmation Sample Results

Station No:			J7			K5		L5			L8			R7		
Sample No.:			PP-13	J7-0100	J7-2100	PP-28	K5-0100	PP-26	L5-0100	L5-2100	PP-23	L8-0090	L8-2090	PP-8	R7-0800	R7-2100
Date Sampled:			3/6/2008	6/8/2009	6/17/2009	8/20/2008	6/8/2009	8/20/2008	6/8/2009	6/17/2009	6/23/2008	6/8/2009	6/17/2009	3/7/2008	6/10/2009	6/22/2009
Sample Depth (ft)			10	10	10	10	10	10	10	10	9	9	9	8	8	8
MTCA A																
VOLATILE ORGANICS																
Benzene	mg/kg	0.03	21	1.5	1.2	21 U1	0.63	1.6 U1	1.8	2.2	4.0	0.26	0.095	0.17	0.043	0.064
Toluene	mg/kg	7	39	1.4	1.7	5.2 U1	0.11	0.32 U	2.2	0.31	10 U1	0.060 U	0.75 U1	5.4 U	0.36 U1	0.14 U
Ethylbenzene	mg/kg	6	120 E	3.5	2.8	5.2 U1	0.58	7.6	7.8	8.4	20	1.0	0.17	11 U1	0.53	0.37
m,p-Xylene	mg/kg	9	350 E	11	14	9.2	1.3	24	37	29	40	1.8	0.55	17	0.83	0.84
o-Xylene	mg/kg	9	130 E	4.2	4.8	5.2 U1	0.27	0.48	14	9.5	21 U1	1.5	0.15 U	11 U1	0.79	0.78
TOTAL PETROLEUM HYDROCARBONS																
Gasoline	mg/kg	30	5100	390 O	380 O	5100 O	190 O	400	1300 O	1800 O	100 U	350 O	140 O	110 U1	240 O	14 U
Diesel Range	mg/kg	2000	410 M	160 M	160 M	2200	210 M	320 M	230 M	460 M	6900	120 M	88	2000	96 M	180
Lube Oil Range	mg/kg	2000	98 M	140 M	150 M	150	130 M	380 M	200 M	190 M	1100	73 M	90	98	61 UM	150
POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)																
Naphthalene	mg/kg	5	--	1.1	0.41	--	1.8	--	1.9	0.70	--	0.021	0.011	--	0.0097	0.0079 U
2-Methylnaphthalene	mg/kg	--	--	2.0	0.74	--	0.88	--	2.9	1.3	--	0.087	0.022	--	0.021	0.0079 U
1-Methylnaphthalene	mg/kg	--	--	1.2	0.54	--	0.77	--	1.6	0.81	--	0.15	0.041	--	0.054	0.0079 U
Acenaphthylene	mg/kg	--	--	0.54	0.19	--	0.039	--	0.014	0.021	--	0.030	0.015	--	0.0081 U	0.0079 U
Acenaphthene	mg/kg	--	--	0.18	0.42	--	2.3	--	0.13	0.20	--	0.45	0.24	--	0.0081 U	0.0079 U
Fluorene	mg/kg	--	--	0.35	0.55	--	2.0	--	0.14	0.19	--	0.44	0.22	--	0.025	0.0079 U
Phenanthrene	mg/kg	--	--	1.4	1.5	--	5.9	--	0.27	0.38	--	1.3	0.50	--	0.026	0.0079 U
Anthracene	mg/kg	--	--	0.46	0.49	--	1.4	--	0.15	0.066	--	0.18	0.11	--	0.0081 U	0.0079 U
Fluoranthene	mg/kg	--	--	1.3	0.87	--	3.8	--	0.14	0.18	--	0.68	0.63	--	0.0098	0.0079 U
Pyrene	mg/kg	--	--	2.6	1.1	--	2.7	--	0.12	0.16	--	0.53	0.53	--	0.0096	0.0086
Benzo[a]anthracene	mg/kg	--	--	0.90	0.35	--	0.78	--	0.040	0.047	--	0.16	0.16	--	0.0081 U	0.0079 U
Chrysene	mg/kg	--	--	0.84	0.35	--	0.64	--	0.044	0.046	--	0.15	0.16	--	0.0081 U	0.0079 U
Benzo[b]fluoranthene	mg/kg	--	--	0.43	0.18	--	0.4	--	0.022	0.025	--	0.076	0.078	--	0.0081 U	0.0079 U
Benzo[k]fluoranthene	mg/kg	--	--	0.55	0.20	--	0.38	--	0.021	0.025	--	0.080	0.080	--	0.0081 U	0.0079 U
Benzo[a]pyrene	mg/kg	0.1	--	0.99	0.33	--	0.44	--	0.030	0.035	--	0.099	0.095	--	0.0081 U	0.0079 U
Indeno(1,2,3-c,d)pyrene	mg/kg	--	--	0.37	0.12	--	0.15	--	0.012	0.013	--	0.037	0.035	--	0.0081 U	0.0079 U
Dibenzo[a,h]anthracene	mg/kg	--	--	0.12	0.042	--	0.059	--	0.0079 U	0.0078 U	--	0.014	0.014	--	0.0081 U	0.0079 U
Benzo[g,h,i]perylene	mg/kg	--	--	0.46	0.14	--	0.16	--	0.016	0.016	--	0.041	0.038	--	0.0081 U	0.0079 U
cPAHs (see cPAHs calcs)	mg/kg	0.1	--	1.2	0.42	--	0.62	--	0.041	0.047	--	0.14	0.13	--	0.012	0.012

Notes:

Shaded cells = Exceeds MTCA A cleanup levels.

E = The value reported exceeds the quantification range and is an estimate.

M = Hydrocarbons in the gasoline range are impacting the diesel range results.

O = Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 = The practical quantitation limit is elevated due to interferences present in the sample.

-- = Not analyzed/not available.

Table 6. Soil Mixing Results Comparison

Station No.	Gasoline (mg/kg)		Diesel (mg/kg)		Lube Oil (mg/kg)	
	Pre-Treatment	Post-Treatment	Pre-Treatment	Post-Treatment	Pre-Treatment	Post-Treatment
B7	3900	190	790	34	100	29
C2	7	340	920	120	240	87
D13	92	29	130	78	68	180
H2	40	120	2316	260	120	190
H10	1000	180	580	100	130	110
G4	110	150	110	240	29	190
J7	5100	380	410	160	98	150
K5	5100	190	2200	210	150	130
L5	400	1800	320	460	380	190
L8	50	140	6900	88	1100	90
R7	55	7	2000	180	98	150
Average	1441	321	1516	175	228	136
Average % Reduction ((Pre-Treatment-Post-Treatment)/ Pre-Treatment)	78		88		40	

Notes:

mg/kg = Milligrams per kilogram.

Table 7. Soil and Groundwater Monitoring Program

Location	Medium	Sample Depth (ft)	Gasoline/ BTEX	Diesel/ Lube Oil	PAHs	Analysis Lead (total and dissolved)	Chloride	Attenuation Parameters ¹
Push Probes								
PP-30	Soil	10	X	-	X	-	-	-
	Groundwater	-	-	-	-	-	-	-
PP-31	Soil	10	X	-	X	-	-	-
	Groundwater	-	-	-	-	-	-	-
PP-32	Soil	10	X	-	-	-	-	-
	Groundwater	-	-	-	-	-	-	-
PP-33	Soil	10	X	-	X	-	-	-
	Groundwater	-	-	-	-	-	-	-
PP34	Soil	GW ³	-	X	-	-	-	-
	Groundwater	-	-	X	-	-	-	-
Monitoring Wells²								
MW-4R	Soil	9	X	-	X	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-9R	Soil	-	-	-	-	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-11	Soil	-	-	-	-	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-13R	Soil	-	-	-	-	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-16R	Soil	-	-	-	-	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-18R	Soil	-	-	-	-	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-19R	Soil	-	-	-	-	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-21R	Soil	10	X	-	-	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-22R	Soil	10	X	-	X	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-25	Soil	-	-	-	-	-	-	-
	Groundwater	-	X	X	X	X	X	X
MW-26R	Soil	9.5	X	-	-	-	-	-
	Groundwater	-	X	X	X	X	X	X

Notes:

¹= Nitrate, sulfate, alkalinity, ferrous iron (dissolved), manganese (dissolved), methane and BOD5.

²= Monitoring well groundwater samples will be collected for three quarterly events.

³= Soil sample will be collected at the groundwater table depth.

- = Not applicable.