

# **FINAL REMOVAL ACTION INVESTIGATION REPORT**

**TRIANGLE PARK PROPERTY  
PORTLAND, OREGON**

Submitted to:

U.S. Environmental Protection Agency  
Region 10, ECL-115  
1200 Sixth Avenue  
Seattle, Washington 98101

Submitted for:

University of Portland  
5000 North Willamette Boulevard  
Portland, Oregon 97203

Submitted by:

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6-61M-114173

May 2008

May 20, 2008

6-61M-114173

Mark Ader  
U.S. Environmental Protection Agency, Region 10  
1200 Sixth Avenue, Suite 900  
Seattle, Washington 98101-3140

Dear Mr. Ader:

**Re: Final Removal Action Investigation Report  
Triangle Park Property, Portland, Oregon**

On behalf of the University of Portland, AMEC Earth & Environmental, Inc. (AMEC) is submitting to the U.S. Environmental Protection Agency (EPA) the enclosed Final Removal Action Investigation Report. This report was originally submitted to the EPA in December 2006. On March 25, 2008, EPA completed a letter providing comments on the report. Each EPA comment is provided below, followed by an AMEC response indicating how the comment was addressed in the accompanying final report.

**General Comments**

In order to make the tables in the report more user friendly, add SLVs, PRGs and background levels to each page of the tables.

**AMEC Response:** Tables 2 through 12 have been revised to include the Oregon Department of Environmental Quality (DEQ) screening level values (SLVs) as of December 2006, EPA Region 6 human health screening levels (HHSLs), and in the case of metals (Table 5), background levels.

**Figures -** There are samples labeled with the beginning designator of DP that are discussed in the body of the report but these samples do not appear on the figures. Please add the samples to the figures or adjust the text so the reader knows where to find these samples and verify that the DP designator is correct. Create a figure which shows the range of detections for the primary contaminants in each MIS area. Include zinc, copper, PCBs, total PAHs, and dioxins.

**AMEC Response:** The DP borings have been added to figures 3 through 9. A figure 10 has been added to the report illustrating the screening level exceedances (as of December 2006) for each sampling area.

**Specific Comments**

**Page viii - last paragraph -** Change third sentence to read "An additional 20 borings encountered waste material during installation, so in accordance with the work plan a waste sample was collected and the boring location was not used as part of the multi-increment sample. A new location was chosen to replace the waste sample boring for the multi-increment sample."

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Action Investigation Report\Revised based  
on EPA comments\Final Removal Action  
Investigation Report rev.doc

**AMEC Response:** The change requested has been made.

**Page ix -** Add following sentence prior to the last sentence in the first paragraph - "A split of the parent sample was archived for future analyses dependent on the results of the multi-increment sample."

**AMEC Response:** The sentence has been added, as requested.

**Page ix - general comment -:** Include a table similar to table 1 in the Parent sample Analysis Recommendations memorandum that shows a comparison between historical results and incremental sample results.

**AMEC Response:** Table 1 in the Parent Sample Analysis Technical Memorandum has been slightly modified (deleted row containing recommendations for parent sample analysis) and has been added to the report as Table 13. Table 13 is referenced on page ix.

**Page ix - Recent Waste Sample Soil Data section -** Include a summary of what was analyzed for and detections.

**AMEC Response:** Table 1 has been modified to include a listing the waste samples that were collected, and the test methods used in analyzing waste samples. A reference to this table has been added to page ix.

**Page x - first bullet -** State whether diesel range hydrocarbons were detected above or below SLVs.

**AMEC Response:** An SLV has not been promulgated for diesel range hydrocarbons. This fact has been indicated on page x.

**Page 2 - Section 1.2 -** Add explanation concerning that only four of the eight planned groundwater samples were collected, due to the depth to groundwater being deeper than was anticipated. Acknowledge that the groundwater samples were to be collected later when the depth to ground water is shallower. Add a statement that this work has not been completed, but will be required in the future.

**AMEC Response:** The requested explanation was added to Section 1.2.

**Page 2 - Section 1.2 - first bullet -** Move up to end of first paragraph.

**AMEC Response:** The requested formatting change has been made to the report.

**Page 2 - Section 2.0 -** Include an introduction which defines and explains how the data and discussion is organized (i.e. all general results in tables, text includes brief discussion of what was detected and which contractor did the work). Discuss how soil and ground water results will be discussed and the order they will be discussed in. Keep in chronological order by area.

**AMEC Response:** Rather than adding the requested information to Section 2.0, AMEC has created a new section entitled "1.3 Report Organization" and included the requested information in this new section.

**Page 3 - Section 2 - general comment -** Add a discussion in last paragraph of how metals background concentration were determined and whether they have been accepted by the EPA and ODEQ or are they still open of consideration.

**AMEC Response:** Discussion added.

**Page 2 - Section 2 - general comment -** Add the acreage of each sub area.

**AMEC Response:** The acreage of each of the 17 sampling areas has been added.

**Page 4 - second paragraph -** Define Level II soil matrix cleanup levels. Are these ODEQs levels?

**AMEC Response:** Yes, soil matrix cleanup levels are cleanup levels promulgated by the DEQ. A regulatory citation for soil matrix regulations has been added to the report.

**Page 4 - third paragraph -** Include the analyses and what was detected in the monitoring wells.

**AMEC Response:** This information is included in the first paragraph (beneath table) on page 5. Each Section 2.0 subsection (2.1 through 2.17) that describes historical sampling activities and results first summarizes soil sampling activities and results, and then groundwater sampling activities and results. No changes were made to the report to address this comment.

**Page 4 - fourth paragraph -** The last sentence states the PCB's were not detected, but there is no indication whether the other analytes were detected. Please clarify.

**AMEC Response:** Subsections 2.1 through 2.17 are systematic in how data are reported (see newly added Section 1.3). First, soil sampling associated with each assessment phase is summarized (in Subsection 2.1 this includes page 4, paragraphs 1 through 5). Information included in each summary paragraph generally includes the number and type of borings included in the assessment, and the analytes included in the testing program. If an analyte was included in the testing program, but not detected, this is indicated (case in point, the absence of PCBs noted in this EPA comment) in the paragraph summarizing that particular assessment event. Analytes detected in the soil samples from all sampling events are then summarized in a table. In Section 2.1, soil detections are summarized in Table 2.1. Table 2.1 is followed by a summary description of historical groundwater sampling activities. This is then followed by a discussion of the results of a comparison of historical soil testing results to JSCS SLVs. No changes were made to the report to address this comment.

**Page 4 - fifth paragraph -** include whether or not dioxin was detected.

The dioxin concentration detected is reported in Table 2.1 on page 7.

**Section 2 - Tables - general comment** -Include the number of samples vs. the number of detections by analyte in each table. Also, add a column for the SLVs and background.

**AMEC Response:** On May 7, 2008, AMEC and Mr. Mark Ader with EPA discussed this comment. It was agreed during the discussion that AMEC would not revise the report at this time based upon this comment. The information requested by EPA in this comment may need to be provided to the EPA at some point in the future.

**Section 2 - general comment** - ROD and SLV discussion should be reversed so that the ROD discussion comes at the end of the text. Also, there are apparent inconsistencies between the ROD conclusions and the exceedances of SLVs. Further discussion should be included to explain why the ROD determined no action when there were exceedances for many COCs. The following sections appear to have these types of inconsistencies: Area 1A, Area 1B, Area 1C, Area 2B, Area 3A, Area 3B, Area 5A, Area 5B, Area 6A, Area 6C, Area 6D,

**AMEC Response:** JSCS SLVs are screening criteria used to establish whether a site should be considered for source control evaluation in Portland Harbor and are not considered regulatory based screening levels. The DEQ ROD reflects DEQ's judgment at the time that SLVs not be used as ARARs.

The following text from page iii of the JSCS confirms the idea that SLVs are not ARARs.

*SLVs may be used in two ways: first, they will be used in screening level risk assessments and second, they may be used as helpful comparisons to prioritize source control tasks. The EPA Portland Harbor ROD(s) will establish contaminant specific cleanup levels based on identified applicable or relevant and appropriate requirements (ARARs) or risk-based levels.*

*Upland sources of contamination threatening the river will be screened against the SLVs. Exceedance of an SLV does not necessarily indicate the upland source of contamination poses an unacceptable risk to human health or the environment, but does require further consideration of the need for source control using a weight-of-evidence evaluation.*

As requested in this comment, ROD and SLV discussion have been reversed so that the ROD discussion comes at the end of sections 2.1 through 2.17.

**Page 9 - Section 2.4 - second paragraph** - One boring is discussed in this section. There appears to be numerical inconsistency within this section. It discusses one boring installed in 1999 and 2000. There is also a reference to "borings" and a single detection of hydrocarbons. Please rewrite to remove the confusing numerical inconsistencies.

**AMEC Response:** The paragraph has been rewritten to remove the confusing numerical inconsistencies.

**Page 9 - Section 2.4 - third paragraph** - Near the end of this paragraph the Region 9 PRGs are discussed. Use the Region 6 PRGs.

**AMEC Response:** EPA Region 9 PRGs have been changed to EPA Region 6 screening values. The EPA Region 6 screening values are known as HHSLs, rather than PRGs, and are referred to as HHSLs throughout the report.

**Page 10 - end of second paragraph** - State whether contaminants were detected from the sample collected from boring SB-15.

**AMEC Response:** Please see the response to the EPA comment regarding “**Page 4 - fourth paragraph**” above. No changes were made to the report to address this comment.

**Page 11 - last paragraph** - Explain the significance of using the “30 weight oil standard”.

**AMEC Response:** AMEC added the following sentence to explain the significance of identifying the calibration standard utilized.

*“Because the petroleum hydrocarbons detected were not within the carbon range of the calibration standard, the detected concentration should be considered approximate.”*

**Page 12 - Area A2-1 - general comment** - Samples labeled DP are not on the figures. Revise accordingly.

**AMEC Response:** Figures 3 through 9 have been revised to include the “DP” borings.

**Page 13 - Area 3A** - Last sentence has a typo, change “note” to “not.”

**AMEC Response:** Typo corrected.

**Page 14 - paragraph after table** - Last sentence is not clear. Rewrite.

**AMEC Response:** This comment has been addressed in the same manner as comment “**Page 11 - last paragraph**” above.

**Page 19 - Area 4 - second and third paragraphs** - both discuss monitoring wells. It appears 8 monitoring wells were installed in 2005 by DEQ with only MW 8 having any detected contaminants. The third paragraph describes wells sampled by AMEC. Were these wells installed by AMEC? If so, state when AMEC installed the wells, it is currently unclear and a little confusing whether these are different wells than the ones installed by ODEQ in 2005. The report should also include a table that lists the wells, elevations, screened intervals, datum used, horizontal coordinates, and depth to groundwater.

**AMEC Response:** Eight monitoring wells were installed by the DEQ in 2005. The results of groundwater sampling and testing of these wells are described by sampling area. The area in which each of the wells is located is summarized below. Text has been added to the report to make the report organization more clear.

- MW-1 and MW-2: Area 6C (report subsection 2.15)
- MW-3: Area 6A (report subsection 2.13)
- MW-4: Area 5B (report subsection 2.11)
- MW-5, MW-6, and MW-7: Area RS-3 (report subsection 2.9)
- MW-8: Area 4 (report subsection 2.8)

Five additional wells were installed by AMEC (MW-A4-1, MW-A4-2, MW-A2-3, MW-A3-4, and MW-A3-5) during the Phase II ESA conducted at the Site in 2005. Text has been added to page 19 to make this clear and in three sections where further information is provided on these wells. Boring logs for each of the five AMEC-installed monitoring wells were included in Appendix B of AMEC's Phase II ESA report. We have attached a copy of the Phase II report.

**Page 19 - Move ROD conclusion to end of section and explain inconsistency with no action and contaminants detected above SLVs. Arsenic appears higher (303 ppm) than in other areas where arsenic cleanup has been recommended.**

**AMEC Response:** In response to this comment, and comment "**Section 2 - general comment**" above, AMEC has moved ROD conclusions in all subsections to the end of the subsection. An arsenic concentration of 303 mg/kg was detected in surface soil sample SS-4. SS-4 is not located within an area stipulated in the ROD for capping or removal. This issue warrants further attention, and will be addressed in the final Removal Action Work Plan for the Site.

**Page 20 - Area RS3 - Move ROD conclusions to end of section.**

**AMEC Response:** ROD conclusions have been moved to the end of the section.

**Page 23 - Section 2.10 - first paragraph - More clearly describe the total number of USTs historically present and the contents of each UST.**

**AMEC Response:** The requested additional information has been added to Section 2.10 of the report.

**Page 25 - table top of page - Verify that the Aroclor concentration is correct for both 1242 and 1254, the reported results are identical.**

**AMEC Response:** According to the information on page 6-25 of the MFA Remedial Investigation For Soil report (MFA, 2002) the concentrations range for both Aroclor 1242 and 1254 are identical. .

**Page 25 - Area A5-11 and Area A5-12B - Both discuss sample results with a designator beginning with DP. These samples are not on the figures. Revise to include these samples on the figures.**

**AMEC Response:** Figures 3 through 9 have been revised to include all “DP” borings from the Phase II ESA conducted by AMEC in 2005.

**Page 32 - Section 2.13** - The first sentence describes that “used UST storage and metal debris storage have occurred in area 6”. The second sentence states that there was a PCP storage tank in this area. How many UST were located here? Was the “used UST” actually used to store old oil, or cut up and scrapped in this area? It is unclear from the way the first sentence is written what actually happened in the area and how many USTs there may have been. Revise to clarify.

**AMEC Response:** The total number of scrap tanks stored in the area is unknown. To clarify, the tanks stored at this location were former USTs, which had been excavated and brought above ground to be stored as scrap metal. Their use history before being brought to the site is not known. Section 2.13 has been revised to clarify this information.

**Page 35 - Section A6 - 18A** - There is inconsistency between the statement on this page concerning capping of this area and on figure 9 that labels the area to be capped as A6-18A and A6-18B. Correct as appropriate.

**AMEC Response:** The “A6-18B” label has been removed from Figure 9.

**Page 41 - top of page** - Area A6-18B may be a typo. At end of second sentence at top of page the sub area is identified as Area A6-16. Correct as appropriate.

**AMEC Response:** Mention of Area A6-18B has been removed from the report. SB-13 (the only boring referenced as within Area A6-18B) is located within Area A6-18. SB-13 has been added to the list of borings that are within Area A6-18 in Section 2.14 of the report.

**Page 41 - fourth bullet** - end of section - Sample SB-13 is in area 6B not 6D. Correct as appropriate.

**AMEC Response:** This error has been corrected by moving information associated with SB-13 from Section 2.16 to Section 2.14.

**Page 43 - second sentence near top of page** - Add the word “acceptable” after the word “levels”.

**AMEC Response:** The word “levels” has been added after the word “acceptable”.

**Page 43** - It appears that Area A6-19 is in RS1 not Area 6D. Correct as appropriate.

**AMEC Response:** Area A6-19 is located in Area 6C, not Area RS1 as implied by the report. Information regarding Area A6-9 has been moved to Section 2.15.

**Page 48 - groundwater sampling discussion** - This section indicates that a low flow approach was used to collect all groundwater samples and that draw down was never more than 0.33 feet, when in fact, at least two of the wells were purged dry several times resulting in the sample

being collected over an extended period of time. Please indicate that this was the case in the discussion.

**AMEC Response:** The requested changes to the discussion regarding temporary well groundwater sampling have been made.

**Page 49 - Section 3.4, second bullet** - Explain how the soil in the 1 liter jar was homogenized.

**AMEC Response:** An explanation of how the soil was mixed has been added to the report.

**Page 50 - Section 3.6** - Has the investigation derived waste water been properly disposed of?

**AMEC Response:** Yes. The report has been revised to reflect this.

**Page 50 - Section 3.7** - Include a statement here that describes the number of GW samples that were intended to be collected and that we did not collect all of them due to the depth of groundwater being greater than originally thought and that we were going to resample the groundwater later when the water level was higher. Note: This work must still be done by the University.

**AMEC Response:** The additional text that EPA has requested has been added.

**Page 51 - top of page** - Explain why 31 samples were collected in the two areas described in this section. Was this just an inadvertent mistake or was there a reason to add one additional location?

**AMEC Response:** The extra samples were collected inadvertently. The text has been revised to reflect this fact.

**Page 51 - Section 4.0, second paragraph** - Explain why only 18 of the 24 waste samples were submitted for analyses. Note that additional sampling may be required by EPA to further delineate the area of contamination.

**AMEC Response:** The six samples collected but not tested were considered redundant. For example, waste sample WS-3A(9.6-10.0)-2A was collected from the boring that was originally planned as multi-increment boring 2 within Area 3A. Because of the presence of "waste" in the boring, a second boring was advanced approximately 5 feet away in a second attempt to obtain multi-increment samples. Black oily soil was observed in this second boring in the interval 9.5 to 10 feet below ground surface, and a second waste sample (WS-3A(9.5-10.0)-2B) was collected from the zone. This second waste sample was not submitted for analysis because the first waste sample was considered representative of this waste.

**Page 51 - Section 4.0, last paragraph** - Add a reference for TPH screening levels.

**AMEC Response:** A sentence was added to Section 4.0 indicating that EPA was the source of the TPH screening value.

**Page 55 - Section 4.2.4, last sentence** - Change lead to zinc. From the data it appears that zinc was detected not lead.

**AMEC Response:** Done.

**Page 67 - WS-6A (8.5-9.0)-9A** - The last sentence in the first paragraph is confusing. It is not clear whether a waste sample was collected from the second boring from this location. Please clarify.

**AMEC Response:** Additional text has been added to the report to clarify that waste and multi-increment soil sampling were conducted at boring 6A-9.

**Page 70 - WS-6D(9-10)-14** - It appears that there were two borings that had waste samples collected from this location 14A and 14B. The text only discusses the results from 14B while the text states the 14A had a PID reading of 185 ppm. Table 8 also is missing the results from sample 14A. Explain why there are no results for the missing sample or add the results to the text and table.

**AMEC Response:** Waste sample WS-6D(9-10)-14A was not tested because it was considered redundant with adjacent waste sample WS-6D(9-10)-14B. Sample 14B had a PID reading of 126 ppm, which is not considered significantly different than the PID reading of 185 ppm in 14A.

**Table 6A** - Verify dioxin screening value.

**AMEC Response:** The units were incorrect. The listed screening level has been corrected.

If you have any questions regarding the attached work plan, please do not hesitate to contact the undersigned at 503-639-3400.

Sincerely,

**AMEC Earth & Environmental, Inc.**



Leonard C. Farr, Jr., RG  
Senior Associate

c: Jennifer MacDonald, USEPA Assistant Regional Counsel  
Jim Kuffner, University of Portland  
David Blount, Landye Bennett Blumstein, LLP

LCF/sl/jm

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## LIST OF ACRONYMS

ARI	Analytical Resources, Inc. (the project contract laboratory)
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. 1251, <i>et seq</i>
DEQ	Oregon Department of Environmental Quality
EPA	United States Environmental Protection Agency
HDPE	High Density Polyethylene
JSCS-	Joint Source Control Strategy developed by EPA and DEQ
MFA	Maul Foster Alongi, Inc.
NWTPH-Dx	Northwest Total Petroleum Hydrocarbon - Diesel Range
PAH	Polynuclear Aromatic Hydrocarbon
PCP	Pentachlorophenol
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
PGSL	The more stringent of two screening levels: EPA 2004 chronic national recommended water quality criteria or DEQ 2004 chronic ambient water quality criteria
ppm	parts per million
QAPP	Quality Assurance Project Plan
ROD	Record of Decision issued in February 2005 by the DEQ
Site	The 35-acre Triangle Park LLC property located at 5828 North Van Houten Place, Portland, Oregon
SLV	Screening Level Value
SOP	Standard Operating Procedure
TPH	Total Petroleum Hydrocarbons
University	University of Portland
VOC	Volatile Organic Compound

## EXECUTIVE SUMMARY

The purpose of this Removal Action Investigation Report is to document both historical and recent environmental investigations conducted at the approximately 35-acre Triangle Park property, located at 5828 North Van Houten Place in Portland, Multnomah County, Oregon (Site).

**Historical Environmental Investigation Data:** Soil samples have been collected from approximately 250 direct-push borings or test pits during previous investigations. Historical environmental investigations conducted at the Site include:

- A 1993 Site investigation by EMCON;
- 1996, 1999 and 2000 Site investigations conducted by Maul Foster Alongi (MFA); and
- A 2005 Phase II Environmental Site Assessment conducted by AMEC Earth and Environmental (AMEC).

**Historical Soil Data:** All data collected and presented in the above referenced reports has been thoroughly reviewed. A brief summary of the areas in which historical soil testing has yielded a concentration exceeding screening levels is provided below.

- Copper and zinc concentrations exceed Portland Harbor Joint Source Control Strategy Screening Level Values (SLVs) in one or more soil samples in all 17 areas of the Site (see Figure 10). In Areas 1A, 2B, 4, 5A, 5B, 6A, 6B, 6C, 6D, RS-1, RS-2, and RS-3 one or more soil sample copper or zinc concentrations exceed background levels (see Figure 3 for sample area configuration).
- Cadmium has been detected at concentrations exceeding SLVs in a total of 17 soil samples collected in Areas 2B, 4, 5A, 5B, RS-2, 6B, 6C, 6D, RS-2, and RS-3; however, cadmium has been detected in only three soil samples (collected in Areas 5B, 6C, and RS-3) at concentrations exceeding background levels.
- Nickel detections exceed the SLV and background levels in soil samples collected in Areas 1C, 4, RS-3.
- Arsenic has been detected at concentrations exceeding SLVs in a total of four soil samples collected in Areas 4, 6B, and 6C. Only in Areas 4 and 6C does arsenic exceed background levels.
- Lead has been detected at concentrations exceeding SLVs in a total of nine samples collected in Areas 2B, 4, and RS-3.

- Polynuclear aromatic hydrocarbons (PAHs) have been detected at concentrations exceeding SLVs in Areas 1A, 2B, 3B, 4, 5A, 6B, 6C, 6D, RS-1, and RS-3.
- Polychlorinated biphenyls (PCBs) have been detected at concentrations exceeding SLVs in Areas 2B, 3B, 5A, 6C, 6D, RS-1, and RS-2.
- Gasoline has been detected at concentrations exceeding U.S. Environmental Protection Agency (EPA) screening levels in Areas 1A, 2B, 3B, 5B, and RS-2. Diesel/heavy oil has been detected at concentrations exceeding EPA screening levels in Areas 1A, 2B, 3A, 3B, 5B, 6B, 6D, RS-2, and RS-3.

**Historical Groundwater Data:** Groundwater samples have been collected from 36 locations during previous investigations. Groundwater analytical results indicate the following:

- Copper and zinc have been detected in unfiltered groundwater samples at concentrations exceeding SLVs in Areas 1A, 5A, 6A, and 6D.
- Cadmium has been detected in unfiltered groundwater samples at concentrations exceeding SLVs in Area 1A.
- Nickel has been detected in unfiltered groundwater samples at concentrations exceeding SLVs in Areas 1A, 3A, 4, 6A, 6D.
- Lead has been detected in unfiltered groundwater samples at concentrations exceeding SLVs in Areas 1A, 6A, and 6D.
- PAHs have been detected in groundwater above the Safe Drinking Water Act Maximum Contaminant Levels (MCLs) or EPA Region 6 residential Human Health Screening Levels (HHSLs) in Areas 1B, 2B, and 5A.
- Volatile organic compounds (VOCs) have been detected in groundwater above EPA HHSLs in a single groundwater sample from Area 2B and a single groundwater sample from Area 6D.
- Gasoline has been detected in groundwater in a single groundwater sample from Area 6B. Diesel has been detected in groundwater in Areas 1A, 2A, 3A, 3B, 4, 5A, 5B, and 6D.

**2006 AMEC Site Characterization:** In October 2006, AMEC advanced a total of 530 borings at the Site. A total of 510 borings were used for parent/multi-increment soil sampling, and in four of these borings, a waste sample also was collected. An additional 20 borings encountered waste material during installation, so in accordance with the work plan, a waste sample was collected and the boring location was not used as part of the multi-increment sample. A new location was chosen to replace the

waste sample boring for the multi-increment sample. In addition, groundwater samples were collected from four borings.

**Recent Multi-Increment Soil Data:** In 2006, thirty borings were advanced in each Site area, and soil samples were collected from three depth horizons in each boring: the A horizon (0 to 1 feet below ground surface (bgs)), B horizon (1 to 5 feet bgs), and C horizon (5 to 10 feet bgs). The 30 parent samples from each depth horizon were ground, and then composited to create a single multi-increment sample for each of the three depth horizons in each Site area. A split of the parent sample was archived for potential future analysis pending analysis of the multi-increment sample. Multi-increment soil analytical results indicate the following (see Table 13 for a summary of the results comparing the multi-increment soil results to selected screening levels):

- Copper concentrations exceed SLVs in all three depth horizons in all 17 areas of the Site. Copper concentrations exceed background levels in areas 2A, 2B, 4, 5A, 6A, 6C, 6D, RS-1, and RS-2. Copper was detected above SLVs and background levels in the C horizon only in Areas 6C, RS-1, and RS-2.
- Zinc concentrations exceed SLVs in all three depth horizons in all 17 areas of the Site. Zinc concentrations exceed background levels in Areas 2A, 2B, 4, 5A, 6A, 6B, 6C, 6D, RS-1, and RS-2. Zinc was detected above SLVs and background levels in the C horizon only in Areas 6C and RS-1.
- Cadmium concentrations exceed SLVs in Areas 1C, 2A, 2B, 3A, 5A, 5B, 6A, 6B, 6C, 6D, RS-1, and RS-2. All cadmium concentrations are below background levels.
- PAHs exceed SLVs in Areas 1B, 2A, 6A, 6B, and RS-1. PAH concentrations exceed SLVs in the C horizon only in Areas 1B and RS-1.
- PCBs exceed SLVs in Areas 3A, 3B, 5B, 6A, RS-1, and RS-2. PCB concentrations exceed SLVs in the C horizon only in Area RS-1.
- Diesel/heavy oil range petroleum hydrocarbons exceed SLVs in Areas 6A, 6C, 6D. Total petroleum hydrocarbons exceed SLVs in the C horizon only in Areas 6C and 6D.
- Dioxins/furans 2,3,7,8-TCDD equivalent (TEQ) concentrations exceeded SLVs in Areas 5B, 6D, RS-1, and RS-3 A horizon samples.

**Recent Waste Sample Soil Data:** Waste material (i.e., soil exhibiting evidence of contamination such as an odor, staining, or an elevated photoionization detector (PID) measurement) encountered during drilling, was sampled according to the EPA soil sampling protocol. A total of 24 waste samples were collected, 18 of which were

submitted to a laboratory during site characterization activities. Table 1 lists each of the waste samples submitted for analysis, and the test methods used in analyzing them. Six of the waste samples were not tested because of their close proximity to other representative tested waste samples.

**Recent Groundwater Data:** AMEC collected groundwater samples at four borings in Area 4 that were co-located with soil samples. The groundwater analytical results indicated:

- Diesel range hydrocarbons were detected in three of the four groundwater samples at concentrations ranging from (0.3 to 3.8 milligrams per liter (mg/L). An SLV has not been promulgated for diesel range hydrocarbons by EPA and DEQ for Portland Harbor Source Control purposes.
- Zinc and nickel were detected at concentrations exceeding SLVs in one groundwater sample.
- PAHs were detected in only one of the four groundwater samples, and the concentrations detected did not exceed SLVs.

The preceding executive summary is intended for introductory and reference use. A complete reading of this report is recommended.

## 1.0 INTRODUCTION

The Triangle Park Property (Site) is currently owned by Triangle Park, L.L.C., who purchased the property in May 1997. The University of Portland (University) plans to purchase and redevelop the property into sports fields and a river-front walkway, and will provide public access in addition to facilities for the students. On December 26, 2008, EPA and the University entered into a Bona Fide Prospective Purchaser (BFPP) agreement to facilitate the purchase which has yet to occur. Under the terms of the BFPP agreement, the parties have agreed that the work at the Site must be consistent with EPA guidance under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and performed with EPA oversight.

During a meeting with the University on July 14, 2006, EPA discussed the additional work (further site characterization and possible upland removal actions) that would be required to enter into a BFPP agreement with the University. The University submitted an initial draft work plan to conduct further site characterization to EPA on August 29, 2006. A final Sampling Investigation Work Plan (WP) and Sampling and Analysis Plan (SAP) were approved by EPA in a letter dated October 11, 2006. Field work consistent with the WP was undertaken in November and December 2006.

This Removal Action Investigation Report includes a detailed description of historical operations and contaminants present at the Site; a description of Site characterization field work; deviations between Site characterization field work and the WP, SAP, and Quality Assurance Project Plan (QAPP); and analytical results from Site characterization field work. Section 1.0 of this report discusses project background and objectives. Section 2.0 discusses historical operations and contaminant concentrations at the Site. Section 3.0 discusses soil and groundwater characterization methods. Section 4.0 discusses the results of the soil and groundwater laboratory testing.

### 1.1 Background

The Site is located within the Portland Harbor Superfund site, adjacent to and northeast of the Willamette River between river miles 7 and 8. The Site address is 5828 North Van Houten Place, Portland, Oregon. The Site is bounded on the southwest by the Willamette River, on the northwest by the McCormick & Baxter superfund site, on the northeast by a bluff and residential properties, and on the southeast by the University of Portland campus. The Site location map is presented on Figure 1.

## 1.2 Objectives

The primary objective of the additional Site characterization was to further evaluate the nature and extent of contamination at the Site. There are no current commercial/industrial activities occurring at the Site. The Site characterization involved soil and groundwater sampling, focused on delineating areas of the Site where contamination exceeds screening levels and may require additional work to better delineate the extent of contamination and determine possible removal actions. The objectives of the additional Site characterization were to:

- Summarize the historical and environmental data for the Site.
- Conduct soil sampling using the multi-increment sampling approach, and evaluate whether concentrations of soil constituents exceed Portland Harbor Joint Source Control Strategy (JSCS) Screening Level Values (SLVs).
- Conduct limited groundwater sampling in the vicinity of a suspected diesel plume in the southwest portion of the Site.

Only four of the planned eight groundwater samples were collected, due to the depth of groundwater, which was encountered at a greater than normal depth during the sampling exercise. EPA requested, and the University of Portland agreed, that the remaining four groundwater samples would be collected at a later date. This work has not been completed to date.

## 1.3 Report Organization

A discussion of the information as presented in each primary section of the report is provided below.

Section 2.0 - Historical Operations and Environmental Assessment: This section is organized into 17 subsections, corresponding to each designated study area within the Site. Each subsection includes the following information in chronological order.

- Available information regarding operational history for each study area.
- A brief summary of the soil samples collected during previous environmental assessments conducted in each area of the Site, including the methods used in testing the samples. The range of detections for a variety of analytes also is provided in table format.

- A brief summary of the groundwater samples collected during previous environmental assessments conducted in each area, including the methods used in testing the samples.
- A comparison of detected historical concentrations within each area to potentially applicable screening levels.
- A discussion of the remedial actions stipulated in the DEQ Record of Decision (DEQ, 2005) for each area.

Section 3.0 - Site Characterization Methodology: This section of the report documents methods used in performing the Removal Action Investigation. Each subsection addresses:

- the rationale for the list of soil and groundwater contaminants of interest used during the investigation;
- how individual boring locations were selected and field located;
- the sampling identity protocol used to name samples, as well as a summary description of soil and groundwater sampling activities;
- the procedures used by the laboratory to prepare each multi-increment soil sample;
- the analytical methods used to test soil and groundwater samples;
- decontamination procedures used during investigation activities; the final disposition of investigation-derived wastes generated during the project; and
- the three deviations from the Work Plan and or Quality Assurance Project Plan that occurred during execution of the project.

Section 4.0 - Laboratory Results: This section of the report summarizes the results of data quality review activities (Section 4.1), and includes a brief summary of the results of soil (Section 4.2), waste (Section 4.3), and groundwater (Section 4.4) testing. In sections 4.2 and 4.3, testing results are summarized chronologically by area. Included in the summary is a listing of the samples that yielded analyte concentrations exceeding JSCS SLVs. SLVs are used to conduct a preliminary screening level risk assessment only. Exceedance of an SLV does not necessarily indicate the upland source of contamination poses an unacceptable risk to human health or the environment, but does require further consideration of the need for source control using a weight-of-evidence evaluation. The EPA Portland Harbor ROD(s) will establish contaminant specific cleanup levels based on identified applicable or relevant and appropriate requirements (ARARs) or risk-based levels. All testing data and

screening values are summarized in tables 2 through 12, and SLV exceedances are highlighted in the tables.

## **2.0 HISTORICAL OPERATIONS AND ENVIRONMENTAL ASSESSMENT RESULTS**

From the early 1900s to 1986, continuous and diverse industrial operations occurred at the Site. The Site has been operationally idle over the past 9 years while undergoing Site-wide environmental investigation under DEQ pursuant to the state Superfund program. In February 2005, following completion of a Site-wide Remedial Investigation and Feasibility Study (RI/FS), and public notice and comment, DEQ issued its Record of Decision (ROD) for soil at the Site.

Previous investigations have divided the Site into 6 Areas (Area 1, Area 2, Area 3, Area 4, Area 5, and Area 6) based on anticipated future use. The University used historical operations performed in each area, analytical results from previous environmental investigations, and proximity of an area to the Willamette River to further divide Areas 1 through 6 as follows:

- Area 1 (5.04 acres) was divided into Areas 1A (2.15 acres), 1B (2.31 acres) and 1C (0.58 acres).
- Area 2 (3.77 acres) was divided into Areas 2A (0.72 acres) and 2B (3.05 acres).
- Area 3 (3.88 acres) was divided into Areas 3A (1.90 acres) and 3B (1.05 acres). The former office building area (0.93 acres) within Area 3 was excluded from the sampling program at EPA's suggestion.
- Area 4 (5.03 acres) was divided into Areas 4 (3.33 acres) and RS-3 (1.70 acres).
- Area 5 (5.51 acres) was divided into Areas 5A (1.58 acres), 5B (2.99 acres), and RS-2 (0.94 acres).
- Area 6 (11.04 acres) was divided into Areas 6A (2.37 acres), 6B (1.47 acres), 6C (2.19 acres), 6D (3.97 acres) and RS-1 (1.04 acres).

Historical site operations and previous environmental assessment results for each area are discussed in Sections 2.1 to 2.17. Previous environmental assessments conducted at the Site, and summarized in Sections 2.1 to 2.17, have included the following:

***Phase I Environmental Site Assessment, Riedel International's North Portland Yard, 5828 Van Houten Place, Portland, Oregon. Prepared by GeoEngineers, Portland, Oregon. June 24, 1992.***

***Focused Phase II Environmental Site Assessment, Riedel International's North Portland Yard, 5828 Van Houten Place, Portland, Oregon. Prepared by EMCON Northwest, Inc., Portland, Oregon. December 15, 1993.***

***Preliminary Assessment, Riedel Environmental Services--North Portland Yard, 5828 N. Van Houten Place, Portland, Oregon. Prepared by Oregon Department of Environmental Quality. November 14, 1995.***

***Remedial Investigation for Soil, Triangle Park, LLC (North Portland Yard Site), 5828 North Van Houten Place, Portland, Oregon. Prepared by MFA, Vancouver, Washington. June 10, 2002.***

When comparing historical detections to screening levels, the primary screening values used for soil are Joint Source Control Strategy (JSCS) screening level values (SLVs). Secondary screening values are EPA Region 6 residential direct contact human health screening levels (HHSLs). For metals in soil, sample concentrations also are compared to DEQ (2007) or Washington Department of Ecology (WDOE, 1994) suggested default background concentrations for inorganic contaminants. These background concentrations have been accepted by DEQ, but EPA has not yet approved their use on a site-specific basis for the Site.

For groundwater, primary screening values used for comparison purposes are EPA 2004 chronic national recommended water quality criteria or Oregon Department of Environmental Quality (DEQ) 2004 chronic ambient water quality criteria from the JSCS, whichever is more stringent. These screening values are referred to herein collectively as primary groundwater screening values or "PGSVs". Secondary groundwater screening values are EPA Region 6 residential tap water HHSLs.

## **2.1 Area 1A**

A Sakrete concrete and asphalt cold patch manufacturing facility (Building 41) was located in Area 1A. Soap and chemical manufacturing operations also occurred in Area 1A between 1952 and 1963.

In 1992, while conducting a Phase I Environmental Site Assessment (ESA) at the Site, GeoEngineers observed soil staining in two areas along the south side of Building 41. The staining appears to be associated with a compressor and scrap underground storage tanks (USTs) that were no longer in use.

In February 1995, two gasoline USTs (500 and 1,000 gallons) and a 1,500 gallon diesel UST located at the southeast corner of Building 41 were decommissioned by removal (DEQ, 1995). No soil staining or petroleum odors were noted within the tank excavations, however a soil sample collected beneath one end of the 1,000 gallon UST contained diesel fuel and heavy oil at 230 and 380 mg/kg, respectively. The reported concentration was below DEQ's Level II soil matrix cleanup level of 500 mg/kg for the Site (Oregon Administrative Rules [OAR] 340-122-0320). The soil was left in place and the excavation was backfilled.

In 1993, EMCON collected soil samples during the installation of two monitoring wells (MW-1 and MW-2) in Area 1A (EMCON, 1993).

During 1996, 1999, and 2000, one test pit (TP-26) and nine borings (GP-15 through GP-23) were advanced in Area 1A (MFA, 2002). Soil samples were analyzed for metals, volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and petroleum hydrocarbons. PCBs were not detected in any of the soil samples analyzed. Other analytes were detected, and the range of these detections are summarized in Table 2.1 below.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, one surface soil sample (GS-A1-6) was collected in Area 1A. The soil sample was analyzed for dioxins/furans.

All soil detection data from previous site assessment activities (excluding the UST related assessment activities described above) are summarized in Table 2.1 below.

**Table 2.1**  
**Area 1A Soil Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.44 to 0.59 mg/kg)	lead (3.1 to 48 mg/kg)
arsenic (0.66 to 2.7 mg/kg)	nickel (7.2 to 26 mg/kg)
chromium (4.9 to 20 mg/kg)	zinc (25 to 120 mg/kg)
copper (7.9 to 42 mg/kg)	
<b>Detected VOCs Included:</b>	
Methylene chloride (1.6 to 3.1 µg/kg)	toluene (3.5 µg/kg)
tetrachloroethene (PCE) (3 µg/kg)	
<b>Detected PAHs Included:</b>	
acenaphthene (2.8 µg/kg)	chrysene (2.9 to 350 µg/kg)
acenaphthylene (7.5 to 150 µg/kg)	dibenz(a,h)anthracene (7.4 to 50 µg/kg)
anthracene (5.5 to 77 µg/kg)	fluoranthene (5.4 to 420 µg/kg)
benz(a)anthracene (5.7 to 210 µg/kg)	fluorene (6.5 to 13 µg/kg)
Benzo(a)pyrene (7.5 to 490 µg/kg)	indeno(1,2,3-cd)pyrene (7.3 to 380 µg/kg)
Benzo(b)fluoranthene (6.8 to 620 µg/kg)	naphthalene (5.5 to 30 µg/kg)
Benzo(g,h,i)perylene (5.7 to 410 µg/kg)	phenanthrene (6.8 to 160 µg/kg)
Benzo(k)fluoranthene (7.4 to 85 µg/kg)	pyrene (5.3 to 680 µg/kg)
<b>Detected Dioxins/Furans Total TEQ Included:</b>	
2.75 picograms per gram (pg/g)	
<b>Detected Petroleum Hydrocarbons Included:</b>	
gasoline (96 mg/kg)	Heavy oil (69 to 6200 mg/kg)
Diesel (30 mg/kg to 2800 mg/kg)	

Groundwater samples collected from EMCON monitoring wells MW-1 and MW-2 were analyzed for total metals, VOCs, PAHs and petroleum hydrocarbons. Total metals detected in one or both groundwater samples at concentrations exceeding PGSVs include cadmium, copper, lead, and nickel. The only VOC detected in either groundwater sample was 2-butanone at a concentration of 4 µg/L in MW-1. No EPA HHSL has been promulgated for 2-butanone. PAHs were not detected in the two EMCON groundwater samples analyzed. Only diesel (0.066 mg/L) was detected in the groundwater sample collected from monitoring well MW-1. Diesel (0.095 mg/L) and heavy oil (0.431 mg/L) were detected in the groundwater sample collected from monitoring well MW-2. PAHs were not detected in either groundwater sample.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in 22 of the 25 soil samples collected in Area 1A. Only one soil sample yielded a copper concentration exceeding background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all 24 soil samples collected in Area 1A. Only one soil sample yielded a zinc concentration exceeding background concentrations.
- Eighteen soil samples were collected in Area 1A were tested for PAHs. Two PAHs (benzo(g,h,i)perylene and indeno(1,2,3-cd)pyrene) were detected in a single soil sample at concentrations exceeding SLV screening values.
- Nineteen soil samples were collected in Area 1A and tested for petroleum hydrocarbons. Gasoline was detected in only one soil sample. The soil sample was collected at a depth of 0.5 feet bgs in boring GP-19. The concentration detected (96 mg/kg) exceeded the EPA required screening level of 80 mg/kg. Diesel/heavy oil was detected in six soil samples, but concentrations in only two soil samples (from GP-19 and MW-1) exceeded the EPA required screening level of 500 mg/kg.

No other soil contaminant of concern (COC) concentrations exceeded SLVs.

The 2005 ROD did not identify any soil contaminant of concern (COC) concentrations in excess of DEQ acceptable levels in Area 1A. Therefore, the ROD required no capping or removal actions in Area 1A. The DEQ remedial decisions are consistent with the discussion regarding SLV exceedances as the SLVs are merely screening values and not cleanup standards.

## 2.2 Area 1B

Railcar servicing, Riedel Environmental Services (RES) material storage, and Riedel International, Inc., construction and heavy equipment storage occurred in Building 20 of Area 1B (GeoEngineers, 1992).

In 1995, three monitoring wells were installed in the northwest portion of the Site by Geraghty and Miller (G&M). One of these wells (E-MW-1 on Figure 4) is located in Area 1B. A copy of the G&M report containing information regarding sampling data from E-MW-1 has not been made available to AMEC or the DEQ.

During 1996, 1999, and 2000 three borings (GP-12 through GP-14) were advanced in Area 1B (MFA, 2002). In addition, a fourth Geoprobe boring location (SS-8) is shown in the MFA RI report figures as an additional exploration location. However, no discussion of this exploration point or the data collected from it could be found in the reports reviewed. Soil samples from GP-12 through GP-14 were analyzed for metals, VOCs, PCBs, PAHs, and petroleum hydrocarbons. Antimony, cadmium, PCBs, and petroleum hydrocarbons were not detected in any of the soil samples analyzed.

All soil detection data from previous site assessment activities are summarized in Table 2.2 below.

**Table 2.2**  
**Area 1B Soil Analytical Results Summary**

<b>Detected Metals Included:</b>	
arsenic (1.0 to 2.0 mg/kg)	lead (2.6 to 21 mg/kg)
chromium (5.9 to 8.6 mg/kg)	nickel (8.3 to 11 mg/kg)
copper (9.1 to 15 mg/kg)	zinc (25 to 40 mg/kg)
<b>Detected VOCs Included:</b>	
methylene chloride (2 µg/kg)	PCE (12 µg/kg)
<b>Detected PAHS Included:</b>	
acenaphthylene (0.72 to 2.8 µg/kg)	chrysene (0.87 to 7.2 µg/kg)
anthracene (0.58 to 0.68 µg/kg)	dibenzo(a,h)anthracene (0.95 µg/kg)
benz(a)anthracene (0.62 to 5.7 µg/kg)	fluoranthene (0.64 to 8.3 µg/kg)
benzo(a)pyrene (0.44 to 8.8 µg/kg)	indeno(1,2,3-cd)pyrene (1.3 to 5.9 µg/kg)
benzo(b)fluoranthene (1.6 to 13 µg/kg)	naphthalene (0.61 to 1.1 µg/kg)
benzo(g,h,i)perylene (1.7 to 5.8 µg/kg)	phenanthrene (0.7 to 1.4 µg/kg)
benzo(k)fluoranthene (1.6 µg/kg)	pyrene (0.7 to 10 µg/kg)

A single groundwater sample reportedly was collected from monitoring well E-MW-1. Geraghty and Miller reportedly provided a verbal report to the DEQ that PAHs were detected in groundwater at concentrations exceeding Safe Drinking Water Act Maximum Contaminant Levels (MCLs) in E-MW-1.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in five of the six soil samples collected in Area 1B. None of the soil samples yielded a copper concentration exceeding background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all six soil samples collected in Area 1B. None of the soil samples yielded a zinc concentration exceeding background concentrations.

No other soil COC concentrations exceeded SLVs.

The ROD did not identify any areas where COC concentrations exceeded acceptable levels in Area 1B. Therefore, the ROD required no capping or removal actions in Area 1B. The ROD remedy decision is consistent with the discussion regarding SLV exceedances above as SLVs are screening tools and not cleanup standards.

## **2.3 Area 1C**

Railcars were loaded with treated logs from the McCormick and Baxter Creosoting Company adjacent to Area 1C (GeoEngineers, 1992).

During 1999 and 2000, three borings (GP-130 through GP-132) were advanced in Area 1C (MFA, 2002). Soil samples from the borings were analyzed for metals, PAHs, PCBs, and petroleum hydrocarbons. Antimony and PCBs were not detected in the soil samples analyzed.

All soil detections from previous site assessment activities are summarized in Table 2.3 below.

**Table 2.3**  
**Area 1C Soil Analytical Results Summary**

<b>Detected Metals Included:</b>	
arsenic (2.1 to 3.6 mg/kg)	lead (4.8 to 27 mg/kg)
cadmium (2.8 to 5.5 mg/kg)	nickel (11 to 90 mg/kg)
chromium (10 to 36 mg/kg)	zinc (36 to 83 mg/kg)
copper (10 to 34 mg/kg)	
<b>Detected PAHs Included:</b>	
benz(a)anthracene (30 to 62 µg/kg)	fluoranthene (50 to 71 µg/kg)
benzo(a)pyrene (48 to 60 µg/kg)	indeno(1,2,3-cd)pyrene (38 µg/kg)
benzo(b)fluoranthene (58 to 77 µg/kg)	phenanthrene (34 to 71 µg/kg)
benzo(g,h,i)perylene (30 to 42 µg/kg)	pyrene (48 to 120 µg/kg)
chrysene (36 to 230 µg/kg)	
<b>Detected Petroleum Hydrocarbons Included:</b>	
motor oil (83 mg/kg)	

No historical groundwater samples were collected in Area 1C.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in eight of the nine soil samples collected in Area 1C. None of the soil samples yielded a copper concentration exceeding background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all six soil samples collected in Area 1C. None of the soil samples yielded a zinc concentration exceeding background concentrations.
- Nickel was detected in Area 1C at a concentration (90 µg/kg) exceeding SLVs and background in only one of the nine soil samples analyzed.

No other soil COC concentrations exceeded SLVs.

The ROD did not identify any areas where COC concentrations exceeded acceptable levels in Area 1C. Therefore, the ROD required no capping or removal actions in Area 1C. The ROD remedial decision is consistent with the discussion regarding SLV exceedances above, as SLVs are screening tools and not cleanup standards.

## 2.4 Area 2A

A Portland General Electric (PGE) steam plant, a wood processing facility, paint and solvent storage, and USTs were located near Building 11 of Area 2A. Underground storage tanks related to the PGE steam plant were located south of Building 11 (GeoEngineers, 1992).

During 1999 and 2000, one boring (GP-134) was advanced in Area 2A (MFA, 2002) south of the PGE steam plant. A single soil sample collected from the boring was analyzed for petroleum hydrocarbons. Detected petroleum hydrocarbons in the sample included diesel (100 mg/kg) and motor oil (220 mg/kg).

During 1996, MFA collected a groundwater sample from a single boring GP-1C located in Area 2A. The groundwater sample was analyzed for petroleum hydrocarbons, VOCs and PAHs. Detected petroleum hydrocarbons included diesel at a concentration of 17 mg/L. VOCs detected in the sample included 1,1-dichloroethane (3 µg/L) and carbon disulfide, neither of which exceeded EPA Region 6 HHSLs for residential water. PAHs were not detected in the groundwater sample.

The ROD did not identify any areas where COC concentrations exceeded acceptable levels in Area 2A. Therefore, the ROD required no capping or removal actions in Area 2A. The concentrations of TPH detected in boring GP-134 did not exceed the EPA required screening level of 500 mg/kg for diesel/heavy oil.

## 2.5 Area 2B

Area 2B has been the site of a concrete batch plant and truck weighing station (Building 3), waste oil and spent solvent drum storage area (Building 19), and USTs.

In 1992, while conducting a Phase I ESA at the Site, GeoEngineers observed soil staining around drums stored outside Building 19, and near a waste oil tank near Building 8 (GeoEngineers, 1992).

In March 1993, two 8,000 gallon gasoline USTs were removed from Area 2B. TPH was not detected in a soil collected from the floor of the excavation, and the cavity was backfilled with clean fill and concrete chunks. Diesel was detected in soil excavated from the cavity at levels below soil matrix cleanup levels, and excavated soil was spread thinly across the surface of the Site (EMCON, 1995). Also in 1993, one boring (SB-15) was advanced in Area 2B (EMCON, 1993). A single soil sample collected at a depth of 15 feet in boring SB-15 was tested for petroleum hydrocarbons, VOCs and PAHs.

During 1996, 1999 and 2000, five test pits (TP-1, TP-2, TP-3, TP-4, and TP-6) and 20 borings (GP-24 through GP-40, GP-133, GP-135, and GP-174) were advanced in Area 2B (MFA, 2002). Soil samples collected from these exploration locations were analyzed for one or more of the following analyte groups: metals, VOCs, PAHs, PCBs, SVOCs, and petroleum hydrocarbons. SVOCs were not detected in any of the soil samples analyzed.

In 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, 11 borings (DP-A2-01 through DP-A2-11) were advanced in Area 2B. Soil samples collected from these borings were analyzed for one or more of the following analytes/analyte groups: PAHs, lead, arsenic, and petroleum hydrocarbons.

All soil detection data showing detections from previous site assessment activities are summarized in Table 2.5 below.

**Table 2.5**  
**Area 2B Soil Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.24 to 4.2 mg/kg)	copper (10 to 110 mg/kg)
arsenic (0.79 to 5.4 mg/kg)	lead (3.1 to 4,260 mg/kg)
beryllium (0.12 to 0.58 mg/kg)	nickel (7.3 to 26 mg/kg)
cadmium (0.24 to 0.56 mg/kg)	zinc (23 to 120 mg/kg)
chromium (5.5 to 91 mg/kg)	
<b>Detected VOCs Included:</b>	
1,2,4-trimethylbenzene (13,000 µg/kg)	methylene chloride (1.4 to 3.8 µg/kg)
1,3,5-trimethylbenzene (2,200 µg/kg)	n-butylbenzene (960 µg/kg)
4-isopropyltoluene (2,500 µg/kg)	n-propylbenzene (540 µg/kg)
chloromethane (3 to 8.5 µg/kg)	naphthalene (340 µg/kg)
dichlorodifluoromethane (19 µg/kg),	o-xylene (110 µg/kg)
ethylbenzene (610 µg/kg)	sec-butylbenzene (1,300 µg/kg)
isopropylbenzene (210 µg/kg)	toluene (1.4 to 1.5 µg/kg)
m,p-xylenes (1,700 µg/kg),	Trichlorofluoromethane (5 µg/kg)
<b>Detected PAHs Included:</b>	
acenaphthene (1,100 µg/kg)	chrysene (4.5 to 130 µg/kg)
Acenaphthylene (5.2 to 24 µg/kg)	dibenz(a,h)anthracene (4.2 to 6.1)
anthracene (4.2 to 72 µg/kg)	fluoranthene (5.1 to 280 µg/kg)
benz(a)anthracene (4.1 to 190 µg/kg)	fluorene (4.7 to 5600 µg/kg)
benzo(a)pyrene (4.3 to 160 µg/kg)	indeno(1,2,3-cd)pyrene (3.9 to 59 µg/kg)
benzo(b)fluoranthene (6.5 to 170 µg/kg)	naphthalene (3.3 to 1,600 µg/kg)
benzo(g,h,i)perylene (3.8 to 56 µg/kg)	phenanthrene (4 to 7,100 µg/kg)
benzo(k)fluoranthene (3.9 to 75 µg/kg)	pyrene (5.6 to 320 µg/kg)
<b>Detected PCBs Included:</b>	
Aroclor 1254 (0.11 mg/kg)	
<b>Detected Petroleum Hydrocarbons Included:</b>	
No. 2 diesel (22 to 26,000 mg/kg)	motor oil (70 to 3,000 mg/kg)
gasoline (91 to 3,200 mg/kg)	

A single groundwater sample was collected by EMCON from SB-15 in 1993. The sample was tested for petroleum hydrocarbons, VOCs and PAHs. Detected petroleum hydrocarbons included petroleum hydrocarbons quantified using 30-weight motor oil as a standard (9.9 mg/L). Because the petroleum hydrocarbons detected were not within the carbon range of the calibration standard, the detected concentration should be considered approximate. VOCs detected in the sample included 1,1-dichloroethane (4.6 µg/L), tetrachloroethene (PCE) (1.0 µg/L) and 1,1,1-trichloroethane (5.1 µg/L). Only PCE exceeded EPA HHSLs. Multiple PAHs were detected in the groundwater sample, and four were detected at concentrations exceeding HHSLs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene).

Two groundwater samples were collected by MFA from boring GP-2C and GP-3C in 1996. Both samples were tested for VOCs and PAHs. No PAHs were detected in either groundwater sample. Three different VOCs were detected in the two samples, but none at concentrations exceeding HHSLs.

A single groundwater sample also was collected from monitoring well A2-MW-3, installed by AMEC in November 2005. This well was installed, along with four other wells, by AMEC as part of a Phase II ESA conducted at the Site. The results of groundwater tests for the other four wells are described in the report subsection that corresponds with the specific Area location of each well. The sample from AMEC monitoring wells A2-MW-3 was analyzed for diesel and heavy oil range hydrocarbons, VOCs, arsenic, lead, and PAHs. None of the analytes tested were detected in the groundwater sample.

A comparison of previously recorded soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in 34 of the 35 soil samples collected in Area 2B. Only three soil samples yielded a copper concentration exceeding background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all 35 soil samples collected in Area 2B. Only one soil sample yielded a zinc concentration exceeding background concentrations.
- Lead was detected at concentrations exceeding SLVs in 4 of the 54 soil samples collected in Area 2B. These soil samples included TP-1 (two samples), TP-4, and GP-174.

- Cadmium was detected at concentrations exceeding SLVs in 6 of the 35 soil samples collected in Area 2B. However, none of the soil samples yielded concentrations exceeding the background concentration.
- A total of 34 soil samples in Area 2B were tested for PAHs. Only the sample from boring GP-37 recorded concentrations exceeding SLV screening values for four PAHs (acenaphthene, fluorene, naphthalene and phenanthrene).
- PCBs (Aroclor 1254) was detected in one (GP-27) of the 30 soil samples collected in Area 2B. The concentration detected (0.11 mg/kg) exceeded the SLV. No other PCBs were detected.
- A total of 30 soil samples in Area 2B were tested for gasoline. Gasoline was detected in two soil samples: one from boring GP-36, and one from boring GP-37. Gasoline concentrations in both samples exceeded the EPA required screening level of 80 mg/kg. A total of 47 soil samples in Area 2B were tested for diesel/heavy oil. Diesel/heavy oil was detected in 16 soil samples, and concentrations in seven soil samples exceeded the EPA required screening level of 500 mg/kg.

No other soil COC concentrations exceeded SLVs.

The ROD identified three areas where COC concentrations exceeded acceptable levels in Area 2B. A brief description of each of these areas is provided below.

**Area A2-1** - Borings in which elevated COC concentrations were detected defining this area of contamination include GP-37, GP-133, GP-135, DP-A2-01 and DP-A2-02. Petroleum hydrocarbons exceed screening levels, and PAHs exceed SLVs (GP-37 only) in this area. Removal of contaminated soil in this area was stipulated in the ROD.

**Area A2-2** - Petroleum hydrocarbons in GP-36 define this area of contamination. Only in GP-36 do petroleum hydrocarbons exceed screening levels. Capping of contaminated soil in this area was stipulated in the ROD.

**Area A2-3** - Lead in test pit TP-1 defines this area of contamination. Only in TP-1 does lead exceed SLVs. Removal of contaminated soil in this area was stipulated in the ROD.

The discussion regarding SLV exceedances above, and the discussion regarding areas where the ROD required mitigation (either removal or capping), are consistent as SLVs are investigative screening tools and not DEQ or EPA cleanup standards.

## 2.6 Area 3A

PCB transformer cleaning and storage, RES chemical storage, heavy equipment storage, and explosives storage occurred near Building 2 in Area 3A. Scattered petroleum soil staining has been observed northeast of Building 2. In 1984, PCB contaminated soil was removed east of Building 2 (see "PCB cleanup" in Figure 6) (GeoEngineers, 1992). Reportedly, PCB spills occurred near Building 2, although copies of the reported releases of PCBs cannot be located by DEQ (DEQ, 1995).

In 1993, EMCON collected a soil sample from boring SB-16 located in Area 3A (EMCON, 1993).

During 1996, 1999, and 2000, three test pits (TP-7, TP-8, and TP-15) and 12 borings (GP-44 through GP-52, GP-137, GP-139, GP-142) were advanced in Area 3A (MFA, 2002). Soil samples from the borings were analyzed for one or more of the following analytes: metals, VOCs, PAHs, PCBs, SVOCs, dioxins/ furans, and petroleum hydrocarbons. SVOC were not detected in any of the samples analyzed.

All soil detection data from previous site assessment activities are summarized in Table 2.6 below.

**Table 2.6**  
**Area 3A Analytical Results Summary**

<b>Detected Metals Included:</b>	
arsenic (1.0 to 2.1 mg/kg)	lead (3.3 to 16 mg/kg)
chromium (6 to 9.6 mg/kg)	nickel (2.9 to 7.6 mg/kg)
copper (8.7 to 19 mg/kg)	zinc (27 to 43 mg/kg)
<b>Detected VOCs Included:</b>	
methylene chloride (1.7 to 4.4 µg/kg)	
<b>Detected PAHs Included:</b>	
2-methylnaphthalene (9.4 µg/kg)	benzo(k)fluoranthene (6.5 to 6.9 µg/kg)
benz(a)anthracene (5.6 µg/kg)	chrysene (5.3 to 6.5 µg/kg)
benzo(a)pyrene (3.4 to 7.4 µg/kg)	fluorene (11 µg/kg)
benzo(b)fluoranthene (4.3 to 9 µg/kg)	phenanthrene (13 µg/kg)
benzo(g,h,i)perylene (6 µg/kg)	pyrene (7 µg/kg)
<b>Detected PCBs Included:</b>	
Aroclor 1260 (0.52 mg/kg)	
<b>Detected Dioxins/Furans Total TEQ Included:</b>	
0.79 pg/g	
<b>Detected Petroleum Hydrocarbons Included:</b>	
No. 2 diesel (960 mg/kg)	
motor oil (64 to 1,400 mg/kg)	

In 1993, one groundwater sample was collected from boring SB-16 in Area 3A (EMCON, 1993). The groundwater sample was analyzed for VOCs and total petroleum hydrocarbons. VOCs were not detected in the groundwater sample. Detected petroleum hydrocarbons were quantified (8.3 mg/L) using 30-weight motor oil as a calibration standard. Because the petroleum hydrocarbons detected were not within the carbon range of the calibration standard, the detected concentration should be considered approximate.

In 1996, a groundwater sample was collected by MFA in boring GP-9B (MFA, 2002). It was tested for total metals, petroleum hydrocarbons, and PAHs. Nickel was detected in the sample at a concentration of 163 µg/L, exceeding the PGSV of 16 µg/L. Diesel and heavy oil were detected in the sample at concentrations of 26 mg/L and 2.73 mg/L, respectively. PAHs were not detected in the sample, but detection limits were elevated above SLVs.

A single groundwater sample also was collected from monitoring well MW-A3-4, installed by AMEC in November 2005. This well was installed, along with four other wells, by AMEC as part of a Phase II ESA conducted at the Site. The results of groundwater tests for each AMEC well are described in the report subsection that corresponds with the Area location of each well. The MW-A3-4 sample was analyzed for diesel and heavy oil range hydrocarbons, VOCs, arsenic, lead, and PAHs. Lead, VOCs, and PAHs were not detected in the groundwater sample. Arsenic was detected at a concentration of 3.97 µg/L. Detected petroleum hydrocarbons included diesel at a concentration of 1.26 mg/L.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in seven of the 10 soil samples collected in Area 3A. None of the copper concentrations detected exceeded background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all 10 soil samples collected in Area 3A. None of the zinc concentrations detected exceeded background concentrations.
- A total of 23 soil samples in Area 3A were tested for diesel/heavy oil. Diesel/heavy oil was detected in 3 soil samples, and concentrations in one soil sample (GP-139) exceeded the EPA required screening level of 500 mg/kg.

No other soil COC concentrations exceeded SLVs.

The ROD did not identify any areas where COC concentrations exceeded acceptable levels in Area 3A. Therefore, the ROD required no capping or removal actions in Area 3A. The DEQ ROD cleanup decisions are consistent with the discussion regarding SLV exceedances above, as SLVs are intended for use as screening tools, not cleanup standards.

## **2.7 Area 3B**

Heavy equipment storage occurred in Area 3B (GeoEngineers, 1992).

During 1996, 1999, and 2000, one test pit (TP-5) was completed and five borings (GP-41 through GP-43, GP-136) were advanced in Area 3B (MFA, 2002). Soil samples from the borings were analyzed for one or more of the following: metals, VOCs, PAHs, PCBs, SVOCs, and petroleum hydrocarbons. Neither PCBs nor SVOCs were detected in any of the soil samples analyzed.

All soil detection data from previous site assessment activities are summarized in Table 2.7 below.

**Table 2.7**  
**Area 3B Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.57 mg/kg)	lead (2.8 to 31 mg/kg)
arsenic (0.78 to 2 mg/kg)	nickel (15 mg/kg)
chromium (5.7 to 14 mg/kg)	and zinc (26 to 44 mg/kg)
copper (12 to 31 mg/kg)	
<b>Detected VOCs Included:</b>	
chloromethane (3.3 to 6.9 µg/kg)	n-butylbenzene (59 µg/kg)
ethylbenzene (1.7 to 5.8 µg/kg)	o-xylene (25 µg/kg)
isopropylbenzene (5.9 µg/kg)	sec-butylbenzene (170 µg/kg)
methylene chloride (1.9 to 77 µg/kg)	
<b>Detected PAHs Included:</b>	
anthracene (600 µg/kg)	fluorene (390 to 1,900 µg/kg)
benz(a)anthracene (1,200 µg/kg)	indeno(1,2,3-cd)pyrene (4.6 µg/kg)
benzo(g,h,i)perylene (4.7 µg/kg)	naphthalene (4.2 µg/kg)
chrysene (38 µg/kg)	phenanthrene (4.5 to 500 µg/kg)
fluoranthene (4.7 µg/kg)	pyrene (5.6 to 600 µg/kg)
<b>Detected Petroleum Hydrocarbons Included:</b>	
No. 2 diesel (36 to 16,000 mg/kg)	kerosene (4,000 to 9,400 mg/kg)
gasoline (150 to 260 mg/kg)	motor oil (92 to 23,000 mg/kg)

A single groundwater sample was collected from monitoring well MW-A3-5, installed by AMEC in November 2005. This well was installed, along with four other wells, by AMEC as part of a Phase II ESA conducted at the Site. The results of groundwater tests for each AMEC well are described in the report subsection that corresponds with the Area location of each well. The MW-A3-5 sample was analyzed for diesel and heavy oil range hydrocarbons, VOCs, arsenic, lead, and PAHs. Lead and PAHs were not detected in groundwater. Diesel was detected at a concentration of 4.07 mg/L, and arsenic at a concentration of 4.06 µg/L. The only VOC detected was tert-butylbenzene at a concentration of 1.19 µg/L.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in all nine of the soil samples collected in Area 3B. None of the copper concentrations detected exceeded background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all nine of the soil samples collected in Area 3B. None of the zinc concentrations detected exceeded background concentrations.
- A total of nine Area 3B soil samples were tested for PAHs. PAHs were detected in five of the samples. Benzo(a)anthracene and fluorene were detected in a single soil sample (collected at a depth of 7 feet in boring GP-41) at concentrations exceeding SLV screening values.
- A total of 10 soil samples Area 3B were tested for gasoline. Gasoline was detected in two soil samples: one from boring GP-41 and one from boring GP-43. Gasoline concentrations in both samples exceeded the EPA required screening level of 80 mg/kg. A total of 12 soil samples collected in Area 3B were tested for diesel and heavy oil range petroleum hydrocarbons. Diesel and/or heavy oil were detected in six soil samples. Concentrations in three soil samples, one from boring GP-41 and two from GP-43, exceeded the EPA required screening level of 500 mg/kg.

No other soil COC concentrations exceeded SLVs.

The ROD did not identify any areas where COC concentrations exceeded acceptable levels in Area 3B. Therefore, the ROD required no capping or removal actions in Area 3B. The DEQ ROD cleanup decisions are consistent with the discussion regarding SLV exceedances above, as SLVs are intended for use as screening tools, not cleanup standards.

## 2.8 Area 4

Currently, a Chevron pump station that provides jet fuel to the Portland International Airport from the Chevron bulk fuel terminal across the Willamette River is located in the southern corner of Area 4. A Chevron fuel pipeline related to the pump station runs along the southern boundary of the Site. Historically, heavy container box storage, heavy equipment storage (GeoEngineers, 1992), and sandblasting (EMCON, 1993) have occurred in Area 4. In 1992 during completion of a Phase I ESA, soil staining was observed around some equipment and storage containers (GeoEngineers, 1992).

In February 1993, two surface soil samples (SS-3 and SS-4) were collected in a former sandblasting area located in Area 4, and were analyzed for metals. In October 1993, four additional surface soil samples (SS-A through SS-D) were collected in the sandblasting area. These samples were gridded composite samples, and also were tested for metals (EMCON, 1993).

During 1996, 1999, and 2000, three test pits (TP-10, TP-11, and TP-14) and 12 borings (GP-53, GP-55, GP-56, GP-60, GP 64 through GP-66, GP-68, and GP-70 through GP-72, GP-144) were advanced in Area 4 (MFA, 2002). Soil samples were analyzed for one or more of the following: metals, VOCs, PAHs, PCBs, SVOCs, and petroleum hydrocarbons.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, soil samples collected from six borings (DP-A4-23 through DP-A4-28) were tested for PAHs. Two surface soil samples (GS-A4-4 and GS-A4-5) were collected in Area 4 and tested for dioxins/furans.

All soil detection data from previous site assessment activities area summarized in Table 2.8 below.

**Table 2.8**  
**Area 4 Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.77 mg/kg to 84 mg/kg)	lead (2.9 to 786 mg/kg)
arsenic (0.89 to 303 mg/kg)	nickel (11 to 68 mg/kg)
chromium (7.9 to 110 mg/kg)	zinc (32 to 9,700 mg/kg)
copper (11 to 3140 mg/kg)	cadmium (1 and 3 mg/kg)
<b>Detected VOCs Included:</b>	
1,2,4-trimethylbenzene (0.43 µg/kg)	naphthalene (0.58 µg/kg)
chloromethane (1.7 to 21 µg/kg)	tert-butylbenzene (3 µg/kg)
dichlorodifluoromethane (0.39 to 9.1 µg/kg)	toluene (0.43 to 2.2 µg/kg)
m,p-xylenes (0.72 µg/kg)	trichlorofluoromethane (1.4 µg/kg)
methylene chloride (0.44 µg/kg)	
<b>Detected PAHs Included:</b>	
1-methylnaphthalene (80 and 400 µg/kg)	benzo(k)fluoranthene (6.9 to 240 µg/kg)
2-methylnaphthalene (9.1 to 610 µg/kg)	chrysene (7.3 to 460 µg/kg)
acenaphthene (15 to 70 µg/kg)	dibenzo(a,h)anthracene (3.7 to 9.2 µg/kg)
acenaphthylene (5.6 to 50 µg/kg)	fluoranthene (8.5 to 510 µg/kg)
anthracene (5.6 to 100 µg/kg)	fluorene (5.7 to 210 µg/kg)
benzo(a)anthracene (8.2 to 270 µg/kg)	indeno(1,2,3-cd)pyrene (9.4 to 140 µg/kg)
benzo(a)pyrene (9.2 to 180 µg/kg)	naphthalene (4.9 to 290 µg/kg)
benzo(b)fluoranthene (6.2 to 240 µg/kg)	phenanthrene (7.8 to 510 µg/kg)
benzo(g,h,i)perylene (6.1 to 140 µg/kg)	pyrene (9.5 to 400 µg/kg)
<b>Detected Dioxins/Furans Total TEQ Included:</b>	
2.9 to 37.7 pg/g	
<b>Detected Petroleum Hydrocarbons Included:</b>	
diesel (22 to 230 mg/kg)	motor oil (68 to 1,100 mg/kg)
kerosene (2,900 mg/kg)	

In 1996, MFA collected three groundwater samples in Area 4 at Geoprobe borings GP-6M-22, GP-5M-22, and GP-7M-26. Groundwater samples were analyzed for metals, petroleum hydrocarbons, VOCs and PAHs. Nickel was detected in a single groundwater sample (GP-6M-22) at a concentration exceeding PGSLs. The VOCs tert-butylbenzene and sec-butylbenzene were detected in GP-6M-22 and GP-7M-26 at

concentrations below EPA HHSLs. The PAHs fluorene and phenanthrene were detected in GP-6M-22 at concentrations of 2 and 5 µg/L, below EPA HHSLs. Diesel was detected at concentrations of 17.9 and 12.7 mg/L in borings GP-6M-22 and GP-7M-26, respectively. Heavy oil was detected at a concentration of 5.43 mg/L in GP-6M-22.

In April 2005, DEQ installed eight monitoring wells (MW-1 through MW-8) along the waterfront of the Site. One of these wells (MW-8) is located in Area 4. Groundwater monitoring events including all eight wells were conducted on April 14, 2005, July 20-21, 2005, and November 7-8, 2005. During the initial monitoring event, groundwater samples were tested for gasoline, diesel and heavy oil, VOCs, PAHs, metals, and PCBs. The July and November monitoring events included testing for PAHs and metals only. Diesel was detected at a concentration of 0.257 mg/L in MW-8 during the initial monitoring event. PCBs, VOCs, and PAHs were not detected in MW-8 groundwater samples collected during the three monitoring events. Metals were detected in groundwater, but not at concentrations exceeding PGSLs. The results of testing of groundwater samples collected from other DEQ monitoring wells are described in the report subsection that corresponds with the location of each well.

In November 2005, AMEC collected groundwater samples from monitoring wells MW-A4-1 and MW-A4-2 in Area 4. These two wells were installed, along with three other wells, by AMEC as part of a Phase II ESA conducted at the Site. The results of testing of groundwater in the other three wells are described in the report subsection that corresponds with the location of each well. The groundwater samples collected from MW-A4-1 and MW-A4-2 were analyzed for arsenic, lead, VOCs, PAHs, and petroleum hydrocarbons. Lead was not detected in groundwater, and arsenic was detected at concentrations (6.36 and 20.9 µg/L) below the its PGSL of 150 µg/L. The PAH phenanthrene was detected in MW-A4-2 at a concentration of 0.199 µg/L. In MW-A4-2, the VOCs sec-butylbenzene and tert-butylbenzene were detected at concentrations of 1.13 and 1.5 µg/L, respectively, below the EPA HHSL of 61 µg/L for sec- and tert-butylbenzene. Diesel was detected at concentrations of 0.249 and 4.03 mg/L in MW-A4-1 and MW-A4-2, respectively.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in all 15 soil samples collected in Area 4. Only two of the copper concentrations (SS-3 and SS-4) exceeded background concentrations.

- Zinc was detected at concentrations exceeding SLVs all 14 soil samples collected in Area 4. Only two of the zinc concentrations (SS-3 and SS-4) exceeded background concentrations.
- Lead was detected at concentrations exceeding SLVs in two soil samples (SS-3 and SS-4) in Area 4.
- Arsenic was detected at concentrations exceeding SLVs in two soil samples (SS-3 and SS-4) collected in Area RS-3.
- Cadmium was detected at concentrations exceeding SLVs in one soil sample (SS-4) collected in Area RS-3.
- Nickel was detected at concentrations exceeding SLVs in a single soil sample (SS-3) in Area 4.
- A total of 32 soil samples in Area 4 were tested for PAHs. A single PAH (indeno(1,2,3-c,d)pyrene) was detected above SLVs in boring DP-A4-23.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD did not identify any areas where COC concentrations exceeded DEQ acceptable levels in Area 4. Therefore, the ROD required no capping or removal actions in Area 4. The DEQ ROD cleanup decisions are consistent with the discussion regarding SLV exceedances above, as SLVs are intended for use as screening tools, not cleanup standards.

## 2.9 Area RS-3

Area RS-3 is located between Area 4 and the Willamette River. Historical Site use in Area RS-3 is similar to historical Site use in Area 4.

In February 1993, EMCON collected surface soil samples SS-2 and SS-5 in Area RS-3 (EMCON, 1993) to explore a former sandblasting area. The soil samples were analyzed for metals.

During 1999 and 2000, three test pits (TP-9, TP-12, and TP-13) and 16 borings (GP-54, GP-57 through GP-59, GP-61 through GP-63, GP-67, GP-69, GP-73, GP-143, GP-145 through GP-148, GP-149) were advanced in Area RS-3 (MFA, 2002). Soil samples collected from these borings were analyzed for one or more of the following: metals, VOCs, PAHs, and petroleum hydrocarbons.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, 14 borings (DP-A4-12 through DP-A4-22, DP-A4-29 through DP-A4-31) were advanced in Area 4. Soil samples collected from these borings were analyzed for one or more of the following: PCBs, PAHs, and petroleum hydrocarbons.

All soil detection data from previous site assessment activities are summarized in Table 2.9 below.

**Table 2.9**  
**Area RS-3 Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.63 to 35 mg/kg)	lead (6.1 to 256 mg/kg)
arsenic (0.91 to 13 mg/kg)	magnesium (6,800 to 11,000 mg/kg)
cadmium (1 mg/kg)	nickel (16 to 140 mg/kg)
chromium (14 to 71 mg/kg)	zinc (53 to 370 mg/kg)
copper (12 to 560 mg/kg)	
<b>Detected VOCs Included:</b>	
Chloromethane (1.6 to 26 µg/kg)	methylene chloride (0.4 to 2.9 µg/kg)
<b>Detected PAHs Included:</b>	
2-methylnaphthalene (4.1 to 240 µg/kg)	chrysene (4.3 to 2,000 µg/kg)
Acenaphthene (4 to 97 µg/kg)	dibenzo(a,h)anthracene (6.4 µg/kg)
acenaphthylene (2.9 to 57 µg/kg)	fluoranthene (3.4 to 1,300 µg/kg)
anthracene (4.9 to 450 µg/kg)	fluorene (5.3 to 55 µg/kg)
benzo(a)anthracene (5.3 to 940 µg/kg)	indeno(1,2,3-cd)pyrene (28 to 380 µg/kg)
benzo(a)pyrene (19 to 710 µg/kg)	naphthalene (3.2 to 820 µg/kg)
benzo(b)fluoranthene (5.8 to 950 µg/kg)	phenanthrene (4.9 to 540 µg/kg)
benzo(g,h,i)perylene (25 to 310 µg/kg)	pyrene (0.64 to 1,200 µg/kg)
benzo(k)fluoranthene (4.8 to 1,000 µg/kg)	
<b>Detected Petroleum Hydrocarbons Included:</b>	
diesel (21 to 860 mg/kg)	oil (110 and 130 mg/kg)
gasoline (19 and 24 mg/kg)	motor oil (82 to 1,600 mg/kg)

Three (MW-5, MW-6, and MW-7) of the eight DEQ monitoring wells installed along the Site waterfront are located in Area RS-3. Groundwater monitoring events including all eight wells were conducted on April 14, 2005, July 20-21, 2005, and November 7-8, 2005. During the initial monitoring event, groundwater samples were tested for gasoline, diesel and heavy oil, VOCs, PAHs, metals, and PCBs. The July and November monitoring events included testing for PAHs and metals only. Petroleum hydrocarbons were not detected in monitoring wells MW-5 or MW-6 during the initial monitoring event. Diesel was detected at a concentration of 0.815 mg/L in MW-7 during the initial monitoring event. PCBs and VOCs were not detected in any of the three monitoring wells during the initial monitoring event. PAHs were detected in groundwater samples collected from monitoring wells MW-6 and MW-7, but not at concentrations exceeding EPA HSLs. Copper, lead and zinc were detected in groundwater samples from all three monitoring wells on at least one occasion at a concentration exceeding PGSLs.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in all eight of the soil samples collected in Area RS-3. Only two of the copper concentrations (SS-2 and SS-5) exceeded background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all five of the soil samples collected in Area RS-3. Two of the zinc concentrations (SS-2, and SS-5) exceeded background concentrations.
- Lead was detected at concentrations exceeding SLVs in three soil samples (TP-13, SS-2, and SS-5) collected in Area RS-3.
- Nickel was detected at concentrations exceeding SLVs in two soil samples (SS-2 and SS-5) collected in Area RS-3.
- A total of 29 soil samples in Area RS-3 were tested for PAHs. Indeno(1,2,3-c,d)pyrene was detected in three soil samples (from borings GP-63, GP-73, and DP-A4-17), benzo(g,h,i)perylene was detected in one soil sample (from boring DP-A4-17), chrysene was detected in one soil sample (from boring DP-A4-17), and naphthalene was detected in one soil sample (from boring GP-143) at concentrations exceeding SLV screening values.

- A total of 23 soil samples in Area RS-3 were tested for gasoline. Gasoline was detected in two soil samples. None of the gasoline concentrations exceeded the EPA required screening level of 80 mg/kg. A total of 39 soil samples in Area RS-3 were tested for diesel/heavy oil. Diesel/heavy oil was detected in 20 soil samples, but concentrations in only three soil samples (from boring GP-73, DP-A5-40, and TP-13) exceeded the EPA required screening level of 500 mg/kg.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD identified six areas where soil COC concentrations exceeded acceptable levels in Area RS-3. A brief description of each of these areas is provided below.

**Area A4-4** - Petroleum hydrocarbons in test pit TP-13 define this area of contamination. Only in TP-13 do petroleum hydrocarbons exceed screening levels. Capping of contaminated soil in this area was stipulated in the ROD.

**Area A4-5** - PAHs in borings GP-149 and DP-A4-17, and PCBs (Aroclor 1260) in boring GP-73 define this area of contamination. Both PAHs and PCBs exceed SLVs. Removal of contaminated soil in this area was stipulated in the ROD.

**Area A4-6** - Petroleum hydrocarbons and PCBs (Aroclor 1260) in boring GP-63 define this area of contamination. Only in GP-63 do petroleum hydrocarbons exceed screening levels and PCBs exceed SLVs. Capping of contaminated soil in this area is stipulated in the ROD.

**Area A4-7** - Petroleum hydrocarbons in boring GP-61 define this area of contamination. Only in GP-61 do petroleum hydrocarbons exceed screening levels. Capping of contaminated soil in this area is stipulated in the ROD.

**Area A4-8** - A single PAH (indeno(1,2,3-c,d)pyrene) exceeds SLVs in borings GP-59, GP-143, and DP-A4-23 and defines this area of contamination. The ROD stipulates soil removal in the GP-59 area and capping in the GP-143 area.

**Area A4-9** - Petroleum hydrocarbons in boring GP-58 define this area of contamination. Only in GP-58 do petroleum hydrocarbons exceed screening levels. Capping of contaminated soil in this area is stipulated in the ROD.

## 2.10 Area 5A

Area 5A has been the site of a single 10,000-gallon diesel UST located between Building 31 and Building 37 (see additional info below), and drum and oil storage facilities.

Soil staining was observed in 1992 during the completion of a Phase I ESA by GeoEngineers northwest of Building 24, near a waste oil tank (GeoEngineers, 1992).

In March 1993, a 10,000 gallon diesel UST (LUST # 26-95-052) was removed from the southwest corner of Area 5A (Figure 8). Ten cubic yards of soil were removed from the excavation and stockpiled. Diesel was detected in the soil from the floor of the excavation cavity (2,000 mg/kg), and in two borings (SB-2A and SB4-A) located east and west of the tank at 10 and 5 feet bgs (209 to 446 mg/kg, respectively). Diesel was not detected in two borings (SB1A and SB3A) located south and north of the tank. The results of testing of groundwater samples collected from these four borings is described below.

During 1999 and 2000, 13 borings (GP-82 through GP-84, GP-86, GP-88, GP-90, GP-153 through GP-158, GP-160) were advanced in Area 5A (MFA, 2002). Soil samples from the borings were analyzed for one or more of the following: metals, VOCs, PAHs, PCBs, SVOCs, and petroleum hydrocarbons. SVOCs were not detected in any of the soil samples analyzed.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, eight borings (DP-A5-36 through DP-A5-38, DP-A5-41, and DP-A5-44 through DP-A5-47) were advanced and one surface soil sample (GS-A5-3) was collected in Area 5A. Soil samples were analyzed for one or more of the following: PAHs, PCBs, arsenic, dioxins/furans, and petroleum hydrocarbons.

All soil detection data from previous site assessment activities are summarized in Table 2.10 below.

**Table 2.10**  
**Area 5A Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (1.7 mg/kg)	copper (9.3 to 110 mg/kg)
arsenic (0.9 to 27.8 mg/kg)	lead (2.1 to 91 mg/kg)
beryllium (0.3 to 0.43 mg/kg)	magnesium (3,950 mg/kg)
cadmium (0.46 mg/kg)	nickel (8.2 to 31 mg/kg)
calcium (4,680 mg/kg)	zinc (29 to 125 mg/kg)
chromium (4.9 to 110 mg/kg)	
<b>Detected VOCs Included:</b>	
Chloromethane (6.7 to 34 µg/kg)	naphthalene (0.67 to 2.8 µg/kg)
dichlorodifluoromethane (2.5 µg/kg)	toluene (0.43 to 0.75 µg/kg)
methylene chloride (2.7 µg/kg)	
<b>Detected PAHs Included:</b>	
2-chloronaphthalene (68 µg/kg)	benzo(k)fluoranthene (2.6 to 280,000 µg/kg)
1-methylnaphthalene (1,500 µg/kg)	chrysene (2.5 to 400,000 µg/kg)
2-methylnaphthalene (0.71 to 5,040 µg/kg)	dibenzo(a,h)anthracene (65,500 µg/kg)
acenaphthene (100 and 1,160 µg/kg)	fluoranthene (4.3 to 920,000 µg/kg)
acenaphthylene (0.67 to 61,000 µg/kg)	fluorene (0.64 to 6,700 µg/kg)
anthracene (1.3 to 39,630 µg/kg)	indeno(1,2,3-cd)pyrene (2.2 to 490,000 µg/kg)
benzo(a)anthracene (2.2 to 390,000 µg/kg)	naphthalene (0.43 to 40,000 µg/kg)
benzo(a)pyrene (5.3 to 610,000 µg/kg)	phenanthrene (2.5 to 94,000 µg/kg)
benzo(b)fluoranthene (5.1 to 490,000 µg/kg)	pyrene (4.4 to 1,200,000 µg/kg)
benzo(g,h,i)perylene (1.8 to 420,000 µg/kg)	
<b>Detected PCBs Included:</b>	
Aroclor 1242 (0.17 to 1.3 mg/kg)	Aroclor 1254 (0.17 to 1.3 mg/kg)
<b>Detected Dioxins/Furans Total TEQ Included:</b>	
14.4 pg/g	
<b>Detected Petroleum Hydrocarbons Included:</b>	
No. 2 diesel (21 to 230 mg/kg)	motor oil (80 to 820 mg/kg)

In 1993, groundwater samples were collected from EMCON borings SB-1A and SB-2A, and were analyzed for PAHs and petroleum hydrocarbons. PAHs dibenzo(a,h)anthracene, benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-c,d)pyrene were detected above EPA HHSLs in the groundwater sample collected from boring SB-1A. Diesel was detected in borings SB-1A and SB-2A at concentrations of 155 µg/L and 57 µg/L, respectively, and heavy oil was detected in borings SB-1A and SB-2A at concentrations of 4.16 and 1.65 mg/L, respectively. Copper and arsenic also were detected, but at concentrations below PGSLs.

In 1996, MFA collected groundwater samples in Area 5A at geoprobe borings GP-4M-18 and GMW-1. Groundwater samples were analyzed for metals. Copper was detected in GMW-1 at a concentration (217 µg/L), exceeding its PGSL.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in six of the eight soil samples collected in Area 5A. Two soil samples yielded a copper concentration exceeding background concentrations.
- Zinc was detected at concentrations exceeding SLVs in seven of the eight soil samples collected in Area 5A. None of the zinc concentrations exceeded background concentrations.
- Cadmium was detected at a concentration exceeding SLVs in one of seven soil samples collected in Area 5A. None of the cadmium concentrations exceeded background concentrations.
- A total of 28 soil samples in Area 5A were tested for PAHs. Fourteen PAHs (acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene) were detected in soil samples collected from boring GP-82 and DP-A5-37 at concentrations exceeding SLV screening values. Soil from boring GP-156 contained a single PAH (naphthalene) at a concentration exceeding SLVs, and soil from boring DP-A5-38 contained a single PAH (indeno(1,2,3-c,d)pyrene) at a concentration exceeding SLVs.
- PCBs (Aroclor 1254) were detected in three (GP-88, GP-158, GP-160) of the 14 soil samples collected in Area 5A at concentrations exceeding SLVs.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD identified two areas where soil COC concentrations exceeded acceptable levels in Area 5A. A brief description of each of these areas is provided below.

**Area A5-11** - PAHs are the COC in this area. PAHs exceed SLVs in borings GP-82, DP-A5-36, DP-A5-37, and DP-A5-38. The ROD stipulates soil removal in this area.

**Area A5-12B** - Arsenic in borings GP-88 and DP-A5-17 define this area of contamination. Arsenic exceeds background levels in GP-88 and DP-A5-17, but does not exceed SLVs. Capping of contaminated soil in this area was stipulated in the ROD based on DEQ-based risk analysis and not SLVs.

## 2.11 Area 5B

A steam cleaning slab for washing of environmental equipment (Building 22), an oil waste drum storage area, and waste oil tanks were located in Area 5B. Reportedly, an above-ground storage tank (AST) containing wash water for the steam cleaning operation was located 100 feet north of the steam cleaning slab. Sludge from the AST reportedly was buried on Site.

Soil staining has been observed near the steam cleaning operation during the 1992 Phase I ESA site reconnaissance (GeoEngineers, 1992).

In 1993, EMCON collected soil samples from six borings (SB-2, SB-3, SB-4, SB-5, SB-6, and SB-7) in Area 5B (EMCON, 1993). Soil samples were analyzed for VOCs and petroleum hydrocarbons.

During 1999 and 2000, 12 borings (GP 74 through GP-78, GP-80, GP-85, GP-87, GP-91, GP-92, GP-127, GP-159) were advanced in Area 5B (MFA, 2002). Soil samples from the borings were analyzed for one or more of the following: metals, VOCs, PAHs, PCBs, SVOCs, and petroleum hydrocarbons.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, three borings (DP-A5-32 through DP-A5-35) were advanced. Soil samples from each boring were analyzed for petroleum hydrocarbons. One surface soil sample (GS-A5-2) also was collected in Area 5B, and was analyzed for dioxins/furans.

All soil detection data from previous site assessment activities are summarized in Table 2.11 below.

**Table 2.11**  
**Area 5B Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.58 to 1.6 mg/kg)	copper (9.9 to 150 mg/kg)
arsenic (0.86 to 4 mg/kg)	lead (1.6 to 95 mg/kg)
beryllium (0.29 to 0.34 mg/kg)	nickel (7.6 to 19 mg/kg)
cadmium (0.26 to 2.1 mg/kg)	zinc (15 to 160 mg/kg)
chromium (3.8 to 30 mg/kg)	
<b>Detected VOCs Included:</b>	
1,2,4-trimethylbenzene (14 to 34 µg/kg)	n-butylbenzene (6.8 µg/kg)
1,3,5-trimethylbenzene (3.9 to 39 µg/kg)	naphthalene (12 to 22 µg/kg)
4-isopropyltoluene (44 µg/kg)	o-xylene (2.2 µg/kg)
Chloromethane (4.8 to 18 µg/kg)	sec-butylbenzene (3 µg/kg)
dichlorodifluoromethane (0.26 to 4.2 µg/kg)	PCE (0.31 to 2.2 µg/kg)
isopropylbenzene (1.3 µg/kg)	toluene (0.23 to 1.1 µg/kg)
m,p-xylenes (3.1 µg/kg)	trichlorofluoromethane (0.24 µg/kg)
methylene chloride (0.73 to 2.7 µg/kg)	total xylenes (6 µg/kg)
<b>Detected PAHs Included:</b>	
pentachlorophenol (PCP) (0.49 to 23 µg/kg)	benzo(k)fluoranthene (1.5 to 22 µg/kg)
2-methylnaphthalene (0.49 to 41 µg/kg)	chrysene (1.3 to 120 µg/kg)
acenaphthene (3.4 µg/kg)	dibenzo(a,h)anthracene (1.6 to 6.3 µg/kg)
acenaphthylene (0.54 to 28 µg/kg)	fluoranthene (1.5 to 190 µg/kg)
anthracene (1.1 to 64 µg/kg)	fluorene (0.49 to 41 µg/kg)
benzo(a)anthracene (0.7 to 58 µg/kg)	indeno(1,2,3-cd)pyrene (0.74 to 37 µg/kg)
benzo(a)pyrene (1.3 to 89 µg/kg)	naphthalene (0.47 to 36 µg/kg)
benzo(b)fluoranthene (1.7 to 130 µg/kg)	phenanthrene (0.6 to 130 µg/kg)
benzo(g,h,i)perylene (1.5 to 22 µg/kg)	pyrene (2.2 to 260 µg/kg)
<b>Detected PCBs Included:</b>	
Aroclor 1260 (0.092 to 0.11 mg/kg)	
<b>Detected Dioxins/Furans Total TEQ Included:</b>	
152.9 pg/g	
<b>Detected Petroleum Hydrocarbons Included:</b>	
diesel (20 to 1,100 mg/kg)	motor oil (79 to 3,700 mg/kg)
gasoline (31 to 130 mg/kg)	

In 1993, EMCON collected groundwater from soil borings SB-3, SB-4, SB-5, SB-6, and SB-7 in Area 5B (EMCON, 1993). The groundwater samples were analyzed for VOCs and petroleum hydrocarbons. Diesel was detected in groundwater samples SB-5 and SB-6 at concentrations of 5,200 and 806 µg/L, respectively. Oil was detected in groundwater samples SB-3, SB-4, and SB-7 at concentrations of 1,990, 630, and 1,000 µg/L, respectively. VOCs benzene (SB-6), toluene (SB-6), and naphthalene (SB-5) were detected, but at concentrations below EPA HHSLs. The VOC 1,1-dichloroethane was detected in SB-6, but at a concentration below its EPA HHSL.

One (MW-4) of the eight monitoring wells installed along the Site waterfront by the DEQ is located in area 5B. Groundwater monitoring events including all eight wells were conducted on April 14, 2005, July 20-21, 2005, and November 7-8, 2005. During the initial monitoring event, groundwater samples were tested for gasoline, diesel and heavy oil, VOCs, PAHs, metals, and PCBs. The July and November monitoring events included testing for PAHs and metals only. Heavy oil range hydrocarbons were detected at a concentration of 0.068 mg/L in MW-4 during the initial monitoring event. Methyl tert-butyl ether (MTBE) also was detected in MW-4 during the initial monitoring event, but at a concentration (4.21 µg/L) below its EPA HHSL. Neither PCBs nor other VOCs were detected in the initial groundwater sample. PAHs were not detected in MW-4 during any of the three monitoring events. Metals were detected in the groundwater sample collected from monitoring well MW-4, but not at concentrations exceeding PGSLs.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in 25 of the 26 soil samples collected in Area 5B. Only two soil samples yielded a copper concentration exceeding background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all 17 of the soil samples collected in Area 5B. Only one soil sample yielded a zinc concentration exceeding background concentrations.
- Cadmium was detected at concentrations exceeding SLVs in 2 of the 17 soil samples collected in Area 5B. Only one of the soil samples yielded concentrations exceeding the background concentration.

- A total of 22 soil samples in Area 5B were tested for gasoline. Gasoline was detected in 2 soil samples, and concentrations in one soil samples (from boring GP-127) exceeded the EPA required screening level of 80 mg/kg. A total of 35 soil samples in Area 5B were tested for diesel/heavy oil. Diesel/heavy oil was detected in 15 soil samples, but concentrations in only three soil samples (from borings GP-77, GP-127, and SB-2) exceeded the EPA required screening level of 500 mg/kg.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD identified one area where soil COC concentrations exceeded acceptable levels in Area 5B. A brief description of this area is provided below.

**Area A5-10** - The COC in this area is petroleum hydrocarbons. Only in soil boring SB-2 do petroleum hydrocarbons exceed screening levels. Capping of contaminated soil in this area was stipulated in the ROD based on DEQ risk-based cleanup standards and not SLVs.

## 2.12 Area RS-2

Area RS-2 is located adjacent to Area 5A, Area 5B and the Willamette River. Historical Site use in Area RS-2 is similar to historical Site use in Areas 5A and 5B.

In 1993, EMCON collected soil samples from borings SB-3A and SB-4A. Soil samples from the borings were analyzed for petroleum hydrocarbons.

In 1999 and 2000, 10 borings (GP-79, GP-81, GP-89, GP-125, GP-150 through GP-152, GP-161 through GP-163) were advanced in Area RS-2 (MFA, 2002). Soil samples from the borings were analyzed for one or more of the following: metals, VOCs, PAHs, PCBs, SVOCs, and petroleum hydrocarbons.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, six borings (DP-A5-39, DP-A5-40, DP-A5-42, DP-A5-43, DP-A5-48, DP-A5-49) were advanced in Area RS-2. Soil samples were analyzed for PCBs and petroleum hydrocarbons.

All soil detection data from previous site assessment activities are summarized in Table 2.12 below.

**Table 2.12**  
**Area RS-2 Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.61 mg/kg)	copper (15 to 40 mg/kg)
arsenic (1.4 to 3.7 mg/kg)	lead (6 to 53 mg/kg)
beryllium (0.35 and 0.37 mg/kg)	nickel (11 to 26 mg/kg)
cadmium (0.32 and 0.86 mg/kg)	zinc (35 to 100 mg/kg)
chromium (9.1 to 27 mg/kg)	
<b>Detected VOCs Included:</b>	
1,2,4-trimethylbenzene (47 µg/kg)	n-butylbenzene (25 µg/kg)
1,3,5-trimethylbenzene (32 µg/kg)	n-propylbenzene (9.8 µg/kg)
chloromethane (4.8 to 9.2 µg/kg)	naphthalene (8.5 µg/kg)
dichlorodifluoromethane (1.1 to 13 µg/kg)	o-xylene (2.9 µg/kg)
isopropylbenzene (2.5 µg/kg)	sec-butylbenzene (5.8 µg/kg)
methylene chloride (1.8 to 2.3 µg/kg)	PCE (56 µg/kg)
<b>Detected PAHs Included:</b>	
2-chloronaphthalene (19 µg/kg)	benzo(k)fluoranthene (6.3 to 13 µg/kg)
2-methylnaphthalene (4 to 170 µg/kg)	chrysene (14 to 62 µg/kg)
acenaphthene (2.6 to 7.2 µg/kg)	fluoranthene (23 to 89 µg/kg)
acenaphthylene (5 to 26 µg/kg)	fluorene (4.3 to 29 µg/kg)
anthracene (4.6 to 28 µg/kg)	indeno(1,2,3-cd)pyrene (11 and 28 µg/kg)
benzo(a)anthracene (14 to 40 µg/kg)	naphthalene (8.2 and 83 µg/kg)
benzo(a)pyrene (23 to 44 µg/kg)	phenanthrene (13 to 92 µg/kg)
benzo(b)fluoranthene (15 to 54 µg/kg)	pyrene (22 to 110 µg/kg)
benzo(g,h,i)perylene (11 to 24 µg/kg)	
<b>Detected PCBs Included:</b>	
Aroclor 1242 (0.3 to 0.7 mg/kg)	Aroclor 1260 (0.12 to 2.1 mg/kg)
Aroclor 1254 (0.4 to 0.7 mg/kg)	
<b>Detected Petroleum Hydrocarbons Included:</b>	
diesel (38 to 6,400 mg/kg)	motor oil (79 to 3,700 mg/kg)
gasoline (50 and 280 mg/kg)	

In 1993, EMCON collected a groundwater sample from boring SB-3A in Area RS-2. The groundwater sample was analyzed for petroleum hydrocarbons and PAHs. Gasoline, diesel, and PAHs were not detected in groundwater. Heavy oil range hydrocarbons were detected at a concentration of 2.94 mg/L in the sample.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in eight of the nine soil samples collected in Area RS-2. Only three soil samples yielded copper concentrations exceeding background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all nine of the soil samples collected in Area RS-2. Only one of the zinc concentrations exceeded background concentrations.
- Cadmium was detected at concentrations exceeding SLVs in two of the nine soil samples collected in Area RS-2. None of the cadmium concentrations exceeded background concentrations.
- PCBs were detected above SLVs in five of the 26 soil samples collected in Area RS-2. Aroclor 1242 was detected above SLVs in four borings (GP-79, GP-89, GP-161, and GP-163); Aroclor 1254 was detected above SLVs in three borings (GP-89, GP-161, GP-163); and Aroclor 1260 was detected above SLVs in one boring (GP-79).
- A total of 12 soil samples collected in Area RS-2 were tested for gasoline. Gasoline was detected in two soil samples, but only one (GP-81) was above the EPA required screening level of 80 mg/kg. A total of 17 soil samples collected in Area RS-2 were tested for diesel/heavy oil. Diesel/heavy oil was detected in 13 soil samples, but concentrations in only three soil samples (from borings GP-79, GP-89, and DP-A5-40) exceeded the EPA screening level of 500 mg/kg.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD identified two areas where soil COC concentrations exceeded acceptable levels in Area RS-2. A brief description of each of these areas is provided below.

**Area A5-12A** - The COCs in this area are PCBs and petroleum hydrocarbons. PCBs (Aroclor 1242 and Aroclor 1254) were detected above SLVs in soil from borings GP-89 and GP-160. Petroleum hydrocarbons were detected above screening levels in GP-89, GP-160, and DP-A5-43. Removal of contaminated soil in this area was stipulated in the ROD.

**Area A5-13** - The COCs in this area are PCBs (Aroclor 1260). Only in boring GP-79 do PCBs exceed SLVs. The ROD stipulated soil removal in this area based on DEQ risk-based cleanup standards and not SLVs.

## 2.13 Area 6A

Scrap former USTs and metal debris were stored above ground in Area 6. Reportedly, a PCP storage tank was located in Area 6. The total number of scrap tanks stored for scrap recycling in the area is not known. The tanks stored in the area were not used for liquid storage at the storage location. It is not known whether the scrap metal including the former USTs came from the subject property or from an off site location.

Soil staining was observed during the Phase I ESA near where the former scrap metal (used USTs and metal debris) were stored (GeoEngineers, 1992).

During the completion of a Focused Phase 2 Site Assessment and Underground Storage Tank Decommissioning project, PAHs were detected in three soil borings located in Area 6A (EMCON, 1993).

In 1993, EMCON advanced one soil boring (SB-8) in Area 6A (EMCON, 1993). Soil samples collected from the boring were analyzed for metals, VOCs and petroleum hydrocarbons.

During 1999 and 2000, four borings (GP-93 through GP-95, GP-170) were advanced in Area 6A (MFA, 2002). Soil samples from the borings were analyzed for one or more of the following: metals and dioxins/furans.

All soil detection data from previous site assessment activities are summarized in Table 2.13 below.

**Table 2.13**  
**Area 6A Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (1.1 mg/kg)	copper (11 to 21 mg/kg)
Arsenic (0.9 to 2.6 mg/kg)	lead (2.6 to 40 mg/kg)
beryllium (0.46 mg/kg)	magnesium (5,500 mg/kg)
Calcium (3,600 mg/kg)	nickel (9.9 to 32 mg/kg)
chromium (7.2 to 24 mg/kg)	zinc (33 to 104 mg/kg)
<b>Detected Dioxins/Furans Total TEQ Included:</b>	
4.9 pg/g	

One groundwater sample was collected from EMCON boring SB-8 in Area 6A. The groundwater sample was analyzed for metals, VOCs, and total petroleum hydrocarbons. Total metals detected at concentrations exceeding PGSLs include copper, lead, nickel, and zinc. The VOC 1,2-dichloropropane was detected at a concentration of 0.8 µg/L, which exceeds its EPA HHSL of 0.16 µg/L. Neither gasoline nor diesel were detected in groundwater. Heavy oil range petroleum hydrocarbons were detected at a concentration of 3.87 mg/L in the sample.

One (MW-3) of the eight monitoring wells installed along the Site waterfront by the DEQ is located in area 6A. Groundwater monitoring events including all eight wells were conducted on April 14, 2005, July 20-21, 2005, and November 7-8, 2005. During the initial monitoring event, groundwater samples were tested for gasoline, diesel and heavy oil, VOCs, PAHs, metals, and PCBs. The July and November monitoring events included testing for PAHs and metals only. Petroleum hydrocarbons, VOCs and PCBs were not detected in MW-3 during the initial monitoring event. PAHs were detected only in the groundwater sample collected during the third groundwater monitoring event, but did not exceed EPA HHSLs. Metals were detected in the groundwater sample collected from monitoring well MW-3, but not at concentrations exceeding PGSLs.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in all 10 of the soil samples collected in Area 6A. None of the copper concentrations exceeded background concentrations.

- Zinc was detected at concentrations exceeding SLVs all nine of the soil samples collected in Area 6A. One of the zinc concentrations exceeded background concentrations.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD did not identify any areas where soil COC concentrations exceeded acceptable levels in Area 6A. Therefore, the ROD required no capping or removal actions in Area 6A. The DEQ ROD cleanup decisions are consistent with the discussion regarding SLV exceedances above, as SLVs are intended for use as screening tools, not cleanup standards.

## 2.14 Area 6B

Sandblasting activities and transformer storage occurred near Building 23 of Area 6B (GeoEngineers, 1992).

In 1993, EMCON advanced boring SB-12 in Area 6B (EMCON, 1993). A single soil sample collected from this boring was analyzed for VOCs and petroleum hydrocarbons.

During 1996, 1999, and 2000, two test pits (TP-17 and TP-18) and 11 borings (GP-96 through GP-101, GP-123, GP-124, GP-128, GP-169, and GP-175) were advanced in Area 6B (MFA, 2002). Soil samples were analyzed for one or more of the following: metals, VOCs, PAHs, SVOCs, dioxins/furans, and petroleum hydrocarbons.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, 10 borings (DP-A6-61 through DP-A6-70) were advanced in Area 6B. Soil samples were analyzed for PAHs and petroleum hydrocarbons.

All soil detection data from previous site assessment activities are summarized in Table 2.14 below.

**Table 2.14**  
**Area 6B Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.47 to 2.8 mg/kg)	copper (9.6 to 201 mg/kg)
arsenic (0.88 to 54 mg/kg)	lead (2.3 to 87 mg/kg)
cadmium (0.23 to 0.38 mg/kg)	magnesium (4,460 to 5,580 mg/kg)
calcium (6,190 to 7,510 mg/kg)	nickel (9.4 to 81 mg/kg)
chromium (6.7 to 100 mg/kg)	zinc (29 to 170 mg/kg)
<b>Detected VOCs Included:</b>	
chloromethane (3.2 to 26 µg/kg)	toluene (0.31 µg/kg)
dichlorodifluoromethane (0.41 to 8.7 µg/kg)	
<b>Detected PAHs Included:</b>	
1-methylnaphthalene (130 and 800 mg/kg)	benzo(k)fluoranthene (0.83 to 2,200 µg/kg)
2-methylnaphthalene (0.81 to 310 µg/kg)	chrysene (6.8 to 4,700 µg/kg)
acenaphthene (2.4 to 410 µg/kg)	dibenzo(a,h)anthracene (0.68 to 700 µg/kg)
acenaphthylene (0.81 to 2,500 µg/kg)	fluoranthene (0.69 to 11,400 µg/kg)
anthracene (2.6 to 1,900 µg/kg)	fluorene (0.51 to 370 µg/kg)
benzo(a)anthracene (7.2 to 5,000 µg/kg)	indeno(1,2,3-cd)pyrene (3.1 to 2,800 µg/kg)
benzo(a)pyrene (0.67 to 4,300 µg/kg)	naphthalene (0.36 to 570 µg/kg)
benzo(b)fluoranthene (0.88 to 5,100 µg/kg)	phenanthrene (4.1 to 4,700 µg/kg)
benzo(g,h,i)perylene (0.57 to 2,400 µg/kg)	pyrene (0.67 to 12,500 µg/kg)
<b>Detected Dioxins/Furans Total TEQ Included:</b>	
1.5 pg/g	
<b>Detected Petroleum Hydrocarbons Included:</b>	
diesel (23 to 910 mg/kg)	oil (1,200 mg/kg)
gasoline (15 mg/kg)	motor oil (120 to 7,000 mg/kg)

The only groundwater sample collected in Area 6B was collected from boring SB-12 (EMCON, 1993). The groundwater sample was analyzed for VOCs and petroleum hydrocarbons. VOCs were not detected in the groundwater sample from SB-12. Gasoline was detected at a concentration of 0.157 mg/L, and oil was detected at a concentration of 0.210 mg/L.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in 23 of the 24 soil samples collected in Area 6B. Copper concentrations in two soil samples exceeded background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all 21 of the soil samples collected in Area 6B. Zinc concentrations in two soil samples exceeded background concentrations.
- Cadmium was detected at concentrations exceeding SLVs in three of the 24 soil samples collected in Area 6B. None of the cadmium concentrations exceeded background concentrations.
- Arsenic was detected at concentrations exceeding SLVs in a single soil sample collected from test pit TP-17.
- A total of 27 soil samples collected in Area 6B were tested for PAHs. PAHs were detected above SLV screening values in 10 soil samples collected from the boring core from SB-13 (acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. GP-96 (Indeno(1,2,3-c,d)pyrene), GP-97 (acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene), GP-99 (acenaphthylene, Indeno(1,2,3-c,d)pyrene), GP-123 (benzo(g,h,i)perylene), DP-A6-61 (benzo(g,h,i)perylene, indeno(1,2,3-c,d)pyrene) DP-A6-62 (fluorene, phenanthrene), DP-A6-63 (acenaphthylene, indeno(1,2,3-c,d)pyrene), DP-A6-68 (acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, and pyrene), and DP-A6-69 (benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, and pyrene).
- A total of 23 soil samples collected in Area 6B were tested for diesel/heavy oil. Diesel/heavy oil was detected in four soil samples, and diesel/heavy oil concentrations in only two soil samples (GP-99 and DP-A6-65) exceeded the EPA required screening level of 500 mg/kg.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD identified one area where soil COC concentrations exceeded acceptable levels in Area 6B. A brief description of this area is provided below.

**Area A6-18** - COCs in this area include PAHs and petroleum hydrocarbons. At least one PAH has been detected in soil exceeding SLVs from borings SB-13, GP-96, GP-97, GP-99, GP-123, DP-A6-61, DP-A6-62, DP-A6-63, DP-A6-64, DP-A6-68, and DP-A6-69. Petroleum hydrocarbons have been detected in soil exceeding screening values from borings GP-99 and DP-A6-65. The ROD stipulates capping of contaminated soil in Area A6-18 based on DEQ risk-based cleanup standards and not SLVs.

## 2.15 Area 6C

In 1993, EMCON advanced one boring (SB-9) in Area 6C (EMCON, 1993). The soil sample collected from this boring was analyzed for metals, VOCs, PAHs, and petroleum hydrocarbons.

During 1996, 1999, and 2000, one test pit (TP-22) and 13 borings (GP-105, GP-106, GP-108 through GP-113, GP-129, GP-164 through GP-166, and GP-173) were advanced in Area 6C (MFA, 2002). Soil samples collected in these borings were analyzed for one or more of the following: metals, VOCs, PAHs, PCBs, SVOCs, and petroleum hydrocarbons.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, 10 borings (DP-A6-50, DP-A6-53 through DP-A6-55, DP-A6-71 through DP-A6-76) were advanced in Area 6C. Soil samples were analyzed for arsenic and/or PCBs.

All soil detection data from previous site assessment activities are summarized in Table 2.15 below.

**Table 2.15**  
**Area 6C Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.57 to 4.1 mg/kg)	copper (13 to 36 mg/kg)
arsenic (1.5 to 34.3 mg/kg)	lead (6.8 to 144 mg/kg)
beryllium (0.35 to 0.53 mg/kg)	magnesium (4,160 to 4,370 mg/kg)
cadmium (1.5 mg/kg)	nickel (11 to 23 mg/kg)
calcium (6,390 to 29,900 mg/kg)	zinc (38 to 171 mg/kg)
chromium (9.4 to 28 mg/kg)	
<b>Detected VOCs Included:</b>	
chloromethane (19 to 51 µg/kg)	methylene chloride (1.8 to 3 µg/kg)
dichlorodifluoromethane (2 to 9.4 µg/kg)	tetrachloroethene (3.7 to 28 µg/kg)
<b>Detected PAHs Included:</b>	
PCP (0.57 µg/kg)	benzo(k)fluoranthene (0.57 to 940 µg/kg)
2-methylnaphthalene (0.54 to 1,200 µg/kg)	chrysene (1.7 to 3,100 µg/kg)
acenaphthene (0.4 to 6,200 µg/kg)	dibenzo(a,h)anthracene (230 µg/kg)
acenaphthylene (1.5 to 880 µg/kg)	fluoranthene (2.5 to 9,800 µg/kg)
anthracene (1.9 to 3,000 µg/kg)	fluorene (0.8 to 3,600 µg/kg)
benzo(a)anthracene (1.1 to 3,200 µg/kg)	indeno(1,2,3-cd)pyrene (16 to 530 µg/kg)
benzo(a)pyrene (1.6 to 3,500 µg/kg)	naphthalene (5.2 to 300 µg/kg)
benzo(b)fluoranthene (2 to 2,800 µg/kg)	phenanthrene (7.9 to 670 µg/kg)
benzo(g,h,i)perylene (12 to 2,200 µg/kg)	pyrene (28 to 1,000 µg/kg)
<b>Detected PCBs Included:</b>	
Aroclor 1254 (0.2 mg/kg)	Aroclor 1260 (0.086 to 0.71 mg/kg)
<b>Detected Petroleum Hydrocarbons Included:</b>	
diesel (23 to 120 mg/kg)	motor oil (83 to 260 mg/kg)

Two (MW-1 and MW-2) of the eight monitoring wells installed along the Site waterfront by the DEQ are located in area 6C. Groundwater monitoring events including all eight wells were conducted on April 14, 2005, July 20-21, 2005, and November 7-8, 2005. During the initial monitoring event, groundwater samples were tested for gasoline, diesel and heavy oil, VOCs, PAHs, metals, and PCBs. The July and November monitoring events included testing for PAHs and metals only. Petroleum hydrocarbons, VOCs, and PCBs were not detected in monitoring wells MW-1 or MW-2 during the initial monitoring event. PAHs were detected only in monitoring well MW-1

during the second and third monitoring events, but at concentrations below EPA HHSLs. During the first and third monitoring events, copper and lead concentrations detected in groundwater exceeded PGSLs. In addition, zinc was detected at a concentration exceeding its PGSL in MW-1 during the first groundwater monitoring event.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in all eight of the soil samples collected in Area 6C. None of the copper concentrations exceeded background concentrations.
- Zinc was detected at concentrations exceeding SLVs in all 10 of the soil samples collected in Area 6C. Zinc concentrations in three soil samples exceeded background concentrations.
- Arsenic was detected at concentrations exceeding SLVs in one of the 42 soil samples collected in Area 6C. Arsenic in the soil sample (from boring DP-A6-72) exceeded background concentrations.
- Cadmium was detected at a concentration exceeding SLVs in one of the 10 soil samples collected in Area 6C. The cadmium concentration in soil exceeded the background concentration.
- A total of 10 soil samples collected in Area 6C were tested for PAHs. Thirteen PAHs were detected in a single soil sample, collected in boring GP-173, at concentrations exceeding SLV screening values.
- A total of 24 soil samples in Area 6C were analyzed for PCBs. Aroclor 1254 was detected above SLVs in a soil sample from boring GP-166, and Aroclor 1260 was detected above SLVs in a soil sample from boring GP-106.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD identified two areas where soil COC concentrations exceeded acceptable levels in Area 6C. A brief description of each of these areas is provided below.

**Area A6-14A** - The COC in this area is arsenic. Arsenic has been detected above background at GP-111, GP-112, and GP-113. The ROD stipulates capping of contaminated soil in Area A6-14A.

**Area A6-15** - The COC in this area is arsenic. The area consists of a single detection of arsenic above background in soil from boring GP-110. The ROD stipulated soil capping in Area A6-15.

**Area A6-19** - The COC in Area A6-19 is PCBs. Aroclor 1260 was detected above SLVs in a single boring (GP-106). The ROD stipulates capping of soil in Area A6-19. The DEQ ROD cleanup decisions are consistent with the discussion regarding SLV exceedances above, as SLVs are intended for use as screening tools, not cleanup standards.

## 2.16 Area 6D

In 1993, EMCON advanced two borings (SB-10 and SB-11) in Area 6D (EMCON, 1993). Soil samples were analyzed for PAHs, VOCs, metals, and petroleum hydrocarbons.

During 1996, 1999, and 2000, three test pits (TP-19, TP-20, and TP-21) and 14 borings (GP-102 through GP-104, GP-114 through GP-122, GP-167, and GP-168) were advanced in Area 6D (MFA, 2002). Soil samples were analyzed for one or more of the following: metals, VOCs, PAHs, PCBs, SVOCs, dioxins/furans, and petroleum hydrocarbons.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, five borings (DP-A6-56 through DP-A6-60) were advanced and one surface soil sample (GS-A6-1) was collected in Area 6D. Soil samples were analyzed for one or more of the following: arsenic, PAHs, and petroleum hydrocarbons.

All soil detection data from previous site assessment activities are summarized in Table 2.16 below.

**Table 2.16**  
**Area 6D Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (0.86 to 17 mg/kg)	copper (10 to 110 mg/kg)
arsenic (0.76 to 9.5 mg/kg)	lead (2.4 to 110 mg/kg)
beryllium (0.37 to 0.51 mg/kg)	nickel (10 to 21 mg/kg)
cadmium (0.62 mg/kg)	zinc (29 to 430 mg/kg)
chromium (8.2 to 24 mg/kg)	
<b>Detected VOCs Include:</b>	
chloromethane (37 µg/kg)	naphthalene (0.44 µg/kg)
cis-1,2-dichloroethene (3.4 µg/kg)	tetrachloroethene (5.9 µg/kg)
dichlorodifluoromethane (0.55 to 6 µg/kg)	trichloroethene (0.98 µg/kg)
methylene chloride (22 µg/kg)	total xylenes (7 to 14 µg/kg)
<b>Detected PAHs Included:</b>	
PCP (17 to 4,400 µg/kg)	benzo(k)fluoranthene (1.3 to 630 µg/kg)
2-methylnaphthalene (0.79 to 380 µg/kg)	chrysene (0.71 to 1,800 µg/kg)
acenaphthene (0.38 to 120 µg/kg)	dibenzo(a,h)anthracene (0.83 to 140 µg/kg)
acenaphthylene (1.2 to 260 µg/kg)	fluoranthene (1.3 to 1,200 µg/kg)
anthracene (0.79 to 420 µg/kg)	fluorene (0.62 to 220 µg/kg)
benzo(a)anthracene (0.85 to 450 µg/kg)	indeno(1,2,3-cd)pyrene (0.61 to 440 µg/kg)
benzo(a)pyrene (0.76 to 1,800 µg/kg)	naphthalene (0.4 to 340 µg/kg)
benzo(b)fluoranthene (1 to 2,800 µg/kg)	phenanthrene (0.47 to 660 µg/kg)
benzo(g,h,i)perylene (0.99 to 380 µg/kg)	pyrene (1.6 to 740 µg/kg)
<b>Detected PCBs Included:</b>	
Aroclor 1260 (0.21 mg/kg)	
<b>Detected Dioxins/Furans Total TEQ Included:</b>	
49.0 to 69.6 pg/g	
<b>Detected Petroleum Hydrocarbons Included:</b>	
diesel (30 to 1,300 mg/kg)	motor oil (59 to 2,400 mg/kg)
gasoline (29 to 57 mg/kg)	

In 1993, groundwater samples collected from EMCON borings SB-10, SB-11, and SB-13 were analyzed for metals, VOCs, PAHs, and petroleum hydrocarbons. Total metals detected in the groundwater exceeding PGSLs included copper (SB-10, SB-13), lead (SB-10, SB-13), nickel (SB-13), and zinc (SB-10, SB-13). At least one VOC constituent was detected in SB-10, SB-11, or SB-13. Only the vinyl chloride concentration in SB-13 exceeds its EPA HHSL. A diesel concentration of 4.01 mg/L was detected in the groundwater sample collected from soil boring SB11-W. The PAHs chrysene (SB-10, 2.6 µg/L) and phenanthrene (SB-13, 0.3 µg/L) were detected in groundwater at concentrations below EPA HHSLs.

In 1996, groundwater samples collected from MFA borings HMW-1, HMW-2, and HMW-3 were analyzed for metals, VOCs, and PAHs. Only copper was detected at a concentration exceeding its PGSL, and only in HMW-1.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in 14 of the 15 soil samples collected in Area 6D. One of the copper concentrations in soil exceeded background concentrations.
- Zinc was detected at a concentration exceeding SLVs in all 13 of the soil samples collected in Area 6D. Three of the zinc concentrations in soil exceeded background concentrations.
- Cadmium was detected at a concentration exceeding SLVs in one of the 15 soil samples collected in Area 6D. None of the cadmium concentrations in soil exceeded background concentrations.
- A total of 27 soil samples collected in Area 6D were tested for PAHs. Six PAHs (acenaphthylene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, indeno(1,2,3-c,d)pyrene, and PCP) were detected in a single soil sample, collected in boring GP-114, at concentrations exceeding SLV screening values.
- PCBs (Aroclor 1260) was detected in only one (GP-117) of the seven soil samples collected in Area 6D. The concentration detected (0.21 mg/kg) exceeded the SLV.
- A total of 15 soil samples in Area 6D were tested for diesel/heavy oil. Diesel/heavy oil was detected in six soil samples, and concentrations in two soil samples (from GP-104 and GP-122) exceeded the EPA required screening level of 500 mg/kg.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD identified three areas where soil COC concentrations exceeded acceptable levels in Area 6D. A brief description of each of these areas is provided below.

**Area A6-16** - The COC in Area A6-16 is arsenic. Arsenic has been detected above background levels in boring GP-117, DP-A6-55, DP-A6-56, and DP-A6-57. Arsenic has not been detected above SLVs in Area A6-16. The ROD stipulates capping of soil in Area A6-16.

**Area A6-17** - COCs in this area include PAHs and PCP. Only in one boring (GP-114) do PAHs and PCP exceed SLVs. The ROD stipulates that soil in the area of GP-114 be capped to mitigate PCP and PAH containing soils in Area A6-17. The DEQ ROD cleanup decisions are consistent with the discussion regarding SLV exceedances above, as SLVs are intended for use as screening tools, not cleanup standards.

## 2.17 Area RS-1

Area RS-1 is located adjacent to Area 6D and Area 6C, and the Willamette River. Historical Site use in Area RS-1 is similar to historical Site use in Area 6D and Area 6C.

In 1993, EMCON advanced one boring (SB-1) in Area RS-1 (EMCON, 1993). The soil sample was analyzed for PAHs, VOCs, metals, and petroleum hydrocarbons.

During 1996, 1999 and 2000, one test pit (TP-23) and four borings (GP-107, GP-126, GP-171, and GP-172) were advanced in Area RS-1 (MFA, 2002). Soil samples were analyzed for one or more of the following: metals, VOCs, PAHs, PCBs, SVOCs, and petroleum hydrocarbons.

In November 2005, AMEC conducted a Phase II ESA at the Site on behalf of the University. During the Phase II ESA, two borings (DP-A6-51 through DP-A6-52) were advanced in Area RS-1. Soil samples were analyzed for PCBs and PAHs.

All soil detection data from previous site assessment activities are summarized in Table 2.17 below.

**Table 2.17**  
**Area RS-1 Analytical Results Summary**

<b>Detected Metals Included:</b>	
antimony (5.6 mg/kg)	lead (12 to 61 mg/kg)
arsenic (2.1 to 9.9 mg/kg)	nickel (13 to 17 mg/kg)
chromium (11 to 18 mg/kg)	Zinc (50 to 125 mg/kg)
copper (24 and 35 mg/kg)	
<b>Detected VOCs Included:</b>	
chloromethane (10 µg/kg)	methylene chloride (1.9 µg/kg)
<b>Detected PAHs Included:</b>	
2-methylnaphthalene (16 to 250 µg/kg)	chrysene (14 to 1,100 µg/kg)
acenaphthene (18 to 290 µg/kg)	dibenzo(a,h)anthracene (790 µg/kg)
acenaphthylene (3.9 to 290 µg/kg)	fluoranthene (21 to 890 µg/kg)
anthracene (5.4 to 670 µg/kg)	fluorene (15 to 570 µg/kg)
benzo(a)anthracene (20 to 860 µg/kg)	indeno(1,2,3-cd)pyrene (10 to 530 µg/kg)
benzo(a)pyrene (16 to 690 µg/kg)	naphthalene (5.2 to 300 µg/kg)
benzo(b)fluoranthene(20 to 730 µg/kg)	phenanthrene (7.9 to 670 µg/kg)
benzo(g,h,i)perylene (20 to 790 µg/kg)	pyrene (28 to 1,000 µg/kg)
benzo(k)fluoranthene (7.1 to 660 µg/kg)	
<b>Detected PCBs Included:</b>	
Aroclor 1260 (0.15 to 1.3 mg/kg)	
<b>Detected Petroleum Hydrocarbons Included:</b>	
diesel (28 to 180 mg/kg)	motor oil (72 to 320 mg/kg)
gasoline (12 mg/kg)	

Groundwater samples have not been collected in Area RS-1.

A comparison of historical soil sample data to SLVs indicates the following:

- Copper was detected at concentrations exceeding SLVs in all three of the soil samples collected in Area RS-1. Copper concentrations did not exceed background concentrations.

- Zinc was detected at concentrations exceeding SLVs all four of the soil samples collected in Area RS-1. Two soil samples, collected in borings SB-1 and GP-126, yielded a zinc concentration exceeding background concentrations.
- A total of 12 soil samples collected in Area RS-1 were tested for PAHs. Three PAHs (acenaphthylene, benzo(g,h,i)perylene, and indeno(1,2,3-c,d)pyrene) were detected in two soil samples from boring GP-172 above SLVs, and one PAH (Fluorene) was detected in one soil sample from boring GP-172 above SLVs.
- PCBs (Aroclor 1260) were detected above SLVs in two of nine soil samples collected in Area RS-1. The soil samples were collected from borings GP-126 and GP-172.

No other soil COC concentrations exceeded SLVs.

The 2005 ROD identified two areas where soil COC concentrations exceeded acceptable levels. A brief description of each of these areas is provided below.

**Area 6-14B** - The COCs in Area 6-14B include PCBs and PAHs. PCBs (Aroclor 1260) have been detected at concentrations exceeding SLVs in borings GP-126 and GP-172. PAHs have been detected above SLVs in GP-172. The ROD is not clear regarding the remedial requirements for Area 6-14B. The DEQ ROD cleanup decisions are consistent with the discussion regarding SLV exceedances above, as SLVs are intended for use as screening tools, not cleanup standards.

### **3.0 SITE CHARACTERIZATION METHODOLOGY FOR AMEC'S 2006 FIELD WORK**

As outlined in the Work Plan, Triangle Park Site characterization involved collection of multi-increment soil samples from the seventeen investigation areas listed in Section 2.0, and collection of groundwater samples from the groundwater assessment area (Figure 3).

Section 3.1 discusses the rationale for the soil and groundwater analytical testing suites used for each area. Section 3.2 summarizes methods for generation of random boring locations and location of borings in the field. Section 3.3 describes soil and groundwater sample collection methods. Section 3.4 describes multi increment soil sample preparation methods. Section 3.5 presents analytical methods for soil and groundwater samples. Sections 3.6 and 3.7 discuss decontamination and disposal methods, and deviations from the QAPP, respectively.

### **3.1 Site Characterization Rationale**

Contaminant detections from previous environmental investigations and historical Site operations (Section 2.0) were used to select laboratory analyses for the Site Characterization. Table 1 provides the testing suite for each sampling area.

#### **3.1.1 Soil Characterization Rationale**

Multi-increment soil samples from all areas were analyzed for analytes that had been detected at the Site during previous environmental investigations, including metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc), PAHs, PCBs, and diesel and heavy oil range hydrocarbons. Additionally, soil samples were analyzed for:

- PCP (Areas 1C and 6D), as suggested by anecdotal evidence of McCormick and Baxter activity in those portions of the Site,
- Dioxins/Furans (Areas 4, 5A, 5B, 6A, 6B, 6C, 6D, RS-1, RS-2, RS-3: A Horizon only); because these areas are adjacent to the Willamette River, and
- Tributyltin (Areas 5A, 6A, 6C, RS-1, and RS-2) in areas of former ship building activities.

VOCs were not included in the Site Characterization because the multi increment soil sampling approach adversely affects sample integrity for VOCs (USEPA, 2003). SVOCs were not included in the Site Characterization because SVOCs were not detected in soil at the Site during the 1999 and 2000 Maul Foster investigations.

#### **3.1.2 Groundwater Characterization Rationale**

Groundwater samples were analyzed for PAHs, diesel and heavy oil range petroleum hydrocarbons, and dissolved metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc) to investigate a suspected low level diesel plume in the groundwater characterization area.

Groundwater samples were not analyzed for VOCs because groundwater did not exhibit field evidence of VOC contamination (i.e., sheen, odor, or visible product).

### **3.2 Field Preparation**

Random boring locations were generated using the Microsoft Excel random number generator function to determine the x and y coordinates for each boring. Borings were located at the Site by a W&H Pacific survey crew using a survey-grade Trimble 5800

Global Positioning System (GPS) unit and three existing control points. According to the instrument manufacturer, the instrument horizontal accuracy is +/- 1 centimeter. Boring locations that were located in densely vegetated areas or inside buildings were located with a Leica TPS 1200 total station. Each boring location was marked in the field with either a 4-foot wooden stake, driven 2-inch stainless steel nail, or spray paint. Boring locations for each area are illustrated in Figures 4 through 9.

Prior to drilling, Site utilities were located by public (Northwest Utility Notification Center) and private (Locates Down Under) utility locating services. Utility locates resulted in moving one boring (2B-23) 10 feet west of a sewer line (Figure 5).

### 3.3 Characterization Sample Collection

Soil samples were collected from 30 randomly located borings that were advanced in each of the 17 sampling areas. A total of 530 direct push borings were completed. In 20 borings, a single waste sample was collected. In four borings, both a waste sample and three depth horizon parent samples were collected. In the remaining 506 borings, parent soil samples were collected from three depth intervals in each boring:

- 0 to 1.0 feet bgs (A horizon), representing surface soil;
- 1.0 to 5.0 feet bgs (B horizon), representing shallow subsurface soil; and
- 5.0 to 10.0 feet bgs (C Horizon), representing subsurface soil immediately above the zone of seasonal groundwater fluctuation.

Additional soil samples were collected from borings south of and adjacent to the Burlington Northern Santa Fe (BNSF) railroad right-of-way for creation of a railroad multi-increment sample (Table 1 and Figures 4 through 9).

The thirty samples collected from each sampling area were denoted "parent samples," and were combined in the laboratory to form a single multi-increment sample for each horizon in each area. All parent samples were labeled with a sample location identifier, date and time of sample collection, and sampler's initials. The unique parent sample identifier was in the format PS-XX(Y)-ZZ, with XX indicating the sampling area in which the sample was collected, Y indicating the depth horizon from which the sample was collected, and ZZ indicating the sampling area boring number. All multi-increment samples were assigned unique identifiers by the laboratory in the format MI-XX(Y), with XX indicating the sampling area in which the sample was collected, and Y indicating the depth horizon from which the sample was collected.

AMEC attempted to drill boreholes at the locations generated by the random number generator; however, some borings were moved due to:

- The random boring being located on a concrete slab,
- Issues with drill rig access, or
- Encountering impenetrable materials in the subsurface.

Random boring locations on concrete slabs were moved in the field to a cracked portion of the slab. Random boring locations that could not be accessed by the drill rig were moved to a location that could be accessed by the drill rig. If refusal was encountered, the boring was moved to a location within 5 feet of the original location. If refusal was encountered a second time, the boring location was moved to another location within 5 feet of the original location. If refusal was encountered a third time, the boring was moved to a location within 10 feet of the original location. Refusal was not encountered more than three times at the same sampling location.

### **3.3.1 Soil Sampling**

Soil samples were collected October 12 through October 30, 2006. Direct-push drilling services were provided by Boart Longyear, Inc., Tualatin, Oregon. The direct-push sampling technique involved advancing a 5-foot long, 1.5-inch inside diameter macrocore sampler into the subsurface using a truck-mounted percussion hammer. Two, 5-foot long soil cores were collected at each borehole.

Prior to commencing field work, a health and safety tailgate meeting was conducted with subcontractors, and field equipment [i.e., photoionization detector (PID), Yellow Springs Instruments (YSI)] was calibrated.

Soil cores were sliced vertically the length of the targeted depth horizon with a stainless steel putty knife and photographed. Soil core photographs are included in Appendix A. The core was screened for visual or olfactory evidence of contamination, and soil lithology was logged according to the following classifications:

- Sand fill;
- Silt or sandy fill;
- Gravel fill;
- Waste material (soil exhibiting evidence of contamination such as an odor, staining, or an elevated photoionization detector [PID] measurement);

- Non-waste debris (i.e. wood, concrete, asphalt, bricks); or
- Native sand (Quaternary Alluvium).

Soil cores were screened for VOCs with a PID at 2-foot intervals. Zones of the core exhibiting visual or olfactory evidence of waste material were screened for VOCs individually. PID readings were recorded on field data sheets or in a field log book. Lithologic Classification Data Sheets are included in Appendix B.

If waste material was encountered in a boring, the depth interval, PID screening results, and characteristics of the waste material were recorded on the lithologic classification data sheet. If a waste sample was collected, the boring was abandoned, and a new boring was advanced 5 feet from the original boring in an attempt to collect the parent sample. If waste material was encountered a second time, a second waste sample was collected, the boring was abandoned, and a new boring was advanced within 5 feet of the original boring in an attempt to collect the parent sample. If waste material was encountered a third time, a third waste sample was collected, and the boring was abandoned. A new boring was then advanced 50 feet from the original boring in order to collect the parent sample. Waste material was not encountered more than three times at the same sampling location.

Supplemental discreet soil/waste samples were collected in 24 borings. Supplemental discreet soil/waste samples were typically characterized by an odor, but did not necessarily yield a PID reading greater than 50 ppm.

Following the completion of each soil boring, it was decommissioned. Boring decommissioning included:

1. Filling the boring to within 1 foot of the ground surface with granular bentonite;
2. Hydrating the granular bentonite by pouring potable water into the borehole; and
3. Filling the remainder of the boring with a commercially available granular material such as filter pack sand.

### **3.3.2 Groundwater Sampling**

Four groundwater samples were collected on October 12 and 13, 2006, in Area 4 of the approximately 3-acre groundwater assessment area (Figure 3). The locations of borings where groundwater samples were collected are illustrated in Figure 7. The groundwater sampling locations were collocated with soil sampling locations, and were chosen to further investigate groundwater contamination previously detected in DEQ

Well Number MW-7, AMEC wells installed during the 2005 Phase II ESA, and boring logs from previous environmental studies that describe stained soil and petroleum odors.

Groundwater samples were collected using a direct-push drilling technique that involved advancing a 4-foot long screen within a protective sleeve to first encountered groundwater. A groundwater sample was obtained by retracting the protective sleeve four feet to expose the screen to the aquifer. Groundwater samples were collected with a low-stress approach in an attempt to minimize drawdown. Water quality indicators were monitored during purging, and a groundwater sample was collected after the water quality indicators stabilized. Groundwater samples were collected with a variable-speed, low-flow-sampling pump (i.e., peristaltic pump) and dedicated polyethylene tubing. Groundwater drawdown was monitored and purge rate was adjusted to ensure that drawdown was minimized.. Maximum drawdown measured in boring 4-1, 4-5, 4-13 and 4-22 was 15 feet (ft), 2 ft, <1 ft and <1 ft, respectively. Boring 4-1 was pumped dry, and allowed to recover during the process of filling required sample bottles. Water quality indicators pH, specific electrical conductance, dissolved oxygen concentration, oxidation-reduction potential and temperature were monitored with a YSI meter and flow-through-cell. Turbidity was measured with a Hach portable turbidimeter. Water quality indicators were recorded on groundwater sampling field forms every 3 to 5 minutes, after a minimum of one tubing volume (including flow-through-cell volume) had been purged from the well. Groundwater sampling field forms are provided in Appendix C.

Groundwater was screened for every five feet to ensure that first-encountered groundwater was sampled. Depth to first-encountered groundwater ranged from 18 to 36 feet bgs on October 12 and 13, 2006. Groundwater levels in the borings were allowed to equilibrate for approximately 30 minutes at each boring. After equilibration, depth to groundwater ranged from 18 to 28 feet bgs.

### **3.4 Multi-Increment Soil Sample Preparation**

Soil from each depth horizon (excluding non-waste debris) was transferred from the macrocore sampler to a labeled, pre-cleaned 8-ounce glass jar. Eight ounce jars from each boring were sealed, placed in Ziploc bags, and transferred into an ice-chilled, pre-cleaned, pre-labeled high density polyethylene (HDPE) container (e.g., cooler). Multi-increment soil samples were stored separate from soil/waste samples. Soil samples from each investigation area were submitted to Analytical Resources, Inc. (ARI) under chain of custody procedures. Chains of custody are provided in Appendix D. ARI prepared the multi-increment sample in accordance with Sampling Investigation Work Plan and Sampling and Analysis Plan Standard Operating

Procedure (SOP) SOP-4, Grinding and Homogenization of Multi-Increment Soil Samples (AMEC, 2006b):

- Upon receipt of all 30 soil samples from a sampling area, samples were air-dried for up to two days. Soil from each 8-ounce soil jar was ground in a jaw crusher to a maximum size of 2 millimeters. Each sample was thoroughly mixed after grinding using a decontaminated stainless steel spoon.
- Ground soil was split into a multi-increment sample and a parent sample. Approximately 6 ounces of each ground sample was placed in a new jar, constituting the parent sample. Approximately 2 ounces of each ground sample was transferred into a large, clean stainless steel bowl. The process was repeated for all 30 samples, and the ground soil in the stainless steel bowl constituted the multi-increment sample. The multi-increment sample was thoroughly mixed using a large stainless steel spoon. After mixing, the sample was transferred to a 1-liter jar.
- The jaw crusher and laboratory equipment were decontaminated prior to grinding the first samples, and prior to grinding soils from each different sampling area. As the samples from each sampling area were composited, there was not need to decontaminate the equipment between each sample.

### 3.5 Analytical Methods

Table 1 provides a summary of soil and groundwater analytical testing suite by sampling area.

Multi-increment soil samples from all areas of the Site were analyzed for:

- PAHs by EPA Method 8270-SIM,
- PCBs by EPA Method SW-8082,
- Diesel and heavy oil range petroleum hydrocarbons by Northwest (NWTPH-Dx) Methods, and
- Metals, including antimony, arsenic, cadmium, total chromium, copper, lead, nickel, and zinc, by EPA Method 6010B or EPA Method 6020.

In addition, multi-increment soil samples from select sampling areas were analyzed for:

- Dioxins/Furans by EPA Method 8290 (Areas 4, 5A, 5B, 6A, 6B, 6C, 6D, RS-1, RS-2, RS-3; A Horizon only),
- PCP by EPA Method 8270-SIM (Areas 1C and 6D), and
- Tributyltin by EPA Method 8270-SIM (Areas 5A, 6A, 6C, RS-1, and RS-2).

Groundwater samples collected from the groundwater investigation area were analyzed for:

- PAHs by EPA Method 8270-SIM,
- Dissolved metals, including antimony, arsenic, cadmium, total chromium, copper, lead, nickel, and zinc by EPA Method 6010B or EPA Method 6020, and
- Diesel and heavy oil range petroleum hydrocarbons by method NWTPH-Dx.

### **3.6 Decontamination and Disposal Methods**

Drill rods and sampling equipment were decontaminated prior to drilling at the site, prior to sampling in each investigation area, and after encountering waste material using a triple wash/rinse process. A solution of Alconox detergent and deionized water was sprayed on sampling equipment and scrubbed with a brush. Sampling equipment was rinsed with potable water to remove loose dirt, and was rinsed a second time with deionized water to rinse the equipment.

Decontamination water, purge water, and soil cuttings were transferred to 55 gallon steel drums provided by Boart Longyear. Drums were labeled to indicate the area from which soil cuttings originated. At the conclusion of all field work, two drums of water and 8 drums of soil had been generated. Following receipt of approval from EPA, soil/personal protective equipment (PPE) was disposed at the Hillsboro Landfill and water was disposed at the Emerald Services facility in Tacoma, Washington.

### **3.7 Deviations from the Work Plan and QAPP**

1. The Investigation Work Plan called for the collection of eight groundwater samples. Following collection of four groundwater samples from the portion of the groundwater characterization area located in Area 4, EPA directed the University to stop groundwater sampling activities due to the unanticipated groundwater depth encountered. As a result, four groundwater samples were not collected from the portion of the groundwater characterization area located in Areas 3 and RS-3

(Figures 6 and 7). EPA may require that the four groundwater samples that were not collected be collected in the future.

2. Due to low yield, groundwater sample 4-1 was not collected using a low-stress sampling method. Sample bottles were filled by pumping the boring dry with a peristaltic pump, allowing groundwater levels to recover, and pumping the boring dry again.
3. Thirty-two parent samples were collected from Area 5A, and 31 parent samples were collected from Area 1A, instead of the 30 parent samples specified in the Work Plan. This occurred inadvertently, as a result of encountering waste in designated increment locations. This deviation is not considered to affect the acceptability of composite sample testing results in Areas 1A and 5A.

## 4.0 LABORATORY RESULTS

As described in Section 3.3, and consistent with the Sampling Investigation Work Plan and Sampling and Analysis Plan (AMEC, 2006b), three multi-increment samples generally composed of 30 parent samples were collected in each of the 17 Site areas. An additional multi-increment sample also was collected to characterize soils adjacent to and southwest of the railroad right of way property. Thus, the total number of multi-increment samples collected and submitted for laboratory testing included 52 samples.

During field sampling activities, evidence of contaminated soil was observed at a number of locations. Evidence observed included staining, odor, and elevated PID screening results. A total of 24 samples were collected to characterize soil containing suspected contamination. Of the 24 collected, 18 were submitted for laboratory analysis. Six samples were not submitted for analysis because they were considered to be redundant with nearby, representative samples that were submitted for analysis.

The data quality evaluation summary is in Section 4.1 below. Laboratory results for multi increment samples are discussed in Section 4.2. Laboratory results for waste samples are discussed in Section 4.3. Groundwater testing results are discussed in Section 4.4.

When comparing analyte detections to screening levels, the primary screening values used for soil are JSCS SLVs. Secondary screening values are EPA Region 6 outdoor occupational HHSLs. For TPH (diesel and heavy oil) in soil, AMEC was instructed by EPA to use a screening level of 500 mg/kg.

For groundwater, primary screening values used for comparison purposes are DEQ 2004 chronic ambient water quality criteria from the JSCS, also referred to as SLVs herein. Secondary groundwater screening values are EPA Region 6 residential HHSLs.

## 4.1 Data Quality Evaluation Summary

The overall quality of the dataset was sufficient to meet project data quality objectives (DQOs), and the overall completeness of the dataset exceeded 98%. Any limitations to usability noted during data quality review were documented in the project database by the addition of expert review qualifiers to any affected result. These qualifications are discussed below:

A total of 76 soil, waste, and water samples were analyzed and 3,502 data records were evaluated. Of these, a total of 52 results (~1.5%) were rejected during data validation. Specific limitations include the following:

- AMEC rejected the nondetected antimony results from 52 solid samples due to very low (<10%) matrix spike recovery. The poor antimony recovery was likely due to preparation of metals by USEPA Method 3050 rather than by closed cup digestion.

Any identified QC anomalies other than those discussed above were relatively minor and resulted in the data being qualified as estimated concentrations. Qualifications included unacceptable surrogate, laboratory control sample, and matrix spike recovery; result detection between the method detection limit and method reporting limit; problems with initial and continuing calibration, presumptive chromatographic identification; imprecision in laboratory and field duplicate analyses; detected concentration exceeding an instrument's upper calibration level; and holding time exceedance. These qualifications did not adversely affect overall usability of the data set for constituents of potential concern.

Field duplicate analyses were performed on three multi-increment samples:

**Sample MI-4(B) DUP (MI-4(B))** was analyzed for metals. Relative percent differences (RPD) between parent and field duplicate samples were within the Quality Assurance Project Plan (QAPP)-specified acceptance limit of 25% for all analytes, except as described below:

- Lead was detected in the primary sample at 11.9 mg/kg and in the field duplicate sample at 36.0 mg/kg for a RPD of 101%. AMEC J qualified the detected lead results from the primary and duplicate samples due to imprecision between duplicate analyses.

**Sample MI-RS-3(A) DUP (MI-RS-3(A))** was analyzed for PCBs. RPDs between parent and field duplicate samples were within the QAPP-specified acceptance limit of 25% for all analytes.

**Sample MI-6A(B) DUP (MI-6A(B))** was analyzed for PAHs. RPDs between parent and field duplicate samples were within the QAPP-specified acceptance limit of 25% for all analytes.

## 4.2 Multi-increment Soil Sample Results

From each of the 17 Site areas, 30 parent samples were collected from each of three depth horizons. Depth horizons were designated A (0-1 feet bgs), B (4-5 feet bgs), and C (5-10 feet bgs). Each of the 30 parent samples from each depth horizon were ground, and then composited to create a single multi-increment sample for each of the three depth horizons. The results of multi-increment soil testing are summarized below in Sections 4.2.1 through 4.2.18.

### 4.2.1 Area 1A

Multi-increment soil samples from each Area 1A depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs and PCBs were not detected in any Area 1A multi-increment samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). However, neither copper nor zinc concentrations detected in the A, B, and C depth horizon multi-increment samples exceeded background concentrations.

#### 4.2.2 Area 1B

Multi-increment soil samples from each Area 1B depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected in each depth horizon multi-increment sample. In the A horizon, acenaphthene, anthracene, flouranthene, flourene, phenanthrene, pyrene, benzo(a)anthracene, benzo(g,h,i)perylene, chrysene, and indeno(1,2,3-cd)pyrene all exceeded SLV screening values (Table 3). In the B horizon, acenaphthene, anthracene, flouranthene, flourene, naphthalene, phenanthrene, pyrene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, and indeno(1,2,3-cd)pyrene all exceeded SLV screening values. In the C horizon, only phenanthrene was detected at a concentration exceeding SLV screening values.

PCBs were not detected in any Area 1B multi-increment samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). However, neither copper nor zinc concentrations detected in the A, B and C depth horizon multi-increment samples exceeded background concentrations.

#### 4.2.3 Area 1C

Multi-increment soil samples from each Area 1C depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs, metals, and PCP. Petroleum hydrocarbons were detected in the A and B depth horizon multi-increment samples. The sum of diesel and heavy oil range hydrocarbons in the A and B samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2). Petroleum hydrocarbons were not detected in the C sample.

PAHs were detected in the A and B depth horizon multi-increment samples at concentrations below SLV screening values (Table 3). PAHs were not detected in the C horizon multi-increment sample.

PCBs were detected in the A depth horizon multi-increment sample at a concentration below the SLV screening value (Table 4). PCBs were not detected in the B or C samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLVs (Table 5). However, neither copper nor zinc concentrations detected in the A, B and C depth horizon multi-increment samples exceeded background concentrations. Cadmium was detected in the A sample at a concentration exceeding the SLV screening level, but below the background concentration.

PCP was detected in the A depth horizon multi-increment sample, but the concentration detected did not exceed SLV screening values (Table 9). PCP was not detected in the B or C horizon samples.

#### **4.2.4 Area 2A**

Multi-increment soil samples from each Area 2A depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected in each depth horizon multi-increment sample. In the A horizon, indeno(1,2,3-cd)pyrene and phenanthrene were detected at concentrations exceeding SLV screening values (Table 3). Detections of PAHs in the B and C horizon samples were below SLV screening values.

PCBs were detected in the A depth horizon multi-increment sample at a concentration below the SLV screening value (Table 4). PCBs were not detected in the B or C horizon samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). In the A horizon, copper, and zinc were detected at concentrations exceeding background levels. Cadmium also was detected in the A horizon, at a concentration exceeding SLV screening values, but below background concentration. In the B depth horizon, zinc was detected at a concentration exceeding background levels. In the C horizon, copper and zinc concentrations did not exceed background concentrations.

#### **4.2.5 Area 2B**

Multi-increment soil samples from each Area 2B depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected in each depth horizon multi-increment sample. PAHs were detected at concentrations below SLV screening values in the A, B, and C horizon samples (Table 3).

PCBs were detected in the A horizon multi-increment sample at a concentration below the SLV screening value (Table 4). PCBs were not detected in horizon B or C samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). In the A horizon sample, both copper and zinc were detected at concentrations exceeding background levels. Cadmium also was detected in the A sample at a concentration exceeding the SLV screening value, but below the background level. Neither copper nor zinc concentrations detected in the B or C depth horizon multi-increment samples exceeded background concentrations.

#### **4.2.6 Area 3A**

Multi-increment soil samples from each Area 3A depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were not detected in any Area 3A multi-increment samples.

PCBs were detected in the A horizon sample. Aroclor 1254 was detected at a concentration exceeding the SLV screening value (Table 4). PCBs were not detected in the B and C horizon samples from Area 3A.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). However, neither copper nor zinc concentrations detected in the A, B and C depth horizon multi-increment samples exceeded background concentrations. Cadmium also was detected in the A depth horizon sample at a concentration exceeding the SLV screening value, but below the background concentration.

#### **4.2.7 Area 3B**

Multi-increment soil samples from each Area 3B depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected in the A and B horizon multi-increment samples at concentrations below SLV screening values (Table 3). PAHs were not detected in the C horizon sample.

PCBs were detected in the A horizon multi-increment sample. Aroclor 1254 was detected at a concentration exceeding the SLV screening value (Table 4). PCBs were not detected in the B or C horizon samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). However, neither copper nor zinc concentrations detected in the A, B and C depth horizon multi-increment samples exceeded background concentrations.

#### **4.2.8 Area 4**

Multi-increment soil samples from each Area 4 depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs, and metals. In addition, the A horizon multi-increment sample was analyzed for dioxins/furans. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected only in the A depth horizon multi-increment sample (Table 3). None of the PAHs detected in the A horizon sample exceeded SLV screening values.

PCBs were not detected in Area 4 depth horizon multi-increment samples (Table 4).

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). In addition, copper exceeded background concentrations in the A horizon sample, and zinc exceeded background concentrations in the A and B horizon samples.

Dioxins were detected in the A depth horizon multi-increment sample. The total 2,3,7,8-TCDD equivalents (TEQ) concentration detected was below the SLV screening value (Table 6).

#### **4.2.9 Area 5A**

Multi-increment soil samples from each Area 5A depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs, metals, and tributyltin. In addition, the A depth horizon multi-increment sample was analyzed for dioxins/furans. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected in the A horizon multi-increment sample at a concentration below the SLV screening values (Table 3). PAHs were not detected in the B and C horizon samples.

PCBs were not detected in any Area 5A multi-increment samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). In addition, copper exceeded background concentrations in the A and B horizon samples and zinc exceeded background concentrations in the A horizon sample. Cadmium also was detected in the A horizon sample at a concentration exceeding the SLV screening value, but below the background concentration.

Dioxins were detected in the Area 5A A depth horizon multi-increment sample. The total TEQ concentration detected was below the SLV screening value (Table 6).

Tributyltin was not detected in any Area 5A multi-increment samples.

#### **4.2.10 Area 5B**

Multi-increment soil samples from each Area 5B depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. In addition, the A depth horizon multi-increment sample was analyzed for dioxins/furans.

Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected in each depth horizon multi-increment sample at concentrations below the SLV screening values (Table 3).

PCBs were detected in the A horizon multi-increment sample. Aroclor 1254 was detected at a concentration exceeding the SLV screening value (Table 4). PCBs were not detected in the B and C horizon samples.

Metals were detected in each depth horizon multi-increment sample. In the A and C horizons, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). In the B horizon, zinc was detected at a concentration exceeding the SLV screening value. However, neither copper nor zinc concentrations detected in the A, B and C depth horizon multi-increment samples exceeded background concentrations. Cadmium also was detected in the A horizon sample at a concentration exceeding the SLV screening value, but below background level.

Dioxins were detected in the Area 5B A depth horizon multi-increment sample. The total TEQ concentration detected exceeded the SLV screening value (Table 6).

#### **4.2.11 Area 6A**

Multi-increment soil samples from each Area 6A depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs, metals and tributyltin. In addition, the A depth horizon multi-increment sample was analyzed for dioxins/furans. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A and B samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2). The sum of diesel and heavy oil range hydrocarbons in the C horizon sample exceeded the screening level.

PAHs were detected in each depth horizon multi-increment sample. In the A horizon, indeno(1,2,3-cd)pyrene and pyrene exceeded the SLV screening values (Table 3). PAHs detected in the B and C horizon samples were at concentrations below the SLV screening values.

PCBs were detected in the A horizon multi increment sample. Aroclor 1254 was detected at a concentration exceeding the SLV screening value (Table 4). PCBs were not detected in the B and C horizon multi-increment samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). In addition, copper and zinc were detected at concentrations exceeding background levels in the A and B horizon samples. Cadmium also was detected in the A horizon sample at a concentration exceeding the SLV screening value, but below its background level.

Dioxins were detected in the Area 6A A depth horizon multi-increment sample. The total TEQ concentration detected was below the SLV screening value (Table 6).

Tributyltin was detected in the Area 6A A depth horizon multi-increment sample at a concentration below the SLV screening value (Table 7). Tributyltin was not detected in the B and C horizon samples.

#### **4.2.12 Area 6B**

Multi-increment soil samples from each Area 6B depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. In addition, the A depth horizon multi-increment sample was analyzed for dioxins/furans. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected only in the A horizon multi-increment sample. Indeno(1,2,3-cd)pyrene was detected at a concentration exceeding its SLV screening value (Table 3). PAHs were not detected in the B and C horizon samples.

PCBs were detected in the A horizon multi-increment sample at a concentration below the SLV screening value (Table 4). PCBs were not detected in the B and C horizon samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). In addition, zinc was detected at a concentration exceeding background level in the A horizon sample. Neither copper nor zinc concentrations detected in the B and C depth horizon multi-increment samples exceeded background concentrations. Cadmium also was detected in the A horizon sample at a concentration exceeding the SLV screening value, but below its background level.

Dioxins were detected in the Area 6B A depth horizon multi-increment sample. The total TEQ concentration detected was below the SLV screening value (Table 6).

#### **4.2.13 Area 6C**

Multi-increment soil samples from each Area 6C depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs, metals, and tributyltin. In addition, the A horizon multi-increment sample was analyzed for dioxins/furans. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the C sample exceeded the screening level assigned by the EPA of 500 mg/kg (Table 2). In horizon A and B samples, petroleum hydrocarbon concentrations were below SLV screening values.

PAHs were detected in each depth horizon multi-increment sample at concentrations below SLV screening values (Table 3).

PCBs were detected in the A and B horizon multi-increment samples at concentrations below SLV screening values (Table 4). PCBs were not detected in the C horizon sample.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding both SLV screening values and background concentrations (Table 5). Cadmium also was detected in the A horizon sample at a concentration exceeding the SLV screening value, but below its background level.

Dioxins were detected in the A horizon sample from Area 6C. The total TEQ concentration was below the SLV screening level (Table 6).

Tributyltin was not detected in any Area 6C depth horizon multi-increment sample.

#### **4.2.14 Area 6D**

Multi-increment soil samples from each Area 6D depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. In addition, the A depth horizon multi-increment sample was analyzed for dioxins/furans and PCP. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the C sample exceeded the screening level assigned by the EPA of 500 mg/kg (Table 2). In horizon A and B samples, petroleum hydrocarbon concentrations were below SLV screening values.

PAHs were detected in each depth horizon multi-increment sample (Table 3). However, concentrations detected all were below SLV screening values.

PCBs were detected in the A horizon sample at a concentration below the SLV screening value (Table 4). PCBs were not detected in the B and C horizon multi-increment samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). In addition, copper and zinc were detected at concentrations exceeding background levels in the A horizon sample. Cadmium also was detected in the A horizon sample at a concentration exceeding the SLV screening value, but below its background level.

Dioxins were detected in the Area 6D A depth horizon multi-increment sample. The total TEQ concentration exceeded the SLV screening value (Table 6).

#### **4.2.15 Area RS-1**

Multi-increment soil samples from each Area RS-1 depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs, metals, and tributyltin. In addition, the A depth horizon sample was analyzed for dioxins/furans. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected in each depth horizon multi-increment sample. Indeno(1,2,3-cd)pyrene was detected at concentrations exceeding SLV screening values in the B and C horizon samples (Table 3).

PCBs were detected in each depth horizon multi-increment sample. Aroclor 1254 was detected at concentrations exceeding SLV screening values in the B and C horizon samples (Table 4).

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding both SLV screening values and background concentrations (Table 5).

Dioxins were detected in the Area RS-1 A depth horizon multi-increment sample. The total TEQ concentration exceeded the SLV screening value (Table 6).

Tributyltin was detected in each depth horizon multi-increment sample at concentrations below the SLV screening level (Table 7).

#### **4.2.16 Area RS-2**

Multi-increment soil samples from each Area RS-2 depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs, metals, and tributyltin. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B, and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected in the A and C horizon multi-increment samples at concentrations below the SLV screening values (Table 3). PAHs were not detected in the B horizon sample.

PCBs were detected in the A horizon multi-increment sample. Aroclor 1254 was detected at a concentration exceeding the SLV screening value (Table 4). PCBs were not detected in the B and C horizon samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). In addition, copper exceeded the background concentration in the C horizon sample and zinc exceeded the background concentration in the A and B horizon samples. Cadmium also was detected in the A horizon sample at a concentration exceeding the SLV screening value, but below its background level.

Dioxins were detected in the Area RS-2 A depth horizon multi-increment sample. The total TEQ concentration was below the SLV screening value (Table 6).

Tributyltin was detected in the A and C horizon samples at concentrations below the SLV screening value (Table 7). Tributyltin was not detected in the B horizon sample.

#### **4.2.17 Area RS-3**

Multi-increment soil samples from each Area RS-3 depth horizon were tested for diesel and heavy oil range petroleum hydrocarbons, PAHs, PCBs and metals. In addition, the A depth horizon sample was analyzed for dioxins/furans. Petroleum hydrocarbons were detected in each depth horizon multi-increment sample. The sum of diesel and heavy oil range hydrocarbons in the A, B and C samples did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2).

PAHs were detected in each depth horizon multi-increment sample at concentrations below SLV screening levels (Table 3).

PCBs were detected in the A horizon multi-increment sample at a concentration below SLV screening levels (Table 4). PCBs were not detected in the B and C horizon samples.

Metals were detected in each depth horizon multi-increment sample. In each depth horizon, copper and zinc were detected at concentrations exceeding SLV screening values (Table 5). However, neither copper nor zinc concentrations detected in the A, B and C depth horizon multi-increment samples exceeded background concentrations.

Dioxins were detected in the Area RS-3 A depth horizon multi-increment sample (Table 6). The total TEQ concentration detected exceeded the SLV screening value.

#### **4.2.18 Railroad Multi-increment Sample**

The railroad multi-increment sample was tested for diesel and heavy oil range petroleum hydrocarbons and PAHs. The sum of diesel and heavy oil range hydrocarbons detected in the railroad multi-increment sample did not exceed the screening level assigned by the EPA of 500 mg/kg (Table 2). PAHs were detected in the railroad multi-increment sample at concentrations below SLV screening levels (Table 5).

### **4.3 Waste Sample Testing Results**

A total of 24 waste samples were collected where evidence of contamination was identified during Removal Action Investigation field activities. A total of 18 waste samples were submitted for analytical testing. Six samples were not analyzed because they were considered redundant with another waste sample collected nearby in the same depth interval. The testing suite for each sample was selected based upon the type of contamination evidence noted in the field. For example, if a gasoline-like odor was noted, and an elevated PID measurement collected, the sample was analyzed for gasoline and VOCs. Most samples exhibited an oil-like odor, and only slightly elevated PID measurement. These samples typically were tested for diesel/heavy oil and PAHs. The results of waste sample soil testing are summarized by area below in Sections 4.3.1 through 4.3.17.

#### **4.3.1 Area 1A**

No waste samples were collected in Area 1A.

#### **4.3.2 Area 1B**

No waste samples were collected in Area 1B.

#### **4.3.3 Area 1C**

No waste samples were collected in Area 1C.

#### **4.3.4 Area 2A**

A single waste sample (WS-2A(9.0-10.0)-16) was collected in Area 2A. The sample exhibited a tar-like odor. It was tested for diesel and heavy oil range hydrocarbons, and PAHs. Diesel and heavy oil range hydrocarbon concentrations of 10,000 and 17,000 mg/kg, respectively, were detected in the sample. PAHs detected in the sample included acenaphthene, flourene, pyrene and chrysene. All PAH concentrations except pyrene exceeded SLV screening values.

Following the observance of this waste material, a second boring was drilled 5 feet from boring 2A-16. Waste material was not observed in this boring. Based upon this second boring, it appears that the waste material is limited in its lateral extent. As the vertical extent of the waste was not observed, its vertical extent is unknown.

#### **4.3.5 Area 2B**

A single waste sample (WS-2B(0-2)-30) was collected in Area 2B. The sample was a gravel, and exhibited a moderate diesel-like odor. It was tested for diesel and heavy oil range hydrocarbons, and PAHs. Diesel and heavy oil range hydrocarbon concentrations of 490 and 2,200 mg/kg, respectively, were detected in the sample. The sum of diesel and heavy oil range hydrocarbons exceeded the screening level assigned by the EPA of 500 mg/kg. PAHs were not detected in the sample.

Multi-increment samples were collected in the same boring as the waste sample, beginning at a depth of 3 feet bgs. Neither petroleum hydrocarbons nor PAHs exceeded screening levels in the three multi-increment samples, indicating that the vertical extent of the waste material is limited. Based upon the results of sampling done nearby (borings DP-A2-06, DP-A2-07, DP-A2-08, and 2B-16 through 2B-20), it appears that the waste material is limited in its lateral extent as well.

#### 4.3.6 Area 3A

A single waste sample (WS-3A(9.6-10.0)-2A) was collected in Area 3A. The sample exhibited a moderate diesel-like odor, but did not yield an elevated PID measurement. It was tested for diesel and heavy oil range hydrocarbons, and PAHs. Diesel and heavy oil range hydrocarbon concentrations of 4,800 and 2,200 mg/kg, respectively, were detected in the sample. The sum of diesel and heavy oil range hydrocarbons exceeded the screening level assigned by the EPA of 500 mg/kg. Several PAHs were detected in the sample, but none at concentrations exceeding SLV screening levels.

After noting a similar diesel-like odor in a second boring located 5 feet north of boring 3A-2, a third boring was drilled 5 feet further north of boring 3A-2. Multi-increment samples were collected in this third boring as soils in this boring did not exhibit a diesel-like odor. Based upon the results of sampling done nearby (borings GP-52, GP-139, and 3A-1), it appears that the waste material is limited in its lateral extent. As the vertical extent of the waste was not observed, its vertical extent is unknown.

#### 4.3.7 Area 3B

Waste samples collected in Area 3B, and tested in the laboratory include:

- WS-3B(8.0-10.0)-1; and
- WS-3B(4.5-5.0)-3.

##### ***WS-3B(8.0-10.0)-1***

This waste sample exhibited a moderate diesel-like odor and a PID screening measurement of 16 ppm. A waste sample was collected from boring 3B-1, and an alternate boring was drilled 5 feet from the original boring. As no evidence of contamination was noted, multi-increment samples were collected from this boring.

The waste sample collected from boring 3B-1 was tested for diesel and heavy oil range hydrocarbons, and PAHs. Neither hydrocarbons nor PAHs were detected in the sample. As TPH and PAHs were not detected in this sample, no further actions are warranted related to this waste sample.

### **WS-3B(4.5-5.0)-3**

This waste sample exhibited a moderate diesel-like odor and a PID screening measurement of 29 ppm. A waste sample was collected from boring 3B-3, and an alternate boring was drilled 5 feet from the original boring. As no evidence of contamination was noted in this boring, multi-increment samples were collected.

The waste sample collected from boring 3B-3 was tested for diesel and heavy oil range hydrocarbons, and PAHs. Diesel and heavy oil range concentrations of 64 and 330 mg/kg, respectively, were detected in WS-3B(4.5-5.0)-3. The sum of diesel and heavy oil range hydrocarbons in this sample did not exceed the screening level assigned by the EPA of 500 mg/kg. PAHs were detected in WS-3B(4.5-5.0)-3, but none at concentrations exceeding SLV screening levels. As TPH and PAH concentrations in this sample did not exceed screening levels, no further actions are warranted related to this waste sample.

#### **4.3.8 Area 4**

No waste samples were collected in Area 4.

#### **4.3.9 Area 5A**

A single waste sample (WS-5A(5-6)-15) was collected in Area 5A. This waste sample exhibited a moderate solvent-like odor and a PID screening measurement of 90 ppm. A waste sample was collected from boring 5A-15, and an alternate boring was drilled 10 feet from the original boring. As no evidence of contamination was noted in this boring, multi-increment samples were collected from it.

The waste sample collected from boring 5A-15 was tested for VOCs. Analytes detected in the sample included methylene chloride (510 µg/kg), acetone (330 µg/kg), 2-butanone (350 µg/kg), 1,2,4-trimethylbenzene (120 µg/kg), sec-butylbenzene (63 µg/kg) and n-butylbenzene (79 µg/kg). None of these analyte concentrations exceeded EPA Region 6 residential human health screening values. As VOC concentrations in this sample did not exceed screening levels, no further actions are warranted related to this waste sample.

#### **4.3.10 Area 5B**

No waste samples were collected in Area 5B.

#### 4.3.11 Area 6A

Waste samples collected in Area 6A, and tested in the laboratory include:

- WS-6A(8-8.5)-8B;
- WS-6A(8-8.5)-8C;
- WS-6A(8.5-9)-9A; and
- WS-6A(3-4)-23.

##### **WS-6A(8-8.5)-8**

This waste sample exhibited a slight oil-like odor and a PID screening measurement of 10 ppm. A waste sample was collected from boring 6A-8A, and an alternate boring (6A-8B) was drilled 10 feet from the original boring. Evidence of contamination was noted in boring 6A-8B, so a third boring was drilled 10 feet away. Again, soil in the depth interval 8-8.5 feet bgs exhibited an oil-like odor, so a fourth boring (6A-8) was drilled. As no evidence of contamination was noted in 6A-8, multi-increment samples were collected from this boring.

Waste samples collected from borings 6A-8B and 6A-8C were tested for diesel and heavy oil range hydrocarbons, and PAHs. Diesel and heavy oil range concentrations of 5,300 and 1,200 mg/kg, respectively, were detected in WS-6A(8-8.5)-8B. Diesel and heavy oil range concentrations of 5,600 and 27,000 mg/kg, respectively, were detected in WS-6A(8-8.5)-8C. The sum of diesel and heavy oil range hydrocarbons in both samples exceeded the screening level assigned by the EPA of 500 mg/kg.

Multiple PAHs were detected in WS-6A(8-8.5)-8B, but only three at concentrations exceeding SLV screening levels. These included acenaphthene (790 µg/kg), fluorene (2,200 µg/kg), and phenanthrene (3,900 µg/kg). Multiple PAHs also were detected in WS-6A(8-8.5)-8C, and five exceeded SLV screening levels including acenaphthene (380 µg/kg), benzo(g,h,i)perylene (410 µg/kg), chrysene (1,600 µg/kg), indeno(1,2,3-cd)pyrene (190 µg/kg), and pyrene (2,500 µg/kg).

##### **WS-6A(8.5-9.0)-9A**

This waste sample exhibited a slight oil-like odor and a PID screening measurement of 26.7 ppm. A second boring was drilled 5 feet away from the original location. A second waste sample was collected in the interval 9.5 to 10 feet bgs in this boring, but was not tested because it was considered redundant. A multi-increment sample also was collected from this second boring.

WS-6A(8.5-9.0)-9A was tested for diesel and heavy oil range hydrocarbons, and PAHs. Diesel and heavy oil range concentrations of 210 mg/kg and 610 mg/kg, respectively, were detected in WS-6A(8.5-9.0)-9A. The sum of diesel and heavy oil range hydrocarbons exceeded the screening level assigned by the EPA of 500 mg/kg. Multiple PAHs were detected in WS-6A(8.5-9.0)-9A. However, none exceeded SLV screening levels.

#### **WS-6A(3-4)-23**

This waste sample exhibited a slight oil-like odor and a PID screening measurement of 60 ppm. A waste sample and multi-increment samples were collected from boring 6A-23.

Waste samples collected from borings 6A-23 were tested for diesel and heavy oil range hydrocarbons, and PAHs. Diesel and heavy oil range concentrations of 3,600 and 220 mg/kg, respectively, were detected in WS-6A(3-4)-23. The sum of diesel and heavy oil range hydrocarbons exceeds the screening level assigned by the EPA of 500 mg/kg. Multiple PAHs were detected in WS-6A(3-4)-23, but only two at concentrations exceeding SLV screening levels. These included fluorene (1,400 µg/kg) and phenanthrene (2,200 µg/kg).

#### **4.3.12 Area 6B**

A single waste sample (WS-6B(7-10)-8A) collected in Area 6B was submitted for laboratory testing. This waste sample exhibited a moderate solvent-like odor and a PID screening measurement of 50 ppm. A waste sample was collected from the initial boring (6B-8A), and an alternate boring (6B-8B) was drilled nearby. A solvent-like odor also was noted at the same depth interval in 6B-8B, so a third boring was drilled. As no evidence of contamination was noted in this boring, so multi-increment samples were collected from it.

The waste sample collected from boring 6B-8A was tested for VOCs. Analytes detected in the sample included methylene chloride (320 µg/kg), acetone (400 µg/kg), 2-butanone (430 µg/kg), sec-butylbenzene (160 µg/kg) and n-butylbenzene (470 µg/kg). None of these analyte concentrations exceeded EPA Region 6 residential human health screening values. As VOCs concentrations did not exceed screening levels, no further actions are warranted related to this waste sample.

#### **4.3.13 Area 6C**

No waste samples were collected in Area 6C.

#### **4.3.14 Area 6D**

Waste samples collected in Area 6D, and tested in the laboratory include:

- WS-6D(9.5-10.0)-6;
- WS-6D(2.0-2.5)-8;
- WS-6D(4.5-5.0)-13A;
- WS-6D(4.5-5.0)-13B; and
- WS-6D(9-10)-14B.

##### ***WS-6D(9.5-10.0)-6***

This waste sample exhibited a slight solvent-like odor and a PID screening measurement of 100 ppm. A waste sample was collected from 6D-6, and an alternate boring was drilled 5 feet from the original boring. No evidence of contamination was noted in this boring, so multi-increment samples were collected from it.

The waste sample collected from boring 6D-6 was tested for VOCs. Analytes detected in the sample included methylene chloride (48 µg/kg), acetone (150 µg/kg), and 4-isopropyltoluene (100 µg/kg). None of these analyte concentrations exceeded EPA Region 6 residential human health screening values. As VOCs did not exceed screening levels, no further actions are warranted related to this waste sample.

##### ***WS-6D(2.0-2.5)-8***

This waste sample was collected from a thin vertical interval where what appeared to be treated wood and associated petroleum hydrocarbon contamination was observed. A waste sample was collected from 6D-8, and an alternate boring was drilled 5 feet from the original boring. No evidence of contamination was noted in this boring, so multi-increment samples were collected from it.

The waste sample collected from boring 6D-8 was tested for petroleum hydrocarbons, PAHs, and PCP. Diesel and heavy oil range hydrocarbon concentrations of 13,000 and 24,000 mg/kg, respectively, were detected in the sample. The sum of diesel and heavy oil range hydrocarbons exceeded the screening level assigned by the EPA of 500 mg/kg.

Multiple PAHs were detected in the sample, but none at concentrations exceeding SLV screening levels. PCP also was not detected in the sample.

### ***WS-6D(4.5-5.0)-13***

This waste sample exhibited a strong petroleum odor and a PID screening measurement of up to 886 ppm. A waste sample was collected from boring 6D-13A, and an alternate boring (6D-13B) was drilled 5 feet from the original boring. Evidence of contamination was noted in boring 6D-13B, so a third boring (6D-13C) was drilled 5 feet away from boring 6D-13B. Again, soil at a depth of approximately 4-5 feet bgs exhibited a strong petroleum odor. A fourth boring was then drilled 50 feet from 6D-13A. As no evidence of contamination was noted in this boring, so multi-increment samples were collected from this fourth boring.

Waste samples collected from borings 6D-13A and 6D-13B were tested for gasoline, diesel and heavy oil range hydrocarbons. Waste sample WS-6D(4.5-5.0)-13A also was tested for VOCs and PAHs. Gasoline, diesel and heavy oil range hydrocarbon concentrations of 3,100, 5,300 and 14,000 mg/kg, respectively, were detected in WS-6D(4.5-5.0)-13A. Gasoline, diesel and heavy oil range concentrations of 5,400, 790 and 1,300 mg/kg, respectively, were detected in WS-6D(4.5-5.0)-13B. Both gasoline and the sum of diesel and heavy oil range hydrocarbons in both samples exceeded the TPH screening levels assigned by the EPA of 80 and 500 mg/kg, respectively.

A total of 14 VOCs were detected in WS-6D(4.5-5.0)-13A. The compounds and concentrations detected are summarized in Table 8. Three analyte concentrations exceeded SLV screening values including 1,2-dichlorobenzene, 1,4-dichlorobenzene, and naphthalene. None of the other 11 VOCs detected exceeded either SLV or EPA Region 6 residential human health screening levels.

Multiple PAHs were detected in WS-6D(4.5-5.0)-13A. Four PAH compounds were detected at concentrations exceeding SLV screening levels. These included acenaphthene (670 µg/kg), fluorene (1,200 µg/kg), naphthalene (5,500 µg/kg), and phenanthrene (3,200 µg/kg).

### ***WS-6D(9-10)-14***

This waste sample exhibited a moderate petroleum odor and a PID screening measurement of up to 185 ppm. A waste sample was collected from boring 6D-14A, and an alternate boring (6D-14B) was drilled 5 feet north of the original boring. Evidence of contamination was noted in boring 6D-14B, so a third boring was drilled

5 feet east of 6D-14A. As no evidence of contamination was noted in this boring, multi-increment samples were collected from this third boring.

Waste samples collected from boring 6D-14B were tested for diesel and heavy oil range hydrocarbons, PAHs and VOCs. The waste sample collected from boring 6D-14A was not analyzed because it was considered redundant with the sample from boring 6D-14B. Diesel and heavy oil range hydrocarbon concentrations of 6,100 and 2,400 mg/kg, respectively, were detected in WS-6D(9-10)-14B. The sum of diesel and heavy oil range hydrocarbons exceeded the TPH screening level assigned by the EPA of 500 mg/kg.

A total of 15 VOCs were detected in WS-6D(9.0-10.0)-14B. The compounds and concentrations detected are summarized in Table 8. Only 1,4-dichlorobenzene was detected at a concentration exceeding its SLV screening value. None of the other 14 VOCs detected exceeded either SLV or EPA Region 6 residential human health screening values.

Multiple PAHs were detected in WS-6D(9-10)-14B. Three PAH compounds were detected at concentrations exceeding SLV screening levels. These included acenaphthene (1,100 µg/kg), acenaphthylene (280 µg/kg), fluorene (3,000 µg/kg) and phenanthrene (5,800 µg/kg).

### ***Area RS-1***

A single waste sample (WS-RS1(5-6)-24) was collected in Area RS-1. The sample exhibited a slight petroleum-like odor. Following the observance of this waste material, a second boring was drilled 5 feet away. Waste material was not observed in this boring, and parent samples were collected from it.

The waste sample was tested for diesel and heavy oil range hydrocarbons, and PAHs. Diesel and heavy oil range hydrocarbon concentrations of 370 mg/kg and 890 mg/kg, respectively, were detected in the sample. The sum of diesel and heavy oil range hydrocarbons exceeded the screening level assigned by the EPA of 500 mg/kg. Multiple PAHs were detected in the sample, but only indeno(1,2,3-cd)pyrene at a concentration of 150 µg/kg exceeded an SLV screening value.

### ***Area RS-2***

No waste samples were collected in Area RS-2.

### **Area RS-3**

A single waste sample (WS-RS3(5-8)-1) was collected in Area RS-3. The sample had the appearance of charred wood. Following the observance of this waste material, a second boring was drilled 5 feet from boring RS3-1. Waste material was not observed in this boring, and parent samples were collected from it.

The waste sample was tested for diesel and heavy oil range hydrocarbons, PAHs, and metals. Diesel and heavy oil range hydrocarbon concentrations of 83 mg/kg and 190 mg/kg, respectively, were detected in the sample. The sum of diesel and heavy oil range hydrocarbons did not exceed the screening level assigned by the EPA of 500 mg/kg. Multiple PAH compounds were detected in the sample, but none at concentrations exceeding screening values.

Multiple PAHs were detected in the sample, but only indeno(1,2,3-cd)pyrene at a concentration of 150 µg/kg exceeded an SLV screening value.

Arsenic was detected at a concentration of 27.1 mg/kg. While this concentration does not exceed the JSCS SLV screening value of 33 mg/kg, it does exceed typical arsenic background concentrations of 7 mg/kg. Copper (51 mg/kg) and zinc (43 mg/kg) were detected at concentrations exceeding their respective SLV screening values, but did not exceed background concentrations.

## **4.4 Groundwater Sample Results**

Four groundwater samples (GW-4-1, GW-4-13, GW-4-22, and GW-4-5) were collected from the groundwater assessment area in Area 4 and analyzed for diesel and heavy oil range petroleum hydrocarbons, PAHs, and dissolved metals. Groundwater sampling field forms are included in Appendix C.

Diesel range hydrocarbons were detected in three of the Area 4 groundwater samples (Table 10). Diesel concentrations ranged from 0.3 to 3.8 mg/L. Heavy oil range hydrocarbons were not detected in the four groundwater samples analyzed.

Naphthalene was detected in groundwater sample GW-4-1 at a concentration below the SLV screening value (Table 11). PAHs were not detected in the remaining three groundwater samples.

Metals were detected in all four groundwater samples from Area 4. Zinc (410 µg/L) and nickel (24.4 µg/L) were detected at concentrations exceeding PGSLs in the GW-4-1 groundwater sample (Table 12). No other metal concentrations exceeded screening levels.

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## LIMITATIONS

This work plan was prepared exclusively for the University of Portland by AMEC Earth & Environmental, Inc. (AMEC). The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this work plan. This Sampling Investigation Work Plan is intended to be used by University of Portland for the Triangle Park Property, 5828 North Van Houten Place, Portland, Oregon only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

## **TABLES**

## FIGURES

## **APPENDIX A**

### Soil Core Photographs

## **APPENDIX B**

### Soil Core Lithologic Classification

## **APPENDIX C**

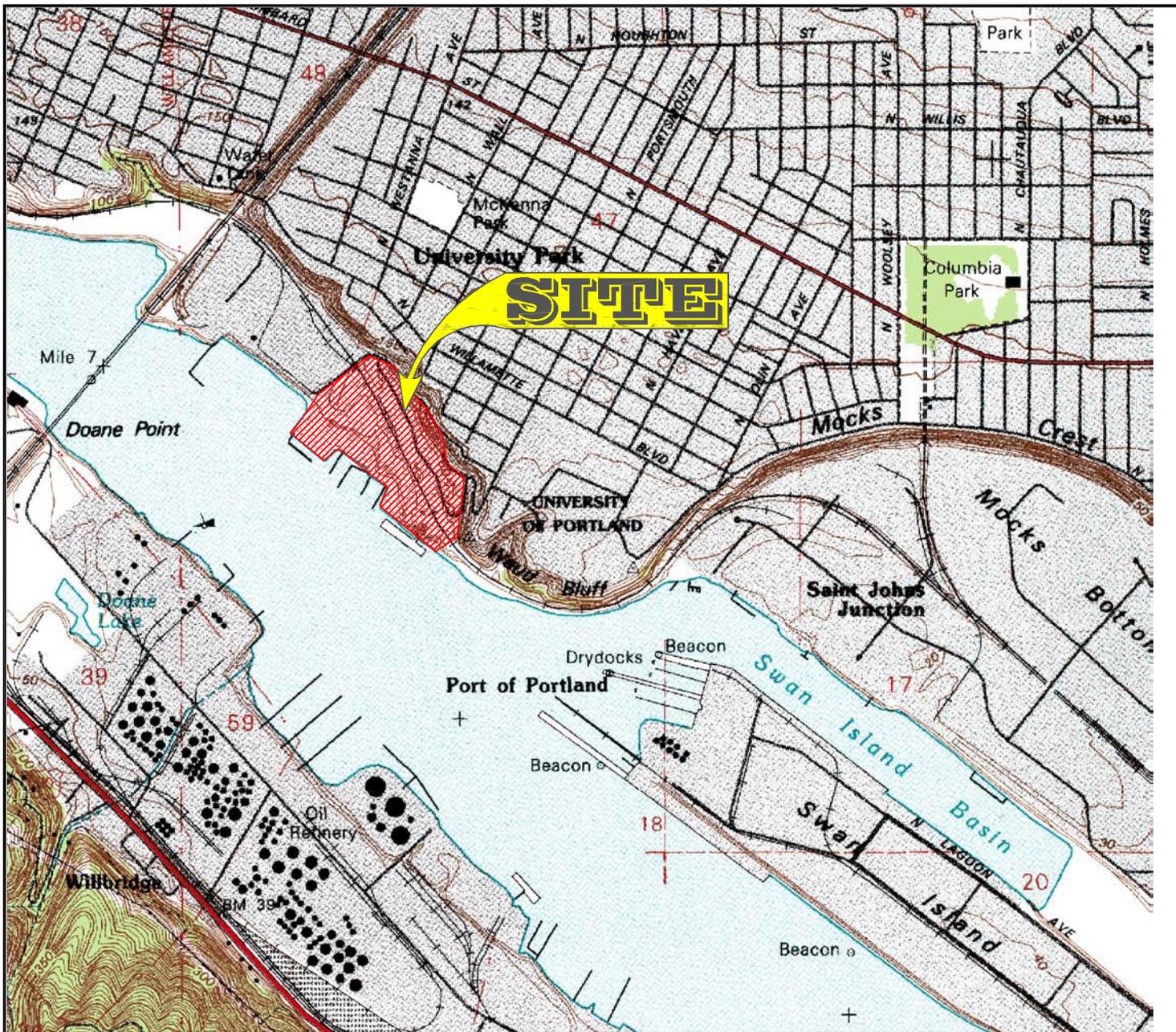
### Groundwater Sampling Field Forms

## **APPENDIX D**

### Chain of Custody Forms

## **APPENDIX E**

### Laboratory Data Summaries



ROAD CLASSIFICATION

- Heavy-duty
- Medium-duty
- Light-duty
- Unimproved dirt
- U.S. Route
- State Route
- Interstate Route

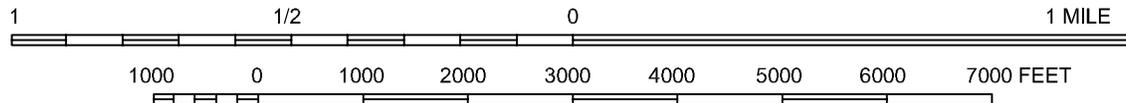
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QUADRANGLE LOCATION

SCALE 1 : 24,000



**AMEC Earth & Environmental**

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Portland OR, U.S.A. 97224



CLIENT  
**TRIANGLE PARK**  
5828 N. VAN HOUTEN PLACE  
PORTLAND, OREGON

PROJECT **TRIANGLE PARK**

DWN BY: DD      DATUM: -      DATE: DECEMBER 2006

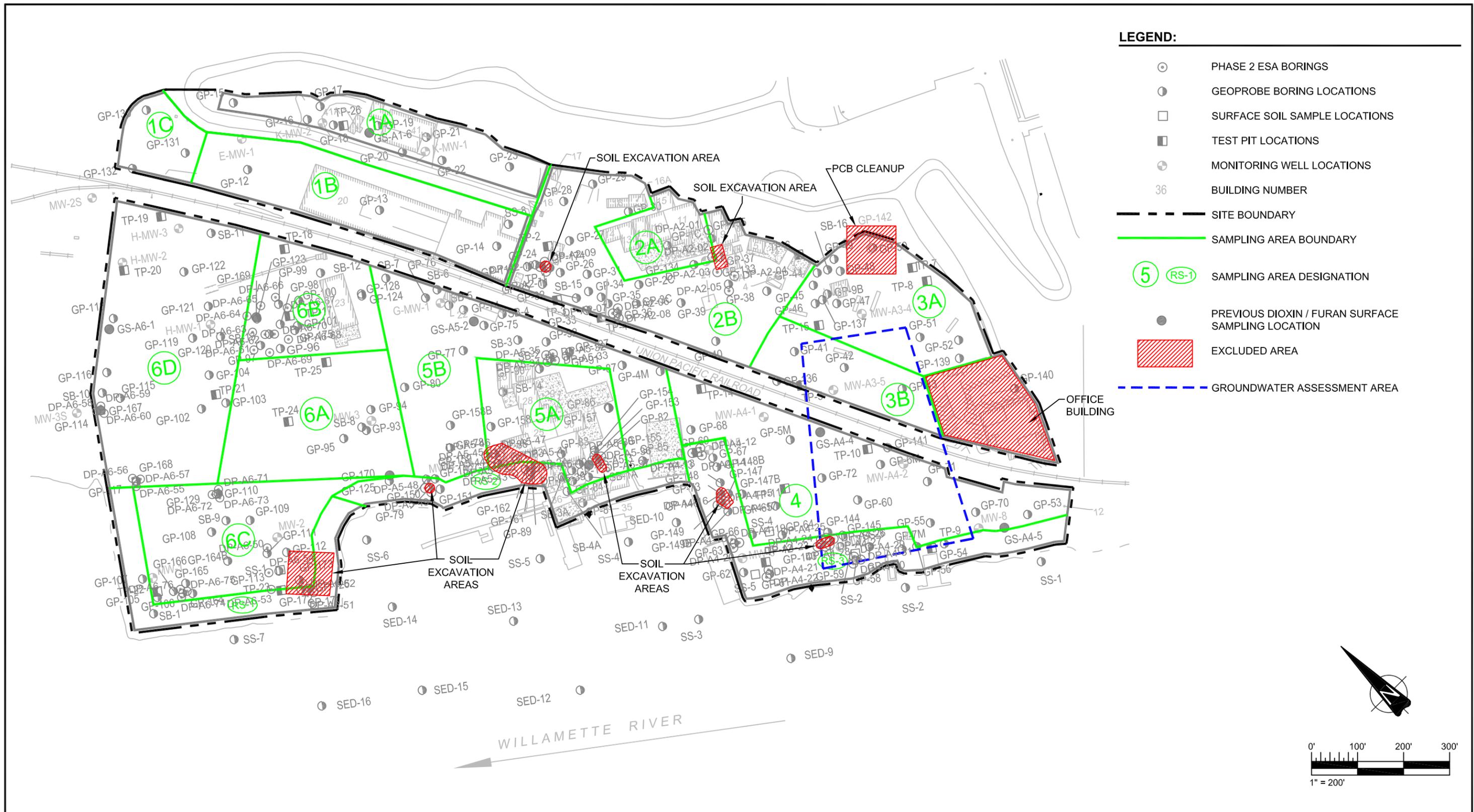
TITLE **SITE LOCATION MAP**

CHK'D BY: MK      REV. NO.: -      PROJECT NO: 6-61M-11417-3

PROJECTION: -      SCALE: AS NOTED      FIGURE No. 1



<b>AMEC Earth &amp; Environmental</b> 7376 S.W. Durham Road Portland OR, U.S.A. 97224				CLIENT <b>TRIANGLE PARK</b> <b>5828 N. VAN HOUTEN PLACE</b> <b>PORTLAND, OREGON</b>	
PROJECT <b>TRIANGLE PARK</b>		DWN BY: DD	DATUM: -	DATE: DECEMBER 2006	
TITLE <b>SITE BOUNDARY</b>		CHK'D BY: MK	REV. NO.: -	PROJECT NO: 6-61M-11417-3	
		PROJECTION: -	SCALE: AS NOTED	FIGURE No. <b>2</b>	



BASEMAP AND PREVIOUS SAMPLING LOCATIONS PROVIDED BY MAUL FOSTER LONGI, INC. HOT SPOT LOCATIONS FROM MAUL FOSTER LONGI, INC. FIGURE 10 "LOCATIONS AND SOIL VOLUMES EXCEEDING HOT SPOT CONCENTRATIONS FOR HUMAN AND ECOLOGICAL RECEPTORS".

CLIENT LOGO

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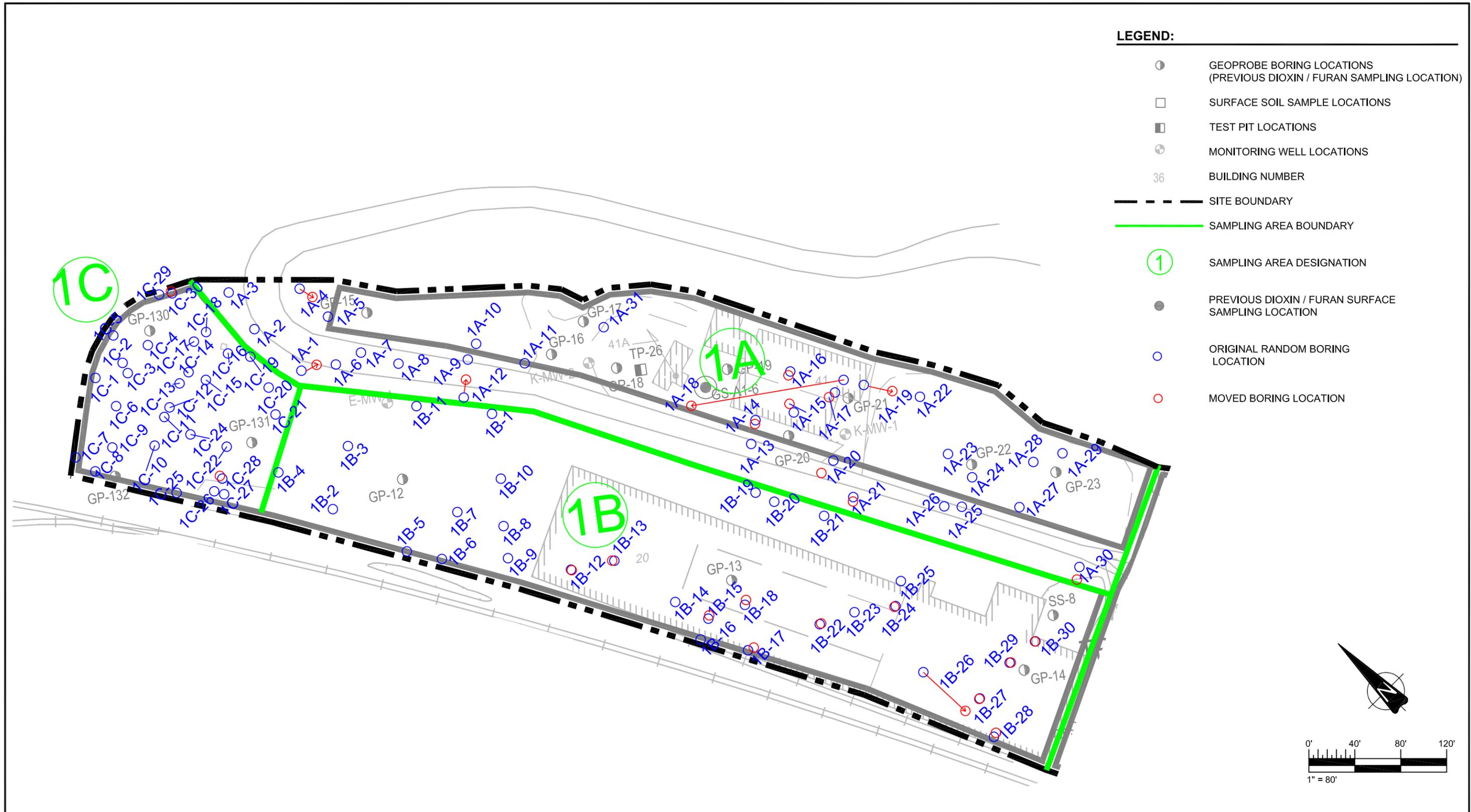


DWN BY: DD  
CHK'D BY: LF  
DATUM: -  
PROJECTION: -  
SCALE: 1" = 200'

PROJECT  
**TRIANGLE PARK PROPERTY**  
5828 N. VAN HOUTEN PLACE  
PORTLAND, OREGON

TITLE  
**SAMPLING AREAS**

DATE: DECEMBER 2006  
PROJECT NO: 5-61M-11417-3  
REV. NO.: -  
FIGURE No. 3



BASEMAP AND PREVIOUS SAMPLING LOCATIONS PROVIDED BY MAUL FOSTER ALONGI, INC. HOT SPOT LOCATIONS FROM MAUL FOSTER ALONGI, INC. FIGURE 10 "LOCATIONS AND SOIL VOLUMES EXCEEDING HOT SPOT CONCENTRATIONS FOR HUMAN AND ECOLOGICAL RECEPTORS".

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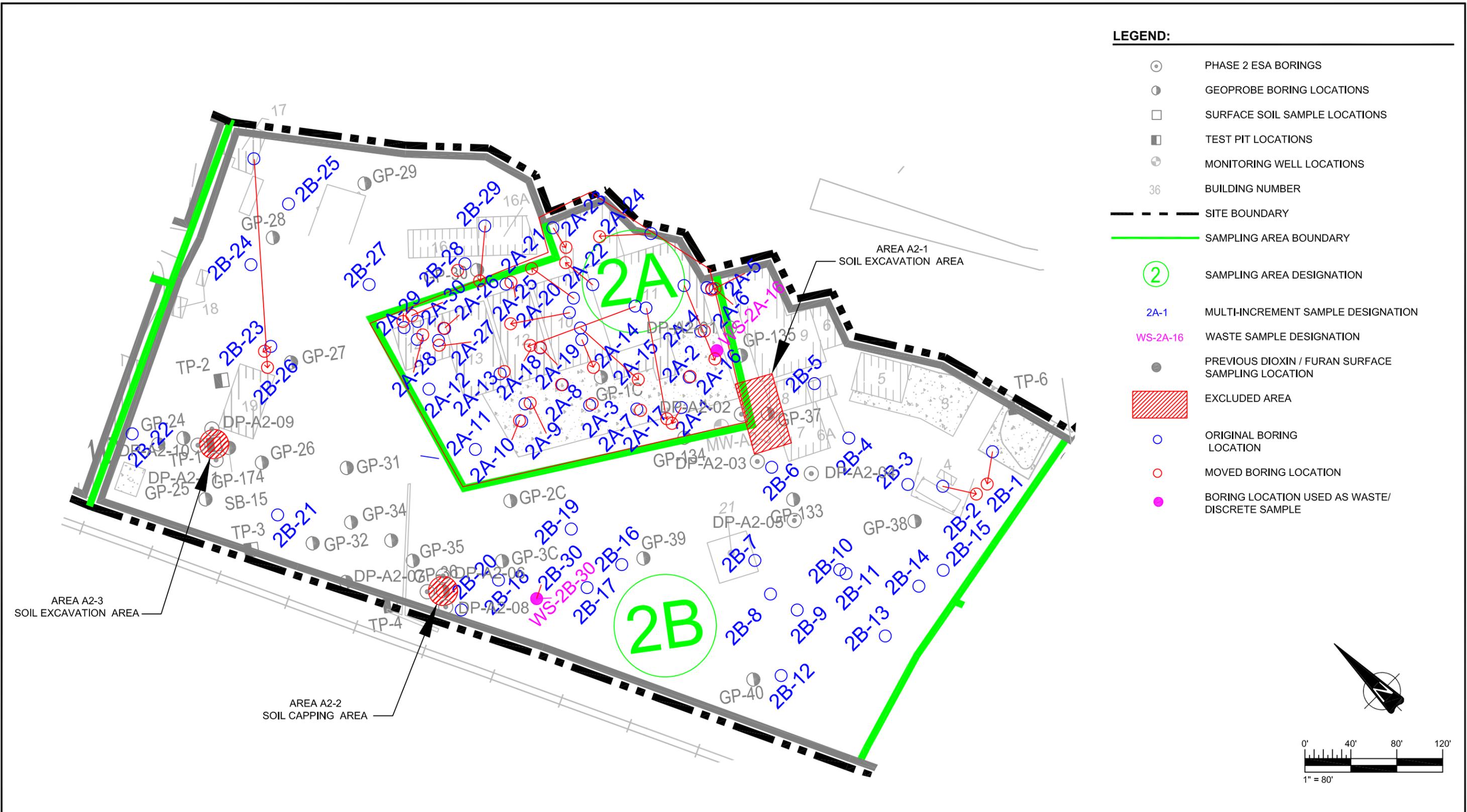


DWN BY: MK / DD  
CHK'D BY: MK  
DATUM: -  
PROJECTION: -  
SCALE: 1" = 80'

PROJECT  
**TRIANGLE PARK PROPERTY**  
5828 N. VAN HOUTEN PLACE  
PORTLAND, OREGON

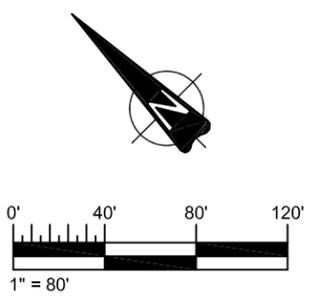
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**AREA 1 SOIL SAMPLING LOCATIONS**

DATE: NOV 2006  
PROJECT NO: 6-61M-11417-3  
REV. NO.: -  
FIGURE No. 4

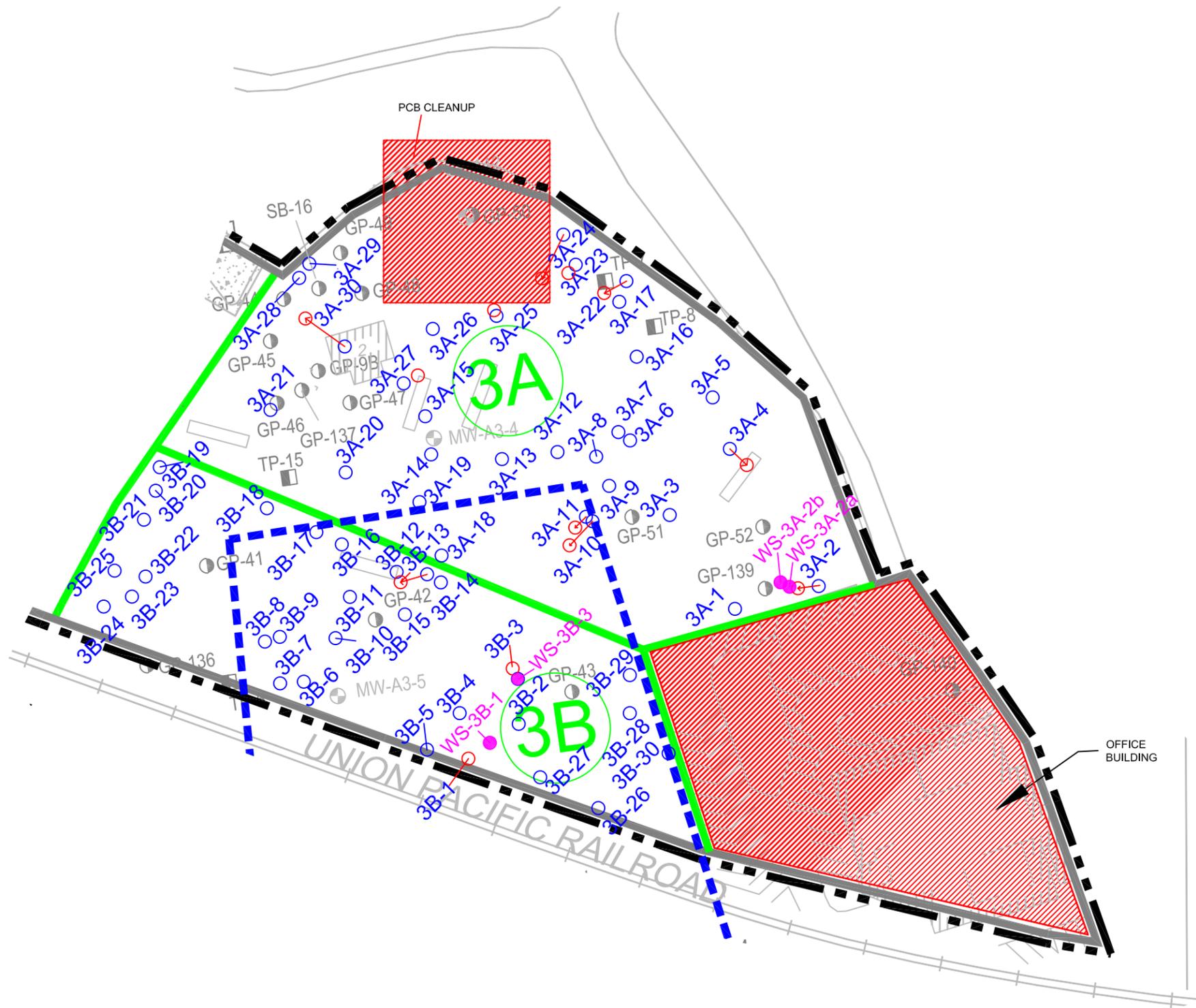


**LEGEND:**

- ⊙ PHASE 2 ESA BORINGS
- GEOPROBE BORING LOCATIONS
- SURFACE SOIL SAMPLE LOCATIONS
- TEST PIT LOCATIONS
- ⊕ MONITORING WELL LOCATIONS
- 36 BUILDING NUMBER
- SITE BOUNDARY
- SAMPLING AREA BOUNDARY
- ② SAMPLING AREA DESIGNATION
- 2A-1 MULTI-INCREMENT SAMPLE DESIGNATION
- WS-2A-16 WASTE SAMPLE DESIGNATION
- PREVIOUS DIOXIN / FURAN SURFACE SAMPLING LOCATION
- ▨ EXCLUDED AREA
- ORIGINAL BORING LOCATION
- MOVED BORING LOCATION
- BORING LOCATION USED AS WASTE/ DISCRETE SAMPLE

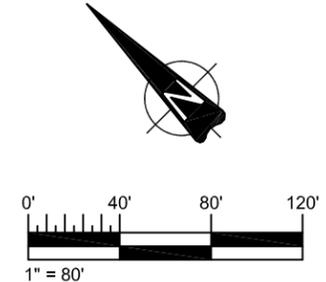


BASEMAP AND PREVIOUS SAMPLING LOCATIONS PROVIDED BY MAUL FOSTER ALONGI, INC. HOT SPOT LOCATIONS FROM MAUL FOSTER ALONGI, INC. FIGURE 10 "LOCATIONS AND SOIL VOLUMES EXCEEDING HOT SPOT CONCENTRATIONS FOR HUMAN AND ECOLOGICAL RECEPTORS".	CLIENT LOGO	CLIENT: UNIVERSITY OF PORTLAND		DWN BY: MK / DD	PROJECT: TRIANGLE PARK PROPERTY 5828 N. VAN HOUTEN PLACE PORTLAND, OREGON	DATE: NOV 2006
		AMEC Earth & Environmental 7376 S.W. Durham Road Portland, OR. U.S.A. 97224		CHK'D BY: MK		PROJECT NO: 5-61M-11417-3
				DATUM: -	TITLE: AREA 2 SOIL SAMPLING LOCATIONS	REV. NO.: -
				PROJECTION: -		FIGURE No. 5
				SCALE: 1" = 80'		



**LEGEND:**

-  GEOPROBE BORING LOCATIONS
-  SURFACE SOIL SAMPLE LOCATIONS
-  TEST PIT LOCATIONS
-  MONITORING WELL LOCATIONS
- 36 BUILDING NUMBER
-  SITE BOUNDARY
-  SAMPLING AREA BOUNDARY
-  SAMPLING AREA DESIGNATION
- 3A-4 MULTI-INCREMENT SAMPLE DESIGNATION
- WS-3A-2a WASTE SAMPLE DESIGNATION
-  PREVIOUS DIOXIN / FURAN SURFACE SAMPLING LOCATION
-  EXCLUDED AREA
-  ORIGINAL BORING LOCATION
-  GROUNDWATER ASSESSMENT AREA BOUNDARY
-  MOVED BORING LOCATION
-  BORING LOCATION USED FOR WASTE/ DISCRETE SAMPLING



BASEMAP AND PREVIOUS SAMPLING LOCATIONS PROVIDED BY MAUL FOSTER ALONGI, INC. HOT SPOT LOCATIONS FROM MAUL FOSTER ALONGI, INC. FIGURE 10 "LOCATIONS AND SOIL VOLUMES EXCEEDING HOT SPOT CONCENTRATIONS FOR HUMAN AND ECOLOGICAL RECEPTORS".



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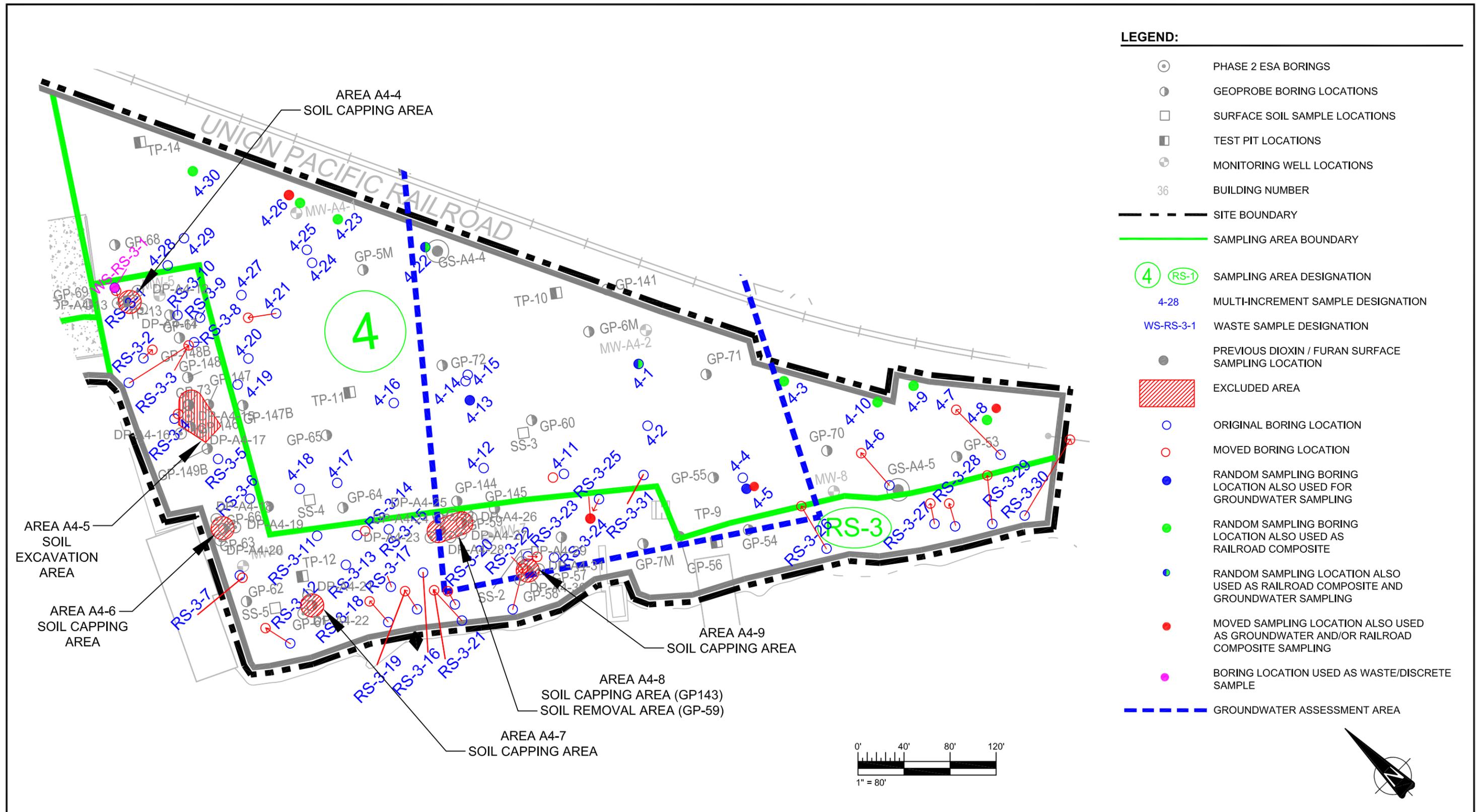


DWN BY: MK / DD  
CHK'D BY: MK  
DATUM: -  
PROJECTION: -  
SCALE: 1" = 80'

PROJECT  
**TRIANGLE PARK PROPERTY**  
5828 N. VAN HOUTEN PLACE  
PORTLAND, OREGON

TITLE  
**AREA 3 SOIL SAMPLING LOCATIONS**

DATE: DECEMBER 2006  
PROJECT NO: 5-61M-11417-3  
REV. NO.: -  
FIGURE No. 6



BASEMAP AND PREVIOUS SAMPLING LOCATIONS PROVIDED BY MAUL FOSTER LONGI, INC. HOT SPOT LOCATIONS FROM MAUL FOSTER LONGI, INC. FIGURE 10 "LOCATIONS AND SOIL VOLUMES EXCEEDING HOT SPOT CONCENTRATIONS FOR HUMAN AND ECOLOGICAL RECEPTORS".

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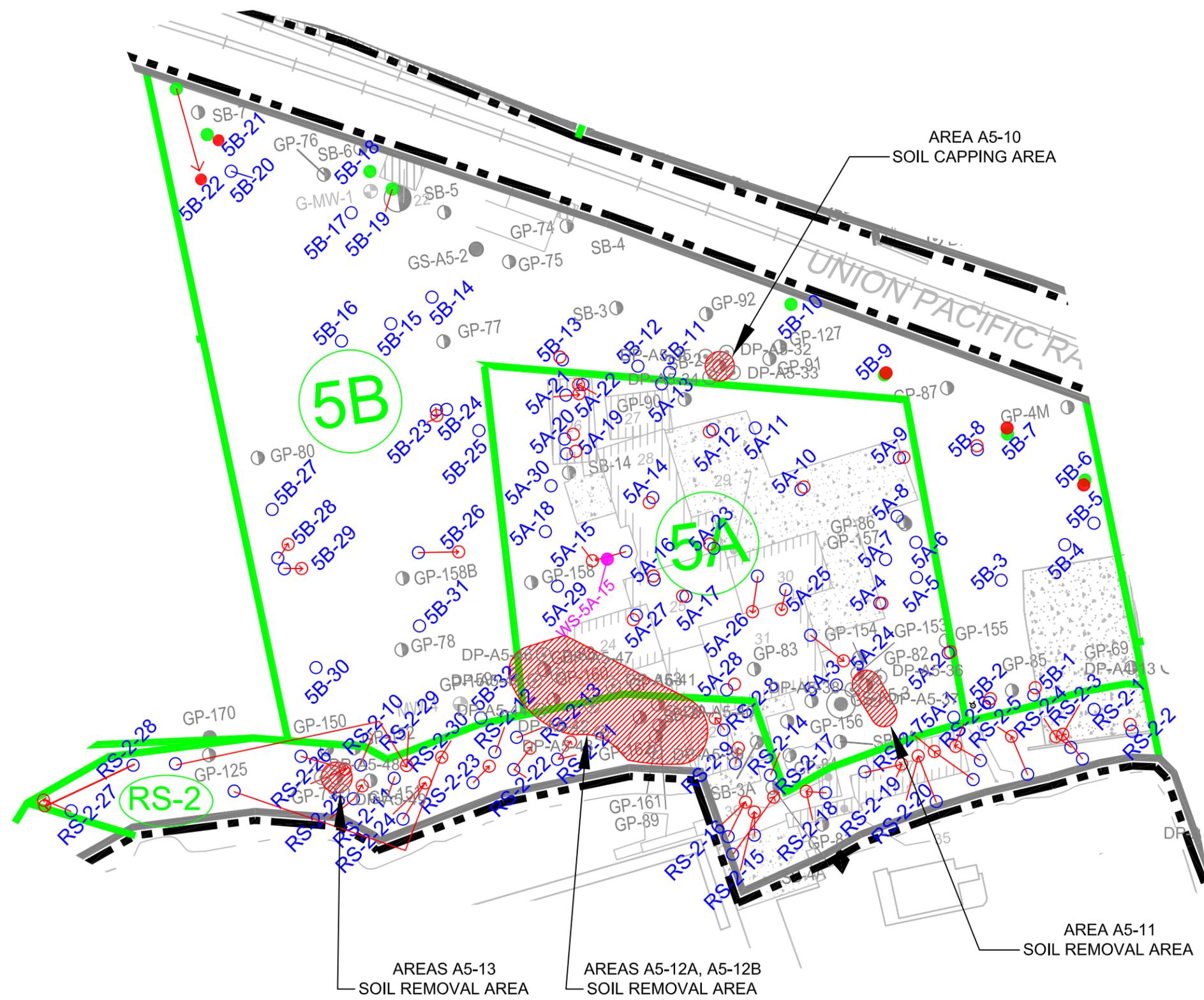


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CHK'D BY: MK  
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PROJECTION: -  
SCALE: 1" = 80'

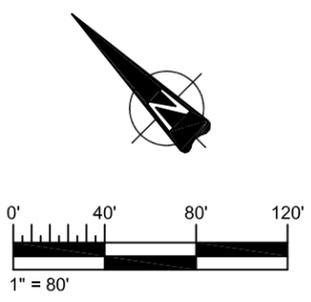
PROJECT  
**TRIANGLE PARK PROPERTY**  
5828 N. VAN HOUTEN PLACE  
PORTLAND, OREGON

TITLE  
**AREA 4 SOIL SAMPLING LOCATIONS**

DATE: DECEMBER 2006  
PROJECT NO.: 6-61M-11417-3  
REV. NO.: 2  
FIGURE No. 7



- LEGEND:**
- PHASE 2 ESA BORINGS
  - GEOPROBE BORING LOCATIONS
  - SURFACE SOIL SAMPLE LOCATIONS
  - TEST PIT LOCATIONS
  - ⊙ MONITORING WELL LOCATIONS
  - 36 BUILDING NUMBER
  - - - SITE BOUNDARY
  - SAMPLING AREA BOUNDARY
  - 5 RS-1 SAMPLING AREA DESIGNATION
  - 5B-9 MULTI-INCREMENT SAMPLE DESIGNATION
  - WS-5A-15 WASTE SAMPLE DESIGNATION
  - PREVIOUS DIOXIN / FURAN SURFACE SAMPLING LOCATION
  - ▨ EXCLUDED AREA
  - ORIGINAL BORING LOCATION
  - MOVED BORING LOCATION
  - ORIGINAL BORING LOCATION ALSO USED AS RAILROAD COMPOSITE
  - MOVED BORING LOCATION ALSO USED AS RAILROAD COMPOSITE
  - BORING LOCATION USED AS WASTE/DISCRETE SAMPLE



BASEMAP AND PREVIOUS SAMPLING LOCATIONS PROVIDED BY MAUL FOSTER ALONGI, INC. HOT SPOT LOCATIONS FROM MAUL FOSTER ALONGI, INC. FIGURE 10 "LOCATIONS AND SOIL VOLUMES EXCEEDING HOT SPOT CONCENTRATIONS FOR HUMAN AND ECOLOGICAL RECEPTORS".

CLIENT LOGO

CLIENT:  
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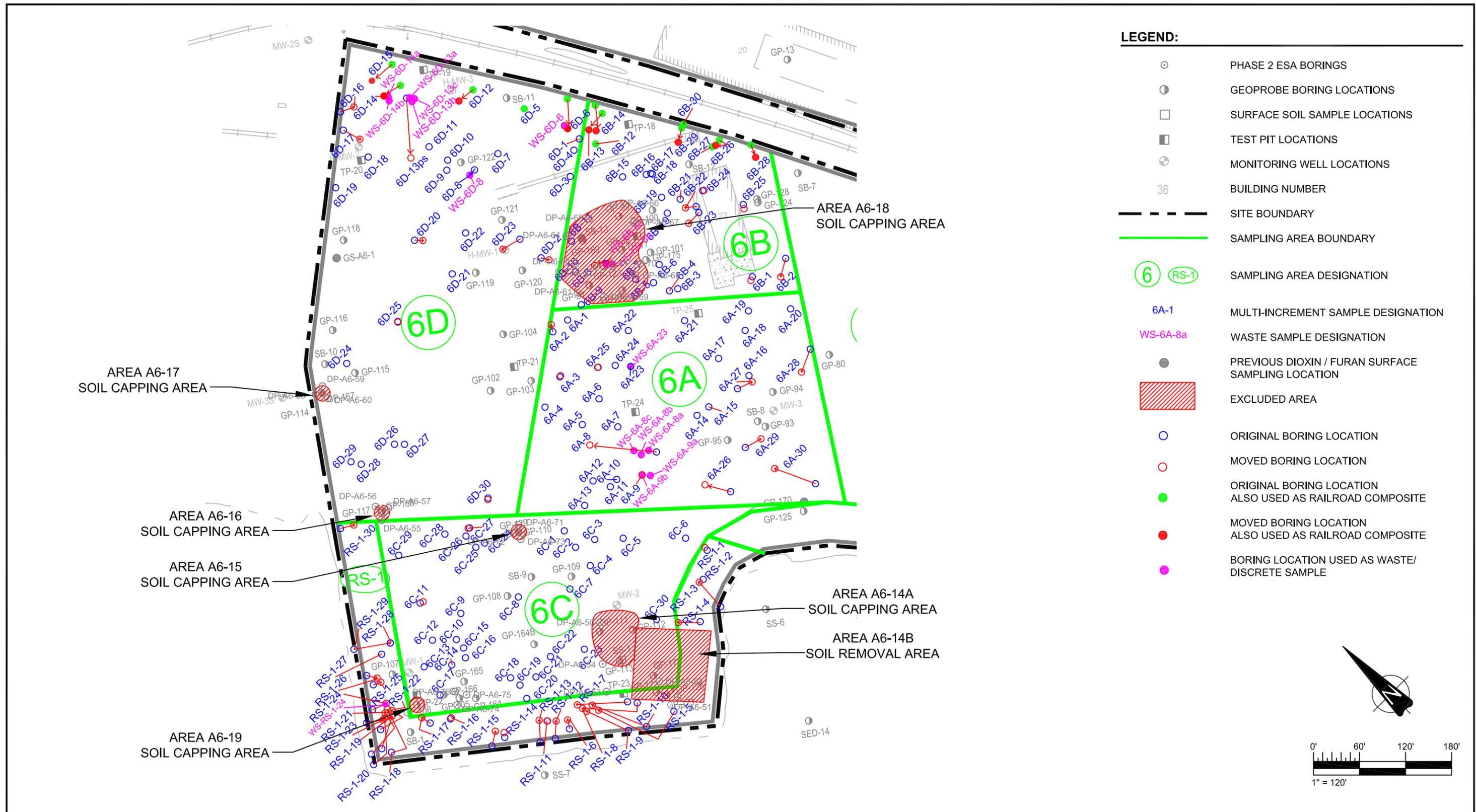
**AMEC Earth & Environmental**  
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DWN BY: MK / DD  
CHK'D BY: MK  
DATUM: -  
PROJECTION: -  
SCALE: 1" = 80'

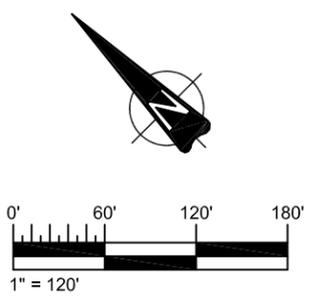
PROJECT  
**TRIANGLE PARK PROPERTY**  
5828 N. VAN HOUTEN PLACE  
PORTLAND, OREGON

TITLE  
**AREA 5 SOIL SAMPLING LOCATIONS**

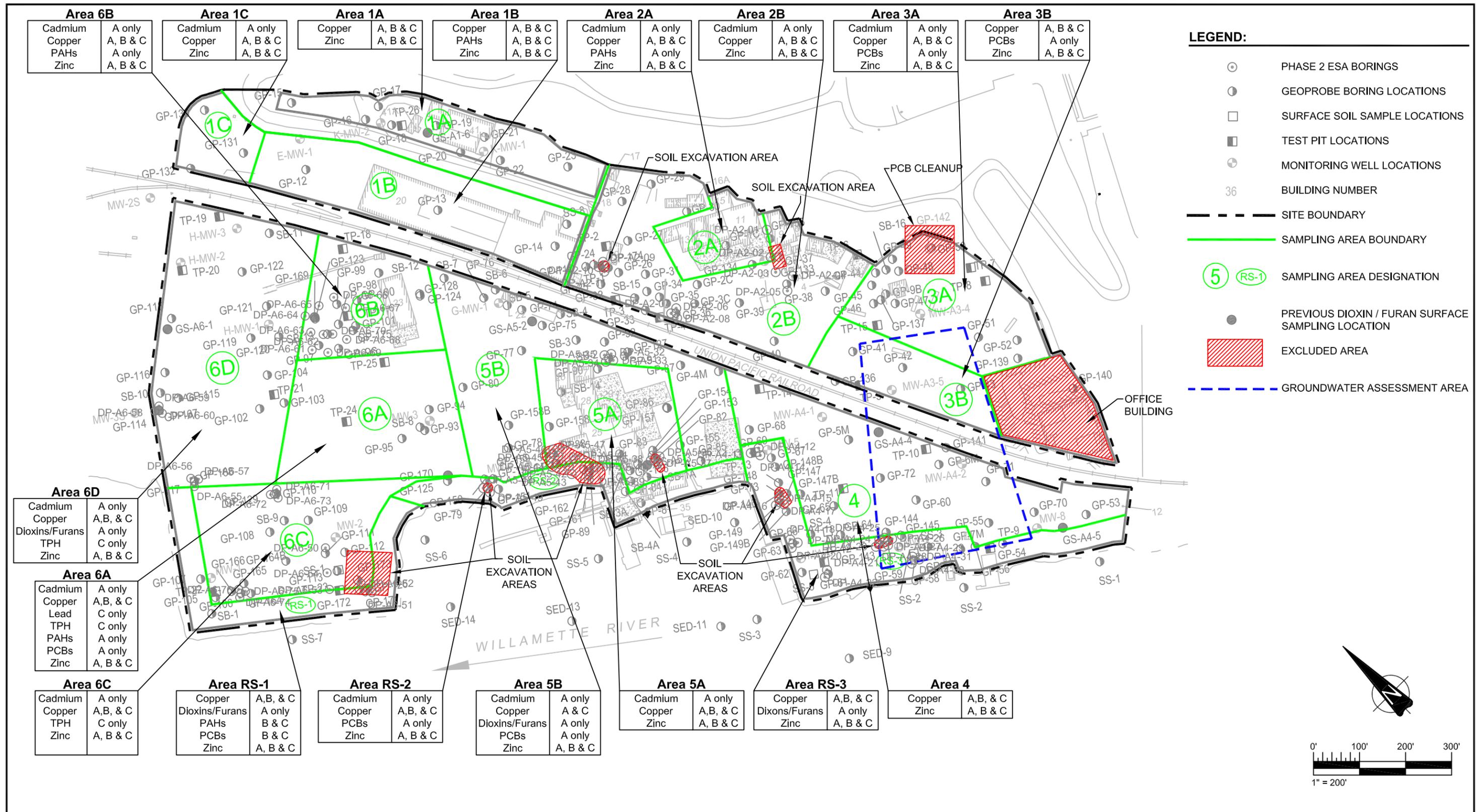
DATE: DECEMBER 2006  
PROJECT NO: 5-61M-11417-3  
REV. NO.: -  
FIGURE No. 8



- LEGEND:**
- PHASE 2 ESA BORINGS
  - GEOPROBE BORING LOCATIONS
  - SURFACE SOIL SAMPLE LOCATIONS
  - TEST PIT LOCATIONS
  - ⊕ MONITORING WELL LOCATIONS
  - 36 BUILDING NUMBER
  - SITE BOUNDARY
  - SAMPLING AREA BOUNDARY
  - ⑥ ⑥ RS-1 SAMPLING AREA DESIGNATION
  - 6A-1 MULTI-INCREMENT SAMPLE DESIGNATION
  - WS-6A-8a WASTE SAMPLE DESIGNATION
  - PREVIOUS DIOXIN / FURAN SURFACE SAMPLING LOCATION
  - ▨ EXCLUDED AREA
  - ORIGINAL BORING LOCATION
  - MOVED BORING LOCATION
  - ORIGINAL BORING LOCATION ALSO USED AS RAILROAD COMPOSITE
  - MOVED BORING LOCATION ALSO USED AS RAILROAD COMPOSITE
  - BORING LOCATION USED AS WASTE/ DISCRETE SAMPLE



BASEMAP AND PREVIOUS SAMPLING LOCATIONS PROVIDED BY MAUL FOSTER ALONGI, INC. HOT SPOT LOCATIONS FROM MAUL FOSTER ALONGI, INC. FIGURE 10 "LOCATIONS AND SOIL VOLUMES EXCEEDING HOT SPOT CONCENTRATIONS FOR HUMAN AND ECOLOGICAL RECEPTORS".	CLIENT LOGO	CLIENT: UNIVERSITY OF PORTLAND		DWN BY: MK / DD	PROJECT: TRIANGLE PARK PROPERTY 5828 N. VAN HOUTEN PLACE PORTLAND, OREGON	DATE: DECEMBER 2006
		AMEC Earth & Environmental 7376 S.W. Durham Road Portland, OR. U.S.A. 97224		CHK'D BY: MK		PROJECT NO: 5-61M-11417-3
				DATUM: -	TITLE: AREA 6 SOIL SAMPLING LOCATIONS	REV. NO.: -
				PROJECTION: -		FIGURE No. 9
				SCALE: 1" = 120'		



BASEMAP AND PREVIOUS SAMPLING LOCATIONS PROVIDED BY MAUL FOSTER ALONGI, INC. HOT SPOT LOCATIONS FROM MAUL FOSTER ALONGI, INC. FIGURE 10 "LOCATIONS AND SOIL VOLUMES EXCEEDING HOT SPOT CONCENTRATIONS FOR HUMAN AND ECOLOGICAL RECEPTORS".



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DWN BY: DD  
CHK'D BY: LF  
DATUM: -  
PROJECTION: -  
SCALE: 1" = 200'

PROJECT  
**TRIANGLE PARK PROPERTY**  
5828 N. VAN HOUTEN PLACE  
PORTLAND, OREGON

TITLE  
**SAMPLING AREAS WITH SUMMARY OF SCREENING LEVEL EXCEEDANCES**

DATE: FEBRUARY 2007  
PROJECT NO: 5-61M-11417-3  
REV. NO.: -  
FIGURE No. 10

**TABLE 1**  
**List of Analytical Testing Suite by Sample**  
**Triangle Park Property**

MEDIA	AREA	SAMPLES	TESTING SUITE
SOIL	1A	MI-1A(A), MI-1A(B), & MI-1A(C)	PCBs, Metals, PAHs, & NWTPH-Dx
	1B	MI-1B(A), MI-1B(B), & MI-1B(C)	PCBs, Metals, PAHs, & NWTPH-Dx
	1C	MI-1C(A), MI-1C(B), & MI-1C(C)	PCBs, Metals, PAHs, PCP, & NWTPH-Dx
	2A	MI-2A(A), MI-2A(B), & MI-2A(C)	PCBs, Metals, PAHs, & NWTPH-Dx
	2B	MI-2B(A), MI-2B(B), & MI-2B(C)	PCBs, Metals, PAHs, & NWTPH-Dx
	3A	MI-3A(A), MI-3A(B), & MI-3A(C)	PCBs, Metals, PAHs, & NWTPH-Dx
	3B	MI-3B(A), MI-3B(B), & MI-3B(C)	PCBs, Metals, PAHs, & NWTPH-Dx
	4	MI-4(A)	Dioxins/Furans, PCBs, Metals, PAHs, & NWTPH-Dx
		MI-4(B) & MI-4(C)	PCBs, Metals, PAHs, & NWTPH-Dx
	5A	MI-5A(A)	Dioxins/Furans, TBT, PCBs, Metals, PAHs, & NWTPH-Dx
		MI-5A(B) & MI-5A(C)	TBT, PCBs, Metals, PAHs, & NWTPH-Dx
	5B	MI-5B(A)	Dioxins/Furans, PCBs, Metals, PAHs, & NWTPH-Dx
		MI-5B(B) & MI-5B(C)	PCBs, Metals, PAHs, & NWTPH-Dx
	6A	MI-6A(A)	Dioxins/Furans, TBT, PCBs, Metals, PAHs, & NWTPH-Dx
		MI-6A(B) & MI-6A(C)	TBT, PCBs, Metals, PAHs, & NWTPH-Dx
	6B	MI-6B(A)	Dioxins/Furans, PCBs, Metals, PAHs, & NWTPH-Dx
		MI-6B(B) & MI-6B(C)	PCBs, Metals, PAHs, & NWTPH-Dx
	6C	MI-6C(A)	Dioxins/Furans, TBT, PCBs, Metals, PAHs, & NWTPH-Dx
		MI-6C(B) & MI-6C(C)	TBT, PCBs, Metals, PAHs, & NWTPH-Dx
	6D	MI-6D(A)	Dioxins/Furans, PCBs, Metals, PAHs, PCP, & NWTPH-Dx
MI-6D(B) & MI-6D(C)		PCBs, Metals, PAHs, & NWTPH-Dx	
RS-1	MI-RS1(A)	Dioxins/Furans, TBT, PCBs, Metals, PAHs, & NWTPH-Dx	
	MI-RS1(B) & MI-RS1(C)	TBT, PCBs, Metals, PAHs, & NWTPH-Dx	
RS-2	MI-RS2(A)	Dioxins/Furans, TBT, PCBs, Metals, PAHs, & NWTPH-Dx	
	MI-RS2(B) & MI-RS2(C)	TBT, PCBs, Metals, PAHs, & NWTPH-Dx	
RS-3	MI-RS3(A)	Dioxins/Furans, PCBs, Metals, PAHs, & NWTPH-Dx	
	MI-RS3(B) & MI-RS3(C)	PCBs, Metals, PAHs, & NWTPH-Dx	
Multiple	RR-composite	PAHs & NWTPH-Dx	
GROUNDWATER	1B	GW-1B-16	Dissolved Metals, PAHs, & NWTPH-Dx
	2A	GW-2A-16	Dissolved Metals, PAHs, & NWTPH-Dx
	3A	GW-3A-2	Dissolved Metals, PAHs, & NWTPH-Dx
	4	GW-4-1	Dissolved Metals, PAHs, & NWTPH-Dx
		GW-4-13	Dissolved Metals, PAHs, & NWTPH-Dx
		GW-4-5	Dissolved Metals, PAHs, & NWTPH-Dx
		GW-4-22	Dissolved Metals, PAHs, & NWTPH-Dx
	5A	GW-5A-15	Dissolved Metals, PAHs, NWTPH-Dx, and VOCs
	6A	GW-6A-8	Dissolved Metals, PAHs, & NWTPH-Dx
		GW-6A-23	Dissolved Metals, PAHs, & NWTPH-Dx
	6B	GW-6B-8	Dissolved Metals, PAHs, & NWTPH-Dx
	6C	GW-6C-22	Dissolved Metals, PAHs, & NWTPH-Dx
	6D	GW-6D-8	Dissolved Metals, PAHs, & NWTPH-Dx
6D	GW-6D-13	Dissolved Metals, PAHs, NWTPH-Dx, VOCs, and TPH-Gx	
WASTE	2A	WS-2A-16	TPH-Dx & PAHs
	2B	WS-2B-30	TPH-Dx & PAHs
	3A	WS-3A-2A	TPH-Dx & PAHs
	3B	WS-3B-1	TPH-Dx & PAHs
	3B	WS-3B-3	TPH-Dx & PAHs
	5A	WS-5A-15	VOCs
	6A	WS-6A-8B	TPH-Dx & PAHs
	6A	WS-6A-8C	TPH-Dx & PAHs
	6A	WS-6A-9A	TPH-Dx & PAHs
	6A	WS-6A-23	TPH-Dx & PAHs
	6B	WS-6B-8A	VOCs
	6D	WS-6D-6	VOCs
	6D	WS-6D-8	TPH-Dx, PAHs, & PCP
	6D	WS-6D-13A	TPH-Dx, TPH-Gx, VOCs, & PAHs
	6D	WS-6D-13B	TPH-Dx & TPH-Gx
	6D	WS-6D-14B	TPH-Dx, PAHs, & VOCs
	RS-1	WS-RS1-24	TPH-Dx & PAHs
	RS-3	WS-RS3-1	TPH-Dx, PAH, & Metals

**TABLE 1**  
**List of Analytical Testing Suite by Sample**  
**Triangle Park Property**

<b>Soil Test Methods</b>		
TPH	NWTPH-Dx	
PAHs	EPA Method 8270C (modified)	
Metals	EPA Method 6010B or EPA Method 6020	
PCBs	EPA Method 8082	
PCP	EPA Method 8041 (Sue will also include in 8270 (modified)	
Dioxin	EPA Method 1613B	
TBT	EPA Method 8270 (SIM)	
VOCs	EPA Method 8260B	Only if waste material with PID screen >200ppm is noted
<b>Groundwater Test Methods</b>		
TPH	NWTPH-Dx	
PAHs	EPA Method 8270 (SIM)	
Metals	EPA Method 6010B or EPA Method 6020	
VOCs	EPA Method 8260B	Only if odor or sheen is noted

**Notes:**

GW = groundwater  
 NWTPH-Dx = Northwest Total Petroleum Hydrocarbons -Diesel range  
 NWTPH-Gx = Northwest Total Petroleum Hydrocarbons - Gasoline range  
 MI = multi-increment  
 PCB = Polychlorinated biphenyl  
 PAH = Polynuclear aromatic hydrocarbons  
 PID = Photoionization detector  
 ppm = parts per million  
 RR = railroad  
 TPH = Total petroleum hydrocarbons  
 TPT = Tributyltin  
 VOC = Volatile organic compound

**TABLE 2**  
**Gasoline, Diesel and Heavy Oil Range Petroleum Hydrocarbons in Soil**  
**Triangle Park Property**

		Diesel Range Hydrocarbons	Gasoline Range Hydrocarbons	Motor Oil
<b>DEQ Soil Matrix Level II Screening Level<sup>2</sup></b>		500 <sup>1</sup>	80	500 <sup>1</sup>
<b>DEQ Risk-Based Concentrations (Occupational)<sup>3</sup></b>		70,000	22,000	--
10/20/2006	MI-1A(A)	<b>57</b>	NA	<b>170</b>
10/20/2006	MI-1A(B)	<b>10</b>	NA	<b>57</b>
10/20/2006	MI-1A(C)	<b>6</b>	NA	<b>11</b>
10/26/2006	MI-1B(A)	<b>53 J</b>	NA	<b>130 J</b>
10/26/2006	MI-1B(B)	<b>28 J</b>	NA	<b>94 J</b>
10/26/2006	MI-1B(C)	<b>15 J</b>	NA	<b>38 J</b>
10/25/2006	MI-1C(A)	<b>12</b>	NA	<b>60</b>
10/25/2006	MI-1C(B)	<b>7.1</b>	NA	<b>40</b>
10/25/2006	MI-1C(C)	0.4 U	NA	11 U
10/27/2006	MI-2A(A)	<b>67 J</b>	NA	<b>310 J</b>
10/27/2006	MI-2A(B)	<b>43 J</b>	NA	<b>240 J</b>
10/27/2006	MI-2A(C)	<b>5 J</b>	NA	<b>18 J</b>
10/26/2006	MI-2B(A)	<b>37 J</b>	NA	<b>150</b>
10/26/2006	MI-2B(B)	<b>21 J</b>	NA	<b>68</b>
10/26/2006	MI-2B(C)	<b>8 J</b>	NA	<b>26</b>
10/27/2006	MI-3A(A)	<b>25 J</b>	NA	<b>110 J</b>
10/27/2006	MI-3A(B)	<b>5 J</b>	NA	<b>21 J</b>
10/27/2006	MI-3A(C)	<b>6 J</b>	NA	<b>13 J</b>
10/30/2006	MI-3B(A)	<b>42 J</b>	NA	<b>170</b>
10/30/2006	MI-3B(B)	<b>35 J</b>	NA	<b>160</b>
10/30/2006	MI-3B(C)	<b>18 J</b>	NA	<b>66</b>
10/12/2006	MI-4(A)	<b>29</b>	NA	<b>140</b>
10/12/2006	MI-4(B)	<b>29 J</b>	NA	<b>400</b>
10/12/2006	MI-4(C)	<b>9</b>	NA	<b>40</b>
10/17/2006	MI-5A(A)	<b>84 J</b>	NA	<b>340</b>
10/17/2006	MI-5A(B)	<b>110 J</b>	NA	<b>390</b>
10/17/2006	MI-5A(C)	<b>26 J</b>	NA	<b>96</b>
10/13/2006	MI-5B(A)	<b>79 J</b>	NA	<b>270</b>
10/13/2006	MI-5B(B)	<b>30 J</b>	NA	<b>120</b>
10/13/2006	MI-5B(C)	<b>26 J</b>	NA	<b>77</b>
10/17/2006	MI-6A(A)	<b>82</b>	NA	<b>380</b>
10/17/2006	MI-6A(B)	<b>100</b>	NA	<b>250</b>
10/17/2006	MI-6A(C)	<b>340</b>	NA	<b>340</b>
10/23/2006	MI-6B(A)	<b>40</b>	NA	<b>150</b>
10/23/2006	MI-6B(B)	<b>24</b>	NA	<b>76</b>
10/23/2006	MI-6B(C)	<b>9</b>	NA	<b>20</b>
10/25/2006	MI-6C(A)	<b>26 J</b>	NA	<b>210</b>
10/25/2006	MI-6C(B)	<b>22 J</b>	NA	<b>170</b>
10/25/2006	MI-6C(C)	<b>69 J</b>	NA	<b>470</b>
10/23/2006	MI-6D(A)	<b>50</b>	NA	<b>200</b>
10/23/2006	MI-6D(B)	<b>160</b>	NA	<b>300</b>
10/23/2006	MI-6D(C)	<b>210</b>	NA	<b>430</b>
10/12/2006	MI-RR-multi-increment	<b>8 J</b>	NA	<b>28 J</b>
10/25/2006	MI-RS-1(A)	<b>22</b>	NA	<b>110</b>
10/25/2006	MI-RS-1(B)	<b>91</b>	NA	<b>370</b>
10/25/2006	MI-RS-1(C)	<b>76</b>	NA	<b>350</b>
10/19/2006	MI-RS-2(A)	<b>57 J</b>	NA	<b>260 J</b>
10/19/2006	MI-RS-2(B)	<b>30 J</b>	NA	<b>110 J</b>
10/19/2006	MI-RS-2(C)	<b>42 J</b>	NA	<b>280 J</b>
10/13/2006	MI-RS-3(A)	<b>36 J</b>	NA	<b>230</b>
10/13/2006	MI-RS-3(B)	<b>35 J</b>	NA	<b>110</b>
10/13/2006	MI-RS-3(C)	<b>31 J</b>	NA	<b>120</b>
10/30/2006	WS-2A(9.0-10.0)-16	<b>10,000</b>	NA	<b>17,000</b>
10/27/2006	WS-2B(0-2)-30	<b>490</b>	NA	<b>2,200</b>
10/27/2006	WS-3A(9.6-10.0)-2A	<b>4,800</b>	NA	<b>2,200</b>
10/30/2006	WS-3B(4.5-5.0)-3	<b>64</b>	NA	<b>330</b>
10/30/2006	WS-3B(8.0-10.0)-1	0 U	NA	11 U
10/18/2006	WS-6A-(3-4)-23	<b>3,600</b>	NA	<b>220</b>
10/19/2006	WS-6A-8.0-8.5-8B	<b>5,300</b>	NA	<b>1,200</b>
10/19/2006	WS-6A-8.0-8.5-8C	<b>5,600</b>	NA	<b>27,000</b>
10/19/2006	WS-6A-8.5-9.0-9A	<b>210</b>	NA	<b>610</b>
10/24/2006	WS-6D(2.0-2.5)-8	<b>13,000</b>	NA	<b>24,000</b>
10/25/2006	WS-6D(4.5-5.0)-13A	<b>5,300</b>	<b>3,100</b>	<b>14,000</b>
10/25/2006	WS-6D(4.5-5.0)-13B	<b>790</b>	<b>5,400</b>	<b>1,300</b>
10/24/2006	WS-6D(9.0-10.0)-14B	<b>6,100</b>	NA	<b>2,400</b>
10/25/2006	WS-RS-1(5-6)-24	<b>370</b>	NA	<b>890</b>
10/13/2006	WS-RS-3(5-8)-1	<b>83 J</b>	NA	<b>190 J</b>

**Notes:**

- 1 Screening level is for sum of diesel and heavy oil range hydrocarbons.
- 2 Oregon Administrative Rules 340-122-340-0320.
- 3 Risk-Based Decision Making for the Remediation of Petroleum Contaminated Sites (DEQ, 2003)
- BOLD** = detection
- J = estimated result
- mg/kg = milligrams per kilogram
- MI = multi-increment
- NA = not analyzed
- RR = railroad
- U = not detected at or below reported method detection limit
- WS = waste sample

**TABLE 3**  
**Polynuclear Aromatic Hydrocarbons in Soil**  
**Triangle Park Property**

		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
<b>JSCS Screening Level (µg/kg)</b>		300	200	845	1,050	1,450	NA	300	13,000	1,290	1,300	2,230	536	100	561	1,170	1,520
<b>EPA Region 6 HHSL-Outdoor Industrial (µg/kg)</b>		33,000,000	NA	100,000,000	2,300	230	2,300	NA	23,000	230,000	230	24,000,000	26,000,000	2,300	210,000	NA	32,000,000
Sample Date	Sample ID	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
10/20/2006	MI-1A(A)	24 U	22 U	28 U	25 U	23 U	34 U	40 U	38 U	27 U	34 U	26 U	26 U	40 U	23 U	29 U	39 U
10/20/2006	MI-1A(B)	24 U	22 U	28 U	25 U	23 U	34 U	40 U	38 U	27 U	34 U	26 U	26 U	40 U	23 U	29 U	39 U
10/20/2006	MI-1A(C)	25 U	22 U	28 U	25 U	23 U	35 U	40 U	38 U	27 U	35 U	27 U	26 U	40 U	23 U	29 U	39 U
10/26/2006	MI-1B(A)	<b>630 J</b>	23 UJ	<b>1,500 J</b>	<b>1,400 J</b>	<b>1,400 J</b>	<b>990 J</b>	<b>460 J</b>	<b>840 J</b>	<b>1,400 J</b>	<b>48 J</b>	<b>4,300 J</b>	<b>850 J</b>	<b>450 J</b>	<b>410 J</b>	<b>6,600 J</b>	<b>3,500 J</b>
10/26/2006	MI-1B(B)	<b>1,000 J</b>	<b>40 J</b>	<b>2,400 J</b>	<b>2,100 J</b>	<b>2,100 J</b>	<b>1,600 J</b>	<b>640 J</b>	<b>1,100 J</b>	<b>2,200 J</b>	<b>76 J</b>	<b>5,900 J</b>	<b>1,400 J</b>	<b>640 J</b>	<b>810 J</b>	<b>11,000 J</b>	<b>5,800 J</b>
10/26/2006	MI-1B(C)	<b>120 J</b>	22 UJ	<b>300 J</b>	<b>330 J</b>	<b>310 J</b>	<b>170 J</b>	<b>89 J</b>	<b>240 J</b>	<b>340 J</b>	35 UJ	<b>970 J</b>	<b>160 J</b>	<b>78 J</b>	23 UJ	<b>1,300 J</b>	<b>870 J</b>
10/25/2006	MI-1C(A)	25 UJ	22 U	28 U	25 U	23 U	35 U	40 U	38 U	27 U	35 U	<b>81</b>	26 U	40 U	23 UJ	29 U	<b>70</b>
10/25/2006	MI-1C(B)	25 UJ	22 U	29 U	<b>84</b>	<b>120</b>	<b>92</b>	<b>88</b>	<b>88</b>	<b>110</b>	35 U	<b>200</b>	26 U	<b>79</b>	24 UJ	<b>120</b>	<b>190</b>
10/25/2006	MI-1C(C)	25 UJ	23 UJ	29 UJ	26 UJ	24 UJ	36 UJ	42 UJ	39 UJ	28 UJ	36 UJ	28 UJ	27 UJ	42 UJ	24 UJ	30 UJ	41 UJ
10/27/2006	MI-2A(A)	<b>260 J</b>	22 UJ	<b>420 J</b>	<b>510 J</b>	<b>560 J</b>	<b>370 J</b>	<b>240 J</b>	<b>380 J</b>	<b>610 J</b>	34 UJ	<b>1,300 J</b>	<b>310 J</b>	<b>230 J</b>	<b>200 J</b>	<b>1,900 J</b>	<b>1,200 J</b>
10/27/2006	MI-2A(B)	25 UJ	22 UJ	29 UJ	25 UJ	24 UJ	35 UJ	40 UJ	38 UJ	<b>40 J</b>	35 UJ	<b>51 J</b>	26 UJ	41 UJ	24 UJ	<b>35 J</b>	<b>54 J</b>
10/27/2006	MI-2A(C)	25 UJ	22 UJ	28 UJ	<b>40 J</b>	23 UJ	35 UJ	40 UJ	38 UJ	<b>38 J</b>	35 UJ	<b>66 J</b>	26 UJ	40 UJ	23 UJ	29 UJ	<b>66 J</b>
10/26/2006	MI-2B(A)	25 UJ	22 UJ	28 UJ	25 UJ	23 UJ	35 UJ	40 UJ	38 UJ	27 UJ	35 UJ	<b>34 J</b>	26 UJ	40 UJ	23 UJ	29 UJ	39 UJ
10/26/2006	MI-2B(B)	25 UJ	22 UJ	29 UJ	<b>49 J</b>	<b>33 J</b>	<b>35 J</b>	41 UJ	<b>38 J</b>	<b>61 J</b>	35 UJ	<b>100 J</b>	26 UJ	41 UJ	24 UJ	<b>80 J</b>	<b>100 J</b>
10/26/2006	MI-2B(C)	25 UJ	22 UJ	28 UJ	<b>38 J</b>	<b>34 J</b>	35 UJ	40 UJ	38 UJ	<b>44 J</b>	35 UJ	<b>71 J</b>	26 UJ	40 UJ	23 UJ	<b>47 J</b>	<b>68 J</b>
10/27/2006	MI-3A(A)	25 UJ	22 UJ	29 UJ	25 UJ	24 UJ	35 UJ	40 UJ	38 UJ	27 UJ	35 UJ	27 UJ	26 UJ	40 UJ	24 UJ	29 UJ	39 UJ
10/27/2006	MI-3A(B)	25 UJ	22 UJ	29 UJ	26 UJ	24 UJ	35 UJ	41 UJ	39 UJ	27 UJ	35 UJ	27 UJ	27 UJ	41 UJ	24 UJ	29 UJ	40 UJ
10/27/2006	MI-3A(C)	24 UJ	22 UJ	28 UJ	25 UJ	23 UJ	35 UJ	40 UJ	38 UJ	27 UJ	35 UJ	26 UJ	26 UJ	40 UJ	23 UJ	29 UJ	39 UJ
10/30/2006	MI-3B(A)	24 UJ	22 UJ	28 U	25 U	23 U	34 U	40 U	38 U	27 U	34 U	<b>36 J</b>	26 UJ	40 UJ	23 UJ	29 U	39 U
10/30/2006	MI-3B(B)	25 UJ	22 UJ	28 U	<b>43 J</b>	<b>40 J</b>	35 U	40 U	38 U	<b>57 J</b>	35 U	<b>93</b>	26 UJ	40 UJ	23 UJ	<b>75</b>	<b>89</b>
10/30/2006	MI-3B(C)	25 UJ	22 UJ	28 U	25 U	23 U	35 U	40 U	38 U	27 U	35 U	26 U	26 UJ	40 UJ	23 UJ	29 U	39 U
10/12/2006	MI-4(A)	24 U	22 U	28 U	25 U	23 U	34 U	<b>63</b>	38 U	27 U	34 U	26 U	26 U	40 U	23 U	29 U	39 U
10/12/2006	MI-4(B)	24 U	22 U	28 U	25 U	23 U	34 U	40 U	38 U	27 U	34 U	26 U	26 U	40 U	23 U	29 U	39 U
10/12/2006	MI-4(C)	25 U	22 U	29 U	25 U	24 U	35 U	40 U	38 U	27 U	35 U	27 U	26 U	40 U	24 U	29 U	39 U
10/17/2006	MI-5A(A)	24 UJ	22 U	28 U	25 U	23 U	34 U	40 U	38 U	27 U	34 U	<b>64</b>	26 U	40 U	23 UJ	29 U	39 U
10/17/2006	MI-5A(B)	25 UJ	22 U	28 U	25 U	23 U	35 U	40 U	38 U	27 U	35 U	27 U	26 U	40 U	23 UJ	29 U	39 U
10/17/2006	MI-5A(C)	24 UJ	22 U	28 U	25 U	23 U	34 U	40 U	38 U	27 U	34 U	26 U	26 U	40 U	23 UJ	29 U	39 U
10/13/2006	MI-5B(A)	24 U	22 U	28 U	<b>51 J</b>	<b>60 J</b>	<b>82</b>	<b>46 J</b>	<b>59 J</b>	<b>83</b>	34 U	<b>110</b>	26 U	40 U	23 U	<b>58 J</b>	<b>130</b>
10/13/2006	MI-5B(B)	24 U	22 U	28 U	<b>62 J</b>	<b>62 J</b>	<b>65</b>	40 U	<b>49 J</b>	<b>72</b>	34 U	<b>98</b>	26 U	40 U	23 U	29 U	<b>100</b>
10/13/2006	MI-5B(C)	25 U	22 U	28 U	<b>39 J</b>	<b>39 J</b>	35 U	40 U	38 U	<b>49 J</b>	35 U	<b>69</b>	26 U	40 U	23 U	<b>55 J</b>	<b>85</b>
10/17/2006	MI-6A(A)	<b>140 J</b>	22 U	<b>290</b>	<b>870</b>	<b>710</b>	<b>590</b>	<b>290</b>	<b>580</b>	<b>1,000</b>	<b>150</b>	<b>2,000</b>	<b>71</b>	<b>290</b>	23 UJ	<b>990</b>	<b>1,600</b>
10/17/2006	MI-6A(B)	25 UJ	22 U	28 U	25 U	<b>77</b>	<b>71</b>	<b>84</b>	38 U	<b>84</b>	35 U	<b>150</b>	26 U	40 U	23 UJ	<b>120</b>	<b>150</b>
10/17/2006	MI-6A(B)DUP	25 UJ	22 U	29 U	25 U	<b>67</b>	35 U	<b>68</b>	38 U	<b>71</b>	35 U	<b>120</b>	26 U	40 U	24 UJ	<b>110</b>	<b>120</b>
10/17/2006	MI-6A(C)	25 UJ	22 UJ	29 UJ	25 UJ	24 UJ	35 UJ	40 UJ	38 UJ	27 UJ	35 UJ	<b>95 J</b>	<b>69 J</b>	41 UJ	24 UJ	<b>170 J</b>	<b>92 J</b>
10/23/2006	MI-6B(A)	25 U	<b>64</b>	28 U	<b>190</b>	<b>280</b>	<b>360</b>	<b>300</b>	<b>180</b>	<b>270</b>	<b>77</b>	<b>440</b>	26 U	<b>220</b>	23 U	<b>290</b>	<b>400</b>
10/23/2006	MI-6B(B)	25 U	22 U	28 U	25 U	23 U	35 U	40 U	38 U	27 U	35 U	27 U	26 U	40 U	23 U	29 U	39 U
10/23/2006	MI-6B(C)	25 U	22 U	29 U	25 U	24 U	35 U	40 U	38 U	27 U	35 U	27 U	26 U	40 U	24 U	29 U	39 U
10/25/2006	MI-6C(A)	25 UJ	22 UJ	28 UJ	<b>50 J</b>	<b>67 J</b>	<b>42 J</b>	40 UJ	<b>59 J</b>	<b>70 J</b>	35 UJ	<b>88 J</b>	26 UJ	40 UJ	23 UJ	<b>36 J</b>	<b>80 J</b>
10/25/2006	MI-6C(B)	26 UJ	23 UJ	30 UJ	26 UJ	24 UJ	36 UJ	42 UJ	40 UJ	<b>36 J</b>	36 UJ	<b>50 J</b>	27 UJ	42 UJ	24 UJ	<b>40 J</b>	<b>42 J</b>
10/25/2006	MI-6C(C)	<b>33 J</b>	23 UJ	<b>43 J</b>	<b>72 J</b>	<b>67 J</b>	<b>50 J</b>	42 UJ	<b>56 J</b>	<b>82 J</b>	36 UJ	<b>210 J</b>	27 UJ	42 UJ	24 UJ	<b>170 J</b>	<b>160 J</b>

**TABLE 3**  
**Polynuclear Aromatic Hydrocarbons in Soil**  
**Triangle Park Property**

		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
<b>JSCS Screening Level (µg/kg)</b>		300	200	845	1,050	1,450	NA	300	13,000	1,290	1,300	2,230	536	100	561	1,170	1,520
<b>EPA Region 6 HHSL-Outdoor Industrial (µg/kg)</b>		33,000,000	NA	100,000,000	2,300	230	2,300	NA	23,000	230,000	230	24,000,000	26,000,000	2,300	210,000	NA	32,000,000
Sample Date	Sample ID	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
10/23/2006	MI-6D(A)	24 U	22 U	28 U	<b>160</b>	<b>150</b>	<b>180</b>	<b>130</b>	<b>130</b>	<b>240</b>	34 U	<b>280</b>	26 U	<b>100</b>	23 U	<b>150</b>	<b>280</b>
10/23/2006	MI-6D(B)	25 U	22 U	28 U	25 U	23 U	35 U	40 U	38 U	<b>79</b>	35 U	<b>74</b>	26 U	40 U	23 U	29 U	39 U
10/23/2006	MI-6D(C)	24 U	22 U	28 U	25 U	23 U	34 U	40 U	38 U	<b>64</b>	34 U	<b>76</b>	26 U	40 U	23 U	29 U	<b>63</b>
10/12/2006	MI-RR-multi-increment	25 UJ	22 UJ	28 UJ	<b>48 J</b>	<b>44 J</b>	35 UJ	40 UJ	38 UJ	<b>47 J</b>	35 UJ	<b>76 J</b>	26 UJ	40 UJ	23 UJ	29 UJ	<b>67 J</b>
10/25/2006	MI-RS-1(A)	25 U	22 U	<b>41 J</b>	<b>40 J</b>	<b>48 J</b>	<b>57 J</b>	40 U	38 U	<b>53 J</b>	35 U	<b>81</b>	26 U	40 U	23 UJ	<b>50 J</b>	<b>76</b>
10/25/2006	MI-RS-1(B)	<b>42 J</b>	<b>80</b>	<b>74</b>	<b>220</b>	<b>280</b>	<b>230</b>	<b>130</b>	<b>290</b>	<b>290</b>	35 U	<b>620</b>	<b>75</b>	<b>120</b>	<b>62 J</b>	<b>500</b>	<b>530</b>
10/25/2006	MI-RS-1(C)	<b>63 J</b>	<b>130</b>	<b>170</b>	<b>460</b>	<b>520</b>	<b>520</b>	<b>200</b>	<b>450</b>	<b>540</b>	35 U	<b>1,300</b>	<b>120</b>	<b>210</b>	<b>82 J</b>	<b>950</b>	<b>1,100</b>
10/19/2006	MI-RS-2(A)	25 UJ	22 UJ	29 UJ	<b>33 J</b>	<b>49 J</b>	35 UJ	<b>51 J</b>	<b>48 J</b>	<b>47 J</b>	35 UJ	<b>48 J</b>	26 UJ	41 UJ	24 UJ	29 UJ	<b>59 J</b>
10/19/2006	MI-RS-2(B)	25 UJ	22 UJ	28 UJ	25 UJ	23 UJ	35 UJ	40 UJ	38 UJ	27 UJ	35 UJ	27 UJ	26 UJ	40 UJ	23 UJ	29 UJ	39 UJ
10/19/2006	MI-RS-2(C)	24 UJ	22 UJ	28 UJ	25 UJ	23 UJ	34 UJ	40 UJ	38 UJ	<b>32 J</b>	34 UJ	<b>33 J</b>	26 UJ	40 UJ	23 UJ	29 UJ	<b>40 J</b>
10/13/2006	MI-RS-3(A)	24 U	22 U	28 U	<b>44 J</b>	<b>38 J</b>	<b>66</b>	40 U	<b>48 J</b>	<b>75</b>	34 U	<b>120</b>	26 U	40 U	23 U	<b>39 J</b>	<b>100</b>
10/13/2006	MI-RS-3(B)	24 U	22 U	28 U	<b>34 J</b>	<b>35 J</b>	<b>36 J</b>	40 U	38 U	<b>48 J</b>	35 U	<b>82</b>	26 U	40 U	23 U	<b>110</b>	<b>82</b>
10/13/2006	MI-RS-3(C)	24 U	22 U	28 U	<b>52 J</b>	<b>56 J</b>	<b>47 J</b>	<b>52 J</b>	<b>46 J</b>	<b>67</b>	35 U	<b>100</b>	26 U	<b>41 J</b>	23 U	<b>72</b>	<b>100</b>
10/30/2006	WS-2A(9.0-10.0)-16	<b>630 J</b>	92 U	120 U	110 U	99 U	150 U	170 U	160 U	<b>1,600</b>	150 U	110 U	<b>2,900</b>	170 U	99 UJ	120 U	<b>470</b>
10/27/2006	WS-2B(0-2)-30	24 UJ	21 UJ	28 UJ	25 UJ	23 UJ	34 UJ	40 UJ	37 UJ	27 UJ	34 UJ	26 UJ	26 UJ	40 UJ	23 UJ	28 UJ	39 UJ
10/27/2006	WS-3A(9.6-10.0)-2A	120 NJ	22 U	28 U	25 U	23 U	34 U	40 U	38 U	<b>110</b>	34 U	26 U	<b>370</b>	40 U	23 UJ	<b>720</b>	39 U
10/30/2006	WS-3B(4.5-5.0)-3	25 UJ	22 U	29 U	25 U	24 U	35 U	41 U	38 U	27 U	35 U	<b>99</b>	26 U	41 U	24 UJ	29 U	<b>65</b>
10/30/2006	WS-3B(8.0-10.0)-1	25 UJ	22 U	29 U	25 U	24 U	35 U	41 U	38 U	27 U	35 U	27 U	26 U	41 U	24 UJ	29 U	39 U
10/18/2006	WS-6A-(3-4)23	<b>260 N</b>	32 U	42 U	37 U	34 U	51 U	59 U	56 U	39 U	51 U	39 U	<b>1,400</b>	59 U	34 U	<b>2,200</b>	<b>110</b>
10/19/2006	WS-6A-8.0-8.5-8B	<b>790 N</b>	<b>22</b>	<b>270</b>	<b>110</b>	<b>100</b>	<b>65</b>	<b>59 J</b>	<b>75</b>	<b>180</b>	34 U	<b>220</b>	<b>2,200</b>	<b>42 J</b>	<b>180 N</b>	<b>3,900</b>	<b>400</b>
10/19/2006	WS-6A-8.0-8.5-8C	<b>380 J</b>	88 NJ	<b>280 J</b>	<b>410 J</b>	<b>1,400 J</b>	<b>580 NJ</b>	<b>410 J</b>	<b>580 NJ</b>	<b>1,600 J</b>	<b>140 J</b>	<b>810 J</b>	<b>420 J</b>	<b>190 J</b>	88 UJ	<b>1,100 J</b>	<b>2,500 J</b>
10/19/2006	WS-6A-8.5-9.0-9A	23 U	20 U	27 U	<b>53 J</b>	<b>83</b>	<b>67</b>	<b>54 J</b>	<b>72</b>	<b>99</b>	33 U	<b>170</b>	25 U	<b>41 J</b>	22 U	<b>46 J</b>	<b>170</b>
10/24/2006	WS-6D(2.0-2.5)-8	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	99 UJ	<b>840 J</b>	99 UJ	<b>190 J</b>	99 UJ	99 UJ	<b>270 J</b>	<b>400 J</b>	<b>230 J</b>
10/25/2006	WS-6D(4.5-5.0)-13A	<b>670 J</b>	150 NJ	<b>420 J</b>	<b>220 J</b>	<b>290 NJ</b>	<b>260 NJ</b>	<b>86 J</b>	<b>320 NJ</b>	<b>380 J</b>	57 UJ	<b>780 J</b>	<b>1,200 J</b>	57 UJ	<b>5,500 J</b>	<b>3,200 J</b>	<b>920 J</b>
10/24/2006	WS-6D(9.0-10.0)-14B	<b>1,100 J</b>	<b>280 NJ</b>	<b>780 J</b>	<b>120 J</b>	<b>110 J</b>	<b>71 J</b>	55 U	<b>60 J</b>	<b>130 J</b>	55 UJ	<b>370 J</b>	<b>3,000 J</b>	55 UJ	<b>390 NJ</b>	<b>5,800 J</b>	<b>340 J</b>
10/25/2006	WS-RS1(5-6)-24	25 UJ	<b>77</b>	<b>74</b>	<b>270</b>	<b>280</b>	<b>240</b>	<b>190</b>	<b>320</b>	<b>400</b>	36 U	<b>800</b>	<b>100</b>	<b>150</b>	24 UJ	<b>500</b>	<b>600</b>
10/13/2006	WS-RS-3(5-8)-1	25 UJ	22 UJ	29 UJ	<b>91 J</b>	<b>72 J</b>	<b>140 J</b>	<b>57 J</b>	<b>54 J</b>	<b>250 J</b>	35 UJ	<b>140 J</b>	<b>110 J</b>	40 UJ	<b>330 J</b>	<b>600 J</b>	<b>110 J</b>

**Notes:**

- BOLD** = detection
- DUP = field duplicate sample
- JSCS = Joint Source Control Strategy
- µg/ kg = micrograms per kilogram
- WS = waste sample
- MI = multi-increment sample
- NA = not applicable
- RR = railroad
- result exceeds JSCS screening level concentration
- J = estimated result
- NJ = result is for a tentatively identified analyte
- U = not detected at or below reported method detection limit
- UJ = not detected above the method detection limit; the limit is an approximate value

**TABLE 4**  
**Polychlorinated Biphenyls in Soil**  
**Triangle Park Property**

		Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
<b>JSCS Screening Level (µg/kg)</b>		420	NA	NA	2	4	10	676
<b>EPA Region 6 HHSL-Outdoor Industrial (µg/kg)</b>		24,000	830	830	830	830	830	830
<b>Sample Date</b>	<b>Sample ID</b>	(µg/kg)						
10/20/2006	MI-1A(A)	3.8 U						
10/20/2006	MI-1A(B)	3.8 U						
10/20/2006	MI-1A(C)	3.8 U						
10/26/2006	MI-1B(A)	4.0 UJ						
10/26/2006	MI-1B(B)	4.0 UJ						
10/26/2006	MI-1B(C)	4.0 UJ						
10/25/2006	MI-1C(A)	4.0 UJ	<b>81 J</b>					
10/25/2006	MI-1C(B)	4.0 UJ						
10/25/2006	MI-1C(C)	4.0 UJ						
10/27/2006	MI-2A(A)	4.0 UJ	<b>58 J</b>					
10/27/2006	MI-2A(B)	4.0 UJ						
10/27/2006	MI-2A(C)	4.0 UJ						
10/26/2006	MI-2B(A)	4.0 UJ	<b>90 J</b>					
10/26/2006	MI-2B(B)	4.0 UJ						
10/26/2006	MI-2B(C)	4.0 UJ						
10/27/2006	MI-3A(A)	4.0 UJ	<b>36 J</b>	<b>130 J</b>				
10/27/2006	MI-3A(B)	4.0 UJ						
10/27/2006	MI-3A(C)	4.0 UJ						
10/30/2006	MI-3B(A)	3.9 U	3.9 U	3.9 U	3.9 U	<b>3.9</b>	<b>150</b>	<b>490</b>
10/30/2006	MI-3B(B)	4.0 U						
10/30/2006	MI-3B(C)	4.0 U						
10/12/2006	MI-4(A)	3.8 U						
10/12/2006	MI-4(B)	3.8 U						
10/12/2006	MI-4(C)	3.8 U						
10/17/2006	MI-5A(A)	4.0 U						
10/17/2006	MI-5A(B)	4.0 U						
10/17/2006	MI-5A(C)	4.0 U						
10/13/2006	MI-5B(A)	4.0 U	<b>81</b>	<b>78</b>				
10/13/2006	MI-5B(B)	4.0 U						
10/13/2006	MI-5B(C)	4.0 UJ						
10/17/2006	MI-6A(A)	4.0 U	<b>38</b>	<b>51</b>				
10/17/2006	MI-6A(B)	4.0 U						
10/17/2006	MI-6A(C)	4.0 U						
10/23/2006	MI-6B(A)	3.8 U	<b>29 J</b>					
10/23/2006	MI-6B(B)	3.8 U						
10/23/2006	MI-6B(C)	3.8 U						
10/25/2006	MI-6C(A)	4.0 UJ	<b>91 J</b>					
10/25/2006	MI-6C(B)	4.0 UJ	<b>23 J</b>					
10/25/2006	MI-6C(C)	4.0 UJ						
10/23/2006	MI-6D(A)	3.8 U	<b>33 J</b>					
10/23/2006	MI-6D(B)	3.8 U						
10/23/2006	MI-6D(C)	3.8 U						
10/25/2006	MI-RS-1(A)	4.0 U	<b>28 J</b>					
10/25/2006	MI-RS-1(B)	4.0 U	<b>35</b>	<b>33 J</b>				
10/25/2006	MI-RS-1(C)	4.0 U	<b>39</b>	<b>30 J</b>				
10/19/2006	MI-RS-2(A)	4.0 UJ	<b>72 J</b>	<b>120 J</b>				
10/19/2006	MI-RS-2(B)	4.0 UJ						
10/19/2006	MI-RS-2(C)	4.0 UJ						
10/13/2006	MI-RS-3(A)	4.0 U	<b>58</b>					
10/13/2006	MI-RS-3(A)DUP	3.9 U	<b>57</b>					
10/13/2006	MI-RS-3(B)	4.0 U						
10/13/2006	MI-RS-3(C)	4.0 U						

**Notes:**

**BOLD** = detection  
 DUP = field duplicate sample  
 JSCS = Joint Source Control Strategy  
 MI = multi-increment sample  
 RR = railroad  
 µg/kg = micrograms per kilogram  
 WS = waste sample

J = estimated result  
 NA = not applicable  
 NJ = the limit is an approximate value  
 U = not detected at or below reported method detection limit  
 UJ = not detected above the method detection limit;  
 result exceeds JSCS screening level concentration

**TABLE 5  
Metals in Soil  
Triangle Park Property**

		Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
JSCS Screening Level (µg/kg)		10	33	0.003	111	10	128	49	3
EPA Region 6 HHSL-Outdoor Industrial (mg/kg)		450	1.8	560	500	42,000	800	23,000	100
DEQ Background Screening Level (µg/kg)		4	7	1	42	36	17	38	86
Sample Date	Sample ID	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
10/20/2006	MI-1A(A)	0.01 R	<b>1.6 J</b>	0.02 U	<b>8.3</b>	<b>20.7</b>	<b>14</b>	<b>14.1</b>	<b>53.0</b>
10/20/2006	MI-1A(B)	0.01 R	<b>1.7</b>	0.02 U	<b>10.0</b>	<b>19.6</b>	<b>15</b>	<b>15.6</b>	<b>54.0</b>
10/20/2006	MI-1A(C)	0.01 R	<b>1.6</b>	0.02 U	<b>9.3</b>	<b>16.7</b>	<b>5</b>	<b>14.9</b>	<b>47.0</b>
10/26/2006	MI-1B(A)	0.01 R	<b>1.5</b>	0.02 U	<b>10.0</b>	<b>19.1</b>	<b>15</b>	<b>14.5</b>	<b>68.0</b>
10/26/2006	MI-1B(B)	0.01 R	<b>1.9</b>	0.02 U	<b>10.0</b>	<b>19.4</b>	<b>19</b>	<b>14.1</b>	<b>68.0</b>
10/26/2006	MI-1B(C)	0.01 R	<b>1.5</b>	0.02 U	<b>10.0</b>	<b>15.0</b>	<b>5</b>	<b>14.2</b>	<b>49.0</b>
10/25/2006	MI-1C(A)	0.01 R	<b>1.3</b>	<b>0.2</b>	<b>11.0</b>	<b>26.8</b>	<b>14</b>	<b>31.3</b>	<b>66.0</b>
10/25/2006	MI-1C(B)	0.01 R	<b>1.0</b>	0.02 U	<b>13.0</b>	<b>16.4</b>	<b>11</b>	<b>32.5</b>	<b>52.0</b>
10/25/2006	MI-1C(C)	0.01 R	<b>1.5</b>	0.02 U	<b>7.7</b>	<b>11.1</b>	<b>3</b>	<b>10.7</b>	<b>37.0</b>
10/27/2006	MI-2A(A)	0.01 R	<b>2.6</b>	<b>0.6</b>	<b>13.0</b>	<b>40.6</b>	<b>84</b>	<b>17.1</b>	<b>133</b>
10/27/2006	MI-2A(B)	0.01 R	<b>3.0</b>	0.02 U	<b>12.0</b>	<b>35.3</b>	<b>29</b>	<b>17.0</b>	<b>115</b>
10/27/2006	MI-2A(C)	0.01 R	<b>2.6</b>	0.02 U	<b>11.0</b>	<b>27.5</b>	<b>6</b>	<b>14.5</b>	<b>51.0</b>
10/26/2006	MI-2B(A)	<b>0.4 J</b>	<b>7.8 J</b>	<b>0.4</b>	<b>13.0</b>	<b>46.5 J</b>	<b>60</b>	<b>16.1</b>	<b>149 J</b>
10/26/2006	MI-2B(B)	0.01 R	<b>1.6</b>	0.02 U	<b>11.0</b>	<b>20.1</b>	<b>20</b>	<b>15.4</b>	<b>59.0</b>
10/26/2006	MI-2B(C)	0.009 R	<b>1.8</b>	0.02 U	<b>11.0</b>	<b>14.9</b>	<b>5</b>	<b>14.7</b>	<b>44.0</b>
10/27/2006	MI-3A(A)	0.01 R	<b>1.3 J</b>	<b>0.3</b>	<b>12.0</b>	<b>25.9</b>	<b>17</b>	<b>19.4</b>	<b>67.0</b>
10/27/2006	MI-3A(B)	0.01 R	<b>1.0</b>	0.02 U	<b>9.0</b>	<b>18.3</b>	<b>5</b>	<b>13.8</b>	<b>55.0</b>
10/27/2006	MI-3A(C)	0.01 R	<b>1.0</b>	0.02 U	<b>9.0</b>	<b>18.0</b>	<b>3</b>	<b>11.9</b>	<b>56.0</b>
10/30/2006	MI-3B(A)	0.009 R	<b>1.4</b>	0.02 U	<b>9.3</b>	<b>26.3</b>	<b>15</b>	<b>14.0</b>	<b>57.0</b>
10/30/2006	MI-3B(B)	0.01 R	<b>0.9</b>	0.02 U	<b>10.0</b>	<b>24.2</b>	<b>16</b>	<b>15.8</b>	<b>59.0</b>
10/30/2006	MI-3B(C)	0.01 R	<b>0.9</b>	0.02 U	<b>11.0</b>	<b>18.6</b>	<b>3</b>	<b>17.0</b>	<b>49.0</b>
10/12/2006	MI-4(A)	0.01 R	<b>2.9</b>	0.02 U	<b>18.1</b>	<b>45.3</b>	<b>36</b>	<b>16.6 J</b>	<b>92.0</b>
10/12/2006	MI-4(B)	0.01 R	<b>3.0</b>	0.02 U	<b>15.0</b>	<b>31.7</b>	<b>36 J</b>	<b>18.7</b>	<b>95.0</b>
10/12/2006	MI-4(B) DUP	0.009 R	<b>2.6</b>	0.02 U	<b>11.2</b>	<b>35.8</b>	<b>12 J</b>	<b>18.9</b>	<b>125</b>
10/12/2006	MI-4(C)	0.01 R	<b>2.3</b>	0.02 U	<b>14.0</b>	<b>22.8</b>	<b>15</b>	<b>19.0</b>	<b>72.0</b>
10/17/2006	MI-5A(A)	0.01 R	<b>2.0 J</b>	<b>0.2</b>	<b>17.0 J</b>	<b>37.0 J</b>	<b>52 J</b>	<b>18.2 J</b>	<b>90.0 J</b>
10/17/2006	MI-5A(B)	0.01 R	<b>2.4</b>	0.02 U	<b>14.2</b>	<b>38.8</b>	<b>32</b>	<b>18.4</b>	<b>73.0</b>
10/17/2006	MI-5A(C)	0.009 R	<b>2.0</b>	0.02 U	<b>12.5</b>	<b>20.2</b>	<b>24</b>	<b>16.6</b>	<b>65.0</b>
10/13/2006	MI-5B(A)	0.01 R	<b>2.6</b>	<b>0.3</b>	<b>12.0</b>	<b>32.2</b>	<b>32 J</b>	<b>18.2</b>	<b>73.0</b>
10/13/2006	MI-5B(B)	0.01 R	<b>1.1</b>	0.02 U	<b>5.1</b>	<b>9.4</b>	<b>10</b>	<b>7.5</b>	<b>31.0</b>
10/13/2006	MI-5B(C)	0.01 R	<b>2.3</b>	0.02 U	<b>20.3</b>	<b>19.3</b>	<b>13</b>	<b>23.5</b>	<b>58.0</b>
10/17/2006	MI-6A(A)	0.01 R	<b>2.7</b>	<b>0.2</b>	<b>13.5</b>	<b>52.9</b>	<b>23</b>	<b>16.4</b>	<b>113</b>
10/17/2006	MI-6A(B)	0.01 R	<b>2.3</b>	0.02 U	<b>10.1</b>	<b>39.7</b>	<b>19</b>	<b>13.9</b>	<b>173</b>
10/17/2006	MI-6A(C)	0.01 R	<b>2.2</b>	0.02 U	<b>9.3</b>	<b>18.0</b>	<b>201</b>	<b>14.9</b>	<b>65.0</b>
10/23/2006	MI-6B(A)	0.009 R	<b>2.9</b>	<b>0.3</b>	<b>15.9</b>	<b>30.5 J</b>	<b>36</b>	<b>17.8</b>	<b>98.0</b>
10/23/2006	MI-6B(B)	0.01 R	<b>2.2</b>	0.02 U	<b>10.4</b>	<b>19.8</b>	<b>9</b>	<b>16.5</b>	<b>64.0</b>
10/23/2006	MI-6B(C)	0.01 R	<b>2.1</b>	0.02 U	<b>10.4</b>	<b>14.4</b>	<b>3</b>	<b>15.9</b>	<b>48.0</b>
10/25/2006	MI-6C(A)	0.01 R	<b>3.8</b>	<b>0.2</b>	<b>19.0</b>	<b>55.0</b>	<b>89</b>	<b>16.0</b>	<b>222</b>
10/25/2006	MI-6C(B)	0.01 R	<b>4.1</b>	0.02 U	<b>26.0</b>	<b>77.2</b>	<b>13</b>	<b>21.4</b>	<b>330</b>
10/25/2006	MI-6C(C)	0.01 R	<b>4.8</b>	0.02 U	<b>18.0</b>	<b>86.5</b>	<b>32</b>	<b>17.3</b>	<b>100</b>
10/23/2006	MI-6D(A)	0.01 R	<b>2.9 J</b>	<b>0.3</b>	<b>17.0</b>	<b>60.5 J</b>	<b>32</b>	<b>17.0</b>	<b>230 J</b>
10/23/2006	MI-6D(B)	0.009 R	<b>2.2</b>	0.02 U	<b>11.5</b>	<b>23.2</b>	<b>13</b>	<b>17.4</b>	<b>73.0</b>
10/23/2006	MI-6D(C)	0.009 R	<b>1.9</b>	0.02 U	<b>11.7</b>	<b>15.9</b>	<b>9</b>	<b>17.3</b>	<b>58.0</b>
10/25/2006	MI-RS-1(A)	0.009 R	<b>3.8 J</b>	0.02 U	<b>14.0 J</b>	<b>39.7 J</b>	<b>23</b>	<b>15.5</b>	<b>94.0</b>
10/25/2006	MI-RS-1(B)	0.01 R	<b>3.6</b>	0.02 U	<b>15.0</b>	<b>71.3</b>	<b>22</b>	<b>16.8</b>	<b>107</b>
10/25/2006	MI-RS-1(C)	0.01 R	<b>3.2</b>	0.02 U	<b>14.0</b>	<b>36.6</b>	<b>16</b>	<b>24.2</b>	<b>89.0</b>
10/19/2006	MI-RS-2(A)	0.01 R	<b>2.2</b>	<b>0.3</b>	<b>15.0</b>	<b>33.8</b>	<b>33</b>	<b>17.7</b>	<b>115</b>
10/19/2006	MI-RS-2(B)	0.01 R	<b>2.3</b>	0.02 U	<b>13.0</b>	<b>28.8</b>	<b>13</b>	<b>16.2</b>	<b>98.0</b>
10/19/2006	MI-RS-2(C)	0.01 R	<b>2.4</b>	0.02 U	<b>14.0</b>	<b>40.8</b>	<b>10</b>	<b>22.2</b>	<b>63.0</b>
10/13/2006	MI-RS-3(A)	0.01 R	<b>2.4</b>	0.02 U	<b>12.7</b>	<b>35.2</b>	<b>37</b>	<b>16.1</b>	<b>58.0</b>
10/13/2006	MI-RS-3(B)	0.01 R	<b>1.8</b>	0.02 U	<b>9.7</b>	<b>21.2</b>	<b>32</b>	<b>15.2</b>	<b>57.0</b>
10/13/2006	MI-RS-3(C)	0.01 R	<b>1.9</b>	0.02 U	<b>12.7</b>	<b>24.2</b>	<b>30</b>	<b>16.1</b>	<b>62.0</b>
10/13/2006	WS-RS-3(5-8)-1	0.01 R	<b>27.1</b>	0.02 U	<b>9.3</b>	<b>51.0</b>	<b>59</b>	<b>19.3</b>	<b>43.0</b>

**Notes:**

**BOLD** = detection  
 DUP = duplicate sample  
 DEQ = Oregon Department of Environmental Quality  
 JSCS = Joint Source Control Strategy  
 mg/kg = milligrams per kilogram  
 MI = multi-increment sample  
 WS = waste sample

J = estimated result  
 NJ = result is for a tentatively identified analyte  
 R = rejected result  
 U = not detected at or below reported method detection limit  
 UJ = not detected above the method detection limit; the limit is an approximate value

 exceeds JSCS Upland Soil/Stormwater Sediment Screening level  
 exceeds DEQ 2004 Default Background concentrations for metals in soil  
 exceeds both JSCS and DEQ screening levels

**TABLE 6A  
Dioxins/Furans in Soil  
Triangle Park Property**

Analyte	WHO TEFs	MI-4(A)		MI-5A(A)		MI-5B(A)		MI-6A(A)		MI-6B(A)		MI-6C(A)		MI-6D(A)		MI-RS-1(A)		MI-RS-2(A)		MI-RS-3(A)	
		pg/g	TEQ*	pg/g	TEQ	pg/g	TEQ	pg/g	TEQ	pg/g	TEQ	pg/g	TEQ	pg/g	TEQ	pg/g	TEFs	pg/g	TEQ	pg/g	TEQ
2,3,7,8-TCDD	1	0.48 U	0.24	0.22 U	0.110	0.26 U	0.130	0.35 U	0.175	0.16 U	0.080	0.17 U	0.085	0.48 U	0.240	0.29 U		0.21 U	0.105	0.31 U	0.155
1,2,3,7,8-PeCDD	1	1.2 U	0.60	0.8 U	0.405	2.0 U	1.000	1.1 U	0.550	0.7 U	0.350	1.0 U	0.475	4.0 J	4.0	3.3 J	3.3	0.7 U	0.335	1.7 U	0.850
1,2,3,4,7,8-HxCDD	0.1	1.4 U	0.07	2 U	0.100	3.0 J	0.3	1.9 U	0.095	6.4	0.64	1.1 U	0.055	6.4	0.6	3.1 J	0.3	0.88 U	0.044	6.1	0.61
1,2,3,6,7,8-HxCDD	0.1	5.9	0.59	9.3	0.93	20	2.0	8.0	0.8	3.8 J	0.38	7.3	0.73	40	4.0	76	7.6	5.8	0.58	14	1.4
1,2,3,7,8,9-HxCDD	0.1	2.1 U	0.105	3.9 J	0.39	9.9	0.99	4.6 J	0.46	2.1 U	0.105	3.5 J	0.35	19	1.9	15	1.5	3.2 J	0.32	7.2	0.72
1,2,3,4,6,7,8-HpCDD	0.01	140	1.4	310	3.1	260	2.6	180	1.8	81	0.81	120	1.2	820	8.2	400	4.0	80	0.8	520	5.2
OCDD	0.0003	1200	0.36	2200	0.66	1900	0.57	1700	0.51	610	0.183	1100	0.33	6700 J	2.0	1700	0.5	560	0.168	5900 J	1.77
2,3,7,8-TCDF	0.1	0.61	0.061	0.59	0.059	2.5	0.25	0.95	0.095	0.59	0.059	0.55 J	0.055	1.4	0.1	10	1.0	1.7	0.17	0.71	0.071
1,2,3,7,8-PeCDF	0.03	0.74 U	0.011	0.62 U	0.009	1.9 U	0.029	0.71 U	0.011	0.5 U	0.008	0.62 U	0.009	2.3 U	0.035	3.8 J	0.1	0.32 U	0.005	1.1 U	0.017
2,3,4,7,8-PeCDF	0.3	0.9 U	0.135	0.9 U	0.134	3.2 J	0.96	1.0 U	0.150	0.6 U	0.089	0.7 U	0.110	3.0 J	0.9	6.1	1.8	0.7 U	0.101	1.2 U	0.180
1,2,3,4,7,8-HxCDF	0.1	2.6	0.26	2.2 U	0.11	5.7	0.57	2.5 U	0.125	1.7 U	0.085	2 U	0.100	11	1.1	5.9	0.6	1.7 U	0.085	3.7 J	0.37
1,2,3,6,7,8-HxCDF	0.1	0.94 U	0.047	1.7 U	0.085	3.8 J	0.38	1.4 U	0.070	0.84 U	0.042	1.1 U	0.055	4.3	0.4	6	0.6	1.3 U	0.065	2.4 U	0.120
2,3,4,6,7,8-HxCDF	0.1	1.1 U	0.055	1.3 U	0.065	3.9 J	0.39	1.2 U	0.060	0.93 U	0.047	0.86 U	0.043	3.9	0.4	6.7	0.7	2 U	0.100	1.7 U	0.085
1,2,3,7,8,9-HxCDF	0.1	0.76 U	0.038	0.22 U	0.011	1.5 U	0.075	0.2 U	0.010	0.21 U	0.011	0.17 U	0.009	0.35 U	0.018	0.39 U		0.41 U	0.021	0.26 U	0.013
1,2,3,4,6,7,8-HpCDF	0.01	25	0.25	52	0.52	66	0.66	28	0.28	25	0.25	5.1	0.051	79	0.79	170	1.7	13	0.13	87	0.87
1,2,3,4,7,8,9-HpCDF	0.01	1.7 U	0.009	3.0 J	0.03	3.3 J	0.033	1.6 U	0.008	0.75 U	0.004	1.2 U	0.006	4.7 J	0.047	4.5 J	0.045	0.91 U	0.005	6.7	0.034
OCDF	0.0003	59	0.018	210	0.063	170	0.051	66	0.0198	29	0.0087	35	0.0105	130	0.039	140	0.042	33	0.0099	610	0.183
Total TEQ (pg/g)			<b>4.25</b>		<b>6.78</b>		<b>10.99</b>		<b>5.22</b>		<b>3.15</b>		<b>3.67</b>		<b>24.88</b>		<b>23.81</b>		<b>3.04</b>		<b>12.65</b>

**Notes:**

WHO TEF = World Health Organization 2,3,7,8-TCDD Total Equivalency Factors, 2005

TEQ = 2,3,7,8-TCDD Equivalents

pg/g = picograms per gram

█ indicates TEQ is greater than the Joint Source Control Strategy Upland Soil/Stormwater Sediment Screening Level of 9.1pg/g.

EPA Region 6 Human Health Medium-Specific Screening Level for 2,3,7,8-TCDD is 1.80x10<sup>-5</sup> mg/kg.

U = not detected at or below reported method detection limit.

J = Concentration detected between method detection limit and method reporting limit

MI = multi-increment sample

\* TEQs for nondetected results were conservatively calculated using a value of one half the detection limit for all congeners.

**TABLE 6B**  
**Historical Dioxins/Furans in Soil**  
**Triangle Park Property**

Analyte	WHO 2005 TEFs	December 2005 Sampling Event										August 2000 Sampling Event									
		GS-A6-1		GS-A5-2		GS-A5-3		GS-A4-4		GS-A4-5		GS-A1-6		GP-142		GP-167		GP-169		GP-170	
		pg/g	TEQ <sup>1</sup>	pg/g	TEQ <sup>1</sup>	pg/g	TEQ <sup>1</sup>	pg/g	TEQ <sup>1</sup>	pg/g	TEQ <sup>1</sup>	pg/g	TEQ <sup>1</sup>	pg/g	TEQ <sup>1</sup>	pg/g	TEQ <sup>1</sup>	pg/g	TEQ <sup>1</sup>	pg/g	TEQ <sup>1</sup>
2,3,7,8-TCDD	1	0.92	0.92	1.2	1.2	0.54	0.54	0.41 U	0.21	0.3 U	0.15	0.23 U	0.115	0.53 U	0.265	0.27 U	0.135	0.19 U	0.095	0.39 U	0.195
1,2,3,7,8-PeCDD	1	11	11	14	14	3.6	3.6	3.7	3.7	0.97 U	0.485	0.97 U	0.485	0.53 U	0.265	4.4	4.4	0.32 U	0.16	1 U	0.5
1,2,3,4,7,8-HxCDD	0.1	26	2.6	29	2.9	5.5	0.55	35	3.5	1.1	0.11	0.97 U	0.049	0.46 U	0.023	5.9	0.59	0.63 U	0.032	1.2 U	0.06
1,2,3,6,7,8-HxCDD	0.1	140	14	520	52	21	2.1	38	3.8	3	0.3	1.9	0.19	0.41 U	0.021	74	7.4	2.9	0.29	6.6	0.66
1,2,3,7,8,9-HxCDD	0.1	43	4.3	47	4.7	10	1.0	18	1.8	1.8	0.18	1.6	0.16	0.39 U	0.02	21	2.1	1.6 U	0.08	3.6	0.36
1,2,3,4,6,7,8-HpCDD	0.01	1,800	18	1,500	15	280	2.80	1,300	13.0	63	0.63	25	0.25	1.6 U	0.008	1,700	17	47	0.47	160	1.60
OCDD	0.0003	15,000	4.5	5,500	1.65	1,700	0.51	10,000	3.0	480	0.14	150	0.05	15	0.005	14,000	4.2	370	0.11	1,900	0.57
2,3,7,8-TCDF	0.1	2.7	0.27	72	7.2	1.8	0.18	0.8	0.08	0.35	0.04	0.38	0.04	0.81 U	0.041	2.8	0.28	0.29 U	0.015	1.4	0.14
1,2,3,7,8-PeCDF	0.03	7.7	0.231	27	0.8	1.8	0.054	2.5	0.075	0.97 U	0.015	0.97 U	0.015	0.44 U	0.007	6.7	0.201	0.29 U	0.004	0.88 U	0.013
2,3,4,7,8-PeCDF	0.3	18	5.4	110	33	3.7	1.11	9.5	2.85	1.5	0.45	1.4	0.42	0.44 U	0.066	9.5	2.85	0.29 U	0.044	0.76 U	0.114
1,2,3,4,7,8-HxCDF	0.1	22	2.2	27	2.7	3.7	0.37	25	2.50	0.97 U	0.049	5.3	0.53	0.34 U	0.017	44	4.4	0.56 U	0.028	3.1	0.31
1,2,3,6,7,8-HxCDF	0.1	0.97 U	0.049	0.97 U	0.049	0.98 U	0.049	0.97 U	0.049	0.97 U	0.049	0.97 U	0.049	0.29 U	0.015	16	1.6	0.3 U	0.015	1.7 U	0.085
2,3,4,6,7,8-HxCDF	0.1	31	3.1	73	7.3	10	1.0	9.8	0.98	1.4	0.14	1.2	0.120	0.36 U	0.018	9.8	0.98	0.32 U	0.016	1.2 U	0.06
1,2,3,7,8,9-HxCDF	0.1	10	1.0	33	3.3	0.98 U	0.049	10	1.0	0.97 U	0.049	0.97 U	0.049	0.37 U	0.019	1.1 U	0.055	0.3 U	0.015	0.48 U	0.024
1,2,3,4,6,7,8-HpCDF	0.01	190	1.9	660	6.6	44	0.44	100	1.00	12	0.12	23	0.230	0.25 U	0.001	250	2.50	12	0.12	19	0.19
1,2,3,4,7,8,9-HpCDF	0.01	9	0.09	28	0.28	3.1	0.031	15	0.15	0.97 U	0.005	0.97 U	0.005	0.33 U	0.002	14	0.140	0.23 U	0.001	1.3 U	0.007
OCDF	0.0003	140	0.042	570	0.171	61	0.018	180	0.054	23	0.007	11	0.003	0.67 U	0.0001	490	0.147	12	0.004	55	0.017
<b>Total TEQ (pg/g)</b>			<b>69.6</b>		<b>152.9</b>		<b>14.4</b>		<b>37.7</b>		<b>2.9</b>		<b>2.8</b>		<b>0.8</b>		<b>49.0</b>		<b>1.5</b>		<b>4.9</b>

**Notes:**

ng/Kg = nanograms per kilogram

U = not detected at or below reported method detection limit.

TEQ = 2,3,7,8-TCDD Equivalents

WHO TEF = World Health Organization 2,3,7,8-TCDD Total Equivalency Factors, 2005

<sup>1</sup> TEQs for nondetected results were conservatively calculated using a value of one half the detection limit for all congeners.

<sup>2</sup> Joint Source Control Strategy Screening Upland Soil/Stormwater Sediment Screening Levels

█ indicates TEQ is greater than the Joint Source Control Strategy Upland Soil/Stormwater Sediment Screening Level of 9.1 pg/g.

EPA Region 6 Human Health Medium-Specific Screening Level for 2,3,7,8-TCDD is 1.8E-05 mg/kg.

**TABLE 7**  
**Tributyltin in Soil**  
**Triangle Park Property**

		Tributyltin
<b>JSCS Screening Level</b>		190
<b>EPA Region 6 HHSL-Outdoor Industrial (µg/kg)</b>		210,000
Sample Date	Sample ID	(µg/kg)
10/17/2006	MI-5A(A)	1.5 UJ
10/17/2006	MI-5A(B)	1.5 UJ
10/17/2006	MI-5A(C)	1.5 UJ
10/17/2006	MI-6A(A)	<b>81 J</b>
10/17/2006	MI-6A(B)	1.4 UJ
10/17/2006	MI-6A(C)	1.4 UJ
10/25/2006	MI-6C(A)	1.5 UJ
10/25/2006	MI-6C(B)	1.5 UJ
10/25/2006	MI-6C(C)	1.5 UJ
10/25/2006	MI-RS-1(A)	<b>4.2 J</b>
10/25/2006	MI-RS-1(B)	<b>12 J</b>
10/25/2006	MI-RS-1(C)	<b>13 J</b>
10/19/2006	MI-RS-2(A)	<b>6.1 J</b>
10/19/2006	MI-RS-2(B)	1.5 UJ
10/19/2006	MI-RS-2(C)	<b>26 J</b>

**Notes:**

**BOLD** = detection

method detection limit

J = estimated result

MI = multi-increment sample

JSCS = Joint Source Control Strategy

U = not detected at or below reported

UJ = not detected above the method detection limit;  
the limit is an approximate value

µg/kg = micrograms per kilogram

**TABLE 8**  
**Volatile Organic Compounds in Soil**  
**Triangle Park Property**

		1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,1-Dichloropropene	1,2,3-Trichlorobenzene	1,2,3-Trichloropropane	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,2-Dibromo-3-chloropropane	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene	1,3-Dichloropropane
JSCS Screening Level		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9,200	NA	NA	1,700	NA	NA	NA	300	NA
EPA Region 6 HHSL-Outdoor Industrial (µg/kg)		7,600	1.40E+06	970	5.60E+06	2100	2.30E+06	4.70E+05	NA	NA	1.44	2.60E+05	2.20E+05	20	3.70E+05	840	850	7.80E+04	1.40E+05	4.10E+05
Sample Date	Sample ID	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
10/18/2006	WS-5A(5-8)15	0.02 U	0.03 U	0.02 U	0.02 U	0.01 U	0.02 U	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U	<b>120 N</b>	0.02 U	3 U	0.02 U	0.02 U	0.01 U	0.01 U	0.01 U
10/23/2006	WS-6B(7-10)8A	0.02 U	0.03 U	0.02 U	0.02 U	0.01 U	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	2.9 U	0.02 U	0.02 U	0.01 U	0.01 U	0.01 U
10/25/2006	WS-6D(4.5-5.0)-13A	0.03 U	0.03 U	0.02 U	0.02 U	0.01 U	0.03 U	0.02 U	0.03 U	0.02 U	0.01 U	0.01 U	<b>28,000</b>	0.02 U	<b>3,600</b>	0.02 U	0.02 U	<b>6,100</b>	0.01 U	0.01 U
10/24/2006	WS-6D(9.0-10.0)-14B	0.02 U	0.03 U	0.02 U	0.02 U	0.01 U	0.03 U	0.02 U	0.02 U	0.02 U	0.01 U	0.01 U	<b>4,100 J</b>	0.02 U	<b>880</b>	0.02 U	0.02 U	<b>610</b>	0.01 U	0.01 U
10/25/2006	WS-6D(9.5-10.0)-6	3.7 U	4.6 U	2.4 U	3.7 U	2.2 U	3.9 U	3.4 U	3.8 U	2.4 U	2.1 U	1.9 U	2 U	3.4 U	0.47 U	3.4 U	3.1 U	1.9 U	1.6 U	2.2 U

**Notes:**

- BOLD** = detection
- HHMS = Human Health Medium-Specific
- J = estimated result
- JSCS = Joint Source Control Strategy
- N = presumptively identified result
- NA = not applicable
- NJ = result is for a tentatively identified analyte
- U = not detected at or below reported method detection limit
- µg/kg = micrograms per kilogram
- UJ = not detected above the method detection limit; the limit is an approximate value
- WS = waste sample
- result exceeds JSCS screening level concentration

**TABLE 8**  
**Volatile Organic Compounds in Soil**  
**Triangle Park Property**

		1,4-Dichlorobenzene	2,2-Dichloropropane	2-Butanone	2-Chloroethylvinylether	2-Chlorotoluene	2-Hexanone	4-Chlorotoluene	4-Isopropyltoluene	4-Methyl-2-Pentanone (MIBK)	Acetone	Acrolein	Acrylonitrile	Benzene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoethane	Bromoform
<b>JSCS Screening Level</b>		300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>EPA Region 6 HHSL-Outdoor Industrial (µg/kg)</b>		3,200	NA	3.21E+07	NA	1.59E+05	1.15E+05	NA	NA	NA	1.42E+07	103	210	656	7.26E+04	NA	1,030	NA	6.16E+04
<b>Sample Date</b>	<b>Sample ID</b>	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
10/18/2006	WS-5A(5-8)15	0.01 U	0.03 U	<b>350</b>	0.06 UJ	0.02 U	0.08 U	0.02 U	0.01 UJ	0.09 U	<b>330</b>	0.1 UJ	0.04 UJ	0.02 U	0.01 U	0.03 U	0.02 U	0.02 U	0.01 U
10/23/2006	WS-6B(7-10)8A	0.01 U	0.03 U	<b>430</b>	0.06 UJ	0.02 U	0.07 U	0.02 U	0.01 UJ	0.08 U	<b>400</b>	0.1 UJ	0.04 U	0.02 U	0.01 U	0.03 U	0.02 U	0.02 U	0.01 U
10/25/2006	WS-6D(4.5-5.0)-13A	<b>1,300</b>	0.04 U	<b>510</b>	0.07 UJ	0.03 U	0.08 U	0.02 U	<b>5,400 J</b>	0.09 U	<b>540</b>	0.11 UJ	0.05 U	0.02 U	0.01 U	0.03 U	0.02 U	0.02 U	0.01 U
10/24/2006	WS-6D(9.0-10.0)-14B	<b>340</b>	0.03 U	<b>440</b>	0.06 UJ	0.02 U	0.08 U	0.02 U	<b>780 J</b>	0.09 U	<b>330</b>	0.1 UJ	0.04 U	0.02 U	0.01 U	0.03 U	0.02 U	0.02 U	0.01 U
10/25/2006	WS-6D(9.5-10.0)-6	0.87 U	5.3 U	11 U	9.6 UJ	3.7 U	12 U	2.8 U	<b>100 J</b>	14 U	<b>150</b>	16 UJ	6.8 UJ	3 U	1.8 U	4.3 U	2.9 U	3.3 U	1.8 U

**Notes:**  
**BOLD** = detection  
 HHMS = Human Health Medium-Specific  
 J = estimated result  
 JSCS = Joint Source Control Strategy  
 N = presumptively identified result  
 NA = not applicable  
 NJ = result is for a tentatively identified analyte  
 U = not detected at or below reported method detection lim  
 µg/kg = micrograms per kilogram  
 UJ = not detected above the method detection limit; the lim  
 WS = waste sample  
     result exceeds JSCS screening leve

**TABLE 8**  
**Volatile Organic Compounds in Soil**  
**Triangle Park Property**

		Bromomethane	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Dibromochloromethane	Dibromomethane	Ethylbenzene	Ethylene Dibromide	Hexachlorobutadiene	Isopropylbenzene	m,p-Xylene	Methyl Iodide	Methylene Chloride
JSCS Screening Level		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	600	NA	NA	NA	NA
EPA Region 6 HHSL-Outdoor Industrial (µg/kg)		3,900	7.21E+05	240	3.17E+05	NA	245	1,260	4.30E+04	NA	NA	NA	2.34E+05	28.3	6,240	NA	2.14E+05	NA	8,900
Sample Date	Sample ID	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
10/18/2006	WS-5A(5-8)15	0.02 U	0.02 UJ	0.03 UJ	0.02 U	0.03 U	0.02 U	0.04 U	0.01 U	0.02 U	0.02 U	0.01 U	0.02 U	0.02 U	0.02 UJ	0.02 U	0.04 U	0.01 U	<b>510 J</b>
10/23/2006	WS-6B(7-10)8A	0.02 U	0.02 UJ	0.03 UJ	0.02 U	0.03 U	0.02 U	0.04 U	0.01 U	0.02 U	0.02 U	0.01 U	0.02 U	0.02 U	0.02 UJ	0.01 U	0.04 U	0.01 U	<b>320 J</b>
10/25/2006	WS-6D(4.5-5.0)-13A	0.02 U	0.03 UJ	0.03 UJ	0.02 U	0.03 U	0.02 U	0.04 U	0.01 U	0.03 U	0.02 U	0.01 U	<b>18,000</b>	0.02 U	0.02 UJ	<b>4,700</b>	<b>58,000</b>	0.01 U	<b>330 J</b>
10/24/2006	WS-6D(9.0-10.0)-14B	0.02 U	0.02 UJ	0.03 UJ	0.02 U	0.03 U	0.02 U	0.04 U	0.01 U	0.03 U	0.02 U	0.01 U	<b>91 N</b>	0.02 U	0.02 UJ	<b>260</b>	<b>480</b>	0.01 U	<b>320 J</b>
10/25/2006	WS-6D(9.5-10.0)-6	2.9 U	3.7 UJ	4.3 UJ	3.4 U	5 U	3.4 U	6.4 U	1.9 U	3.9 U	2.5 U	1.4 U	3.8 U	2.6 U	3.2 UJ	2.4 U	5.7 U	1.3 U	<b>48 J</b>

**Notes:**

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- NA = not applicable
- NJ = result is for a tentatively identified analyte
- U = not detected at or below reported method detection lim
- µg/kg = micrograms per kilogram
- UJ = not detected above the method detection limit; the lim
- WS = waste sample
- result exceeds JSCS screening leve

**TABLE 8**  
**Volatile Organic Compounds in Soil**  
**Triangle Park Property**

		Naphthalene	n-Butylbenzene	n-Propylbenzene	o-Xylene	sec-Butylbenzene	Styrene	tert-Butylbenzene	Tetrachloroethene	Toluene	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	trans-1,4-Dichloro-2-butene	Trichloroethene	Trichlorofluoromethane	Vinyl Acetate	Vinyl Chloride
<b>JSCS Screening Level</b>		561	NA	NA	NA	NA	NA	NA	500	NA	NA	NA	NA	NA	NA	NA	NA
<b>EPA Region 6 HHSL-Outdoor Industrial (µg/kg)</b>		1.20E+05	1.45E+05	1.45E+05	2.82E+05	1.12E+05	1.73E+06	1.32E+05	554	5.21E+05	6.34E+04	NA	NA	42.6	3.87E+05	4.27E+05	43
<b>Sample Date</b>	<b>Sample ID</b>	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
10/18/2006	WS-5A(5-8)15	0.01 U	<b>79 N</b>	0.57 U	0.02 U	<b>63 N</b>	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.04 U	0.02 U	0.04 U	0.04 U	0.04 U
10/23/2006	WS-6B(7-10)8A	0.01 U	<b>470</b>	0.56 U	0.02 U	<b>160</b>	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.04 U	0.02 U	0.04 U	0.04 U	0.04 U
10/25/2006	WS-6D(4.5-5.0)-13A	<b>2,900</b>	<b>2,400 N</b>	<b>3,900</b>	<b>24,000</b>	<b>2,000</b>	0.02 U	0.02 U	0.03 U	<b>3,800</b>	0.02 U	0.02 U	0.04 U	0.02 U	0.04 U	0.05 U	0.05 U
10/24/2006	WS-6D(9.0-10.0)-14B	0.01 U	<b>820</b>	<b>820</b>	<b>290 N</b>	<b>460</b>	0.02 U	0.02 U	0.03 U	0.02 U	0.02 U	0.02 U	0.04 U	0.02 U	0.04 U	0.04 U	0.05 U
10/25/2006	WS-6D(9.5-10.0)-6	1 U	2.2 U	0.09 U	2.5 U	2.9 U	2.7 U	2.8 U	3.9 U	3.7 U	2.8 U	2.6 U	6.4 U	3.1 U	6.3 U	6.8 U	7.1 U

**Notes:**

- BOLD** = detection
- HHMS = Human Health Medium-Specific
- J = estimated result
- JSCS = Joint Source Control Strategy
- N = presumptively identified result
- NA = not applicable
- NJ = result is for a tentatively identified analyte
- U = not detected at or below reported method detection lim
- µg/kg = micrograms per kilogram
- UJ = not detected above the method detection limit; the lim
- WS = waste sample
- result exceeds JSCS screening leve

**TABLE 9**  
**Pentachlorophenol in Soil**  
**Triangle Park Property**

		Pentachlorophenol
<b>JSCS Screening Level</b>		1,000
<b>EPA Region 6 HHSL-Outdoor Industrial (µg/kg)</b>		10,000
Sample Date	Sample ID	(µg/kg)
10/25/2006	MI-1C(A)	<b>6.6 J</b>
10/25/2006	MI-1C(B)	4.3 U
10/25/2006	MI-1C(C)	4.4 U
10/23/2006	MI-6D(A)	<b>11 J</b>
10/24/2006	WS-6D(2.0-2.5)-8	5.6 U

**Notes:**

**BOLD** = detection

J = estimated result

MI = multi-increment

JSCS = Joint Source Control Strategy

U = not detected at or below reported  
method detection limit

µg/kg = micrograms per kilogram

WS = waste sample

**TABLE 10**  
**Diesel and Heavy Oil Range Petroleum Hydrocarbon Groundwater Analytical Results**  
**Triangle Park Property**

		Diesel Range Hydrocarbons	
Sample Date	Sample ID	(mg/L)	Motor Oil (mg/L)
10/12/2006	GW-4-1	<b>0.89</b>	0.5 U
10/12/2006	GW-4-13	0.02 U	0.5 U
10/12/2006	GW-4-5	<b>3.8</b>	0.5 U
10/13/2006	GW-4-22	<b>0.3</b>	0.5 U
11/02/2006	Decon Water	0.02 U	0.5 U

**Notes:**

**BOLD** = detection  
 GW = groundwater sample  
 mg/L = milligrams per liter  
 U = not detected at or below reported  
 method detection limit

**TABLE 11**  
**Polynuclear Aromatic**  
**Hydrocarbons in Groundwater**  
**Triangle Park Property**

		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
<b>JSCS Screening Level</b>		520	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	620	NA	NA
<b>EPA Region 6 HHSL-Residential (µg/l)</b>		370	NA	1,800	0.029	0.0029	0.029	NA	0.29	2.9	0.0029	1,500	240	0.029	6.2	NA	180
<b>Sample Date</b>	<b>Sample ID</b>	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
10/12/2006	GW-4-1	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	0.04 UJ	0.04 UJ	0.05 UJ	0.06 UJ	0.04 UJ	0.05 UJ	0.02 UJ	0.03 UJ	0.05 UJ	<b>0.11 J</b>	0.02 UJ	0.04 UJ
10/12/2006	GW-4-13	0.02 U	0.02 U	0.02 U	0.02 U	0.04 U	0.04 U	0.05 U	0.06 U	0.04 U	0.05 U	0.02 U	0.03 U	0.05 U	0.03 U	0.02 U	0.04 UJ
10/12/2006	GW-4-5	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	0.04 UJ	0.04 UJ	0.05 UJ	0.06 UJ	0.04 UJ	0.05 UJ	0.02 UJ	0.03 UJ	0.05 UJ	0.03 UJ	0.02 UJ	0.04 UJ
10/13/2006	GW-4-22	0.02 UJ	0.02 UJ	0.02 UJ	0.02 UJ	0.04 UJ	0.04 UJ	0.05 UJ	0.06 UJ	0.04 UJ	0.05 UJ	0.02 UJ	0.03 UJ	0.05 UJ	0.03 UJ	0.02 UJ	0.04 UJ
11/02/2006	Decon Water	0.02 U	0.02 U	0.02 U	0.02 U	0.04 U	0.04 U	0.05 U	0.06 U	0.04 U	0.05 U	0.02 U	0.03 U	0.05 U	0.03 U	0.02 U	0.04 U

**Notes:**

**BOLD** = detection

GW = groundwater

JSCS = Joint Source Control Strategy

J = estimated result

N = presumptively identified result

NA = not available

NJ = result is for a tentatively identified analyte

U = not detected at or below reported  
method detection limit

UJ = not detected above the method detection limit; the limit is an approximate value

µg/L = micrograms per liter

**TABLE 12**  
**Dissolved Metals in Groundwater**  
**Triangle Park Property**

		Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
<b>JSCS Screening Level</b>		1600	150	0.094	NA	2.7	0.54	16	33.0
<b>EPA Region 6 HHSL-Residential (µg/l)</b>		15	0.045	18	110	1,400	15	730	11,000
<b>Sample Date</b>	<b>Sample ID</b>	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
10/12/2006	GW-4-1	0.02 U	<b>2.7</b>	0.02 U	0.2 U	0.1 U	0.4 U	<b>24.4</b>	<b>410</b>
10/12/2006	GW-4-13	0.02 U	<b>0.4</b>	0.02 U	0.2 U	0.1 U	0.4 U	<b>1.2</b>	31
10/12/2006	GW-4-5	0.02 U	<b>11.2</b>	0.02 U	0.6 U	0.1 U	0.4 U	<b>8.3</b>	7.0
10/13/2006	GW-4-22	0.02 U	<b>3.0</b>	0.02 U	0.6 U	0.1 U	0.4 U	<b>2.0</b>	9.0
11/02/2006	Decon Water	<b>0.4</b>	<b>0.6</b>	0.01 U	<b>3.1</b>	<b>9.8</b>	<b>3</b>	<b>7.6</b>	<b>50</b>

**Notes:**

**BOLD** = detection

GW = groundwater

JSCS = Joint Source Control Strategy

NA = not available

U = not detected at or below reported method detection limit

µg/L = micrograms per liter

result exceeds JSCS screening level concentration

**TABLE 13**  
**Summary of Multi-Increment Analytical Testing Results Comparison to Potentially Applicable Screening Levels**  
**Triangle Park Property**

AREA	HORIZON	EXCEEDED JSCS SEDIMENT SCREENING VALUES
1A	A	Copper & Zinc
	B	Copper & Zinc
	C	Copper & Zinc
1B	A	Copper, Zinc, & PAHs
	B	Copper, Zinc, & PAHs
	C	Copper, Zinc, & PAHs
1C	A	Cadmium, Copper, & Zinc
	B	Copper & Zinc
	C	Copper & Zinc
2A	A	Cadmium, Copper, Zinc, & PAHs
	B	Copper & Zinc
	C	Copper & Zinc
2B	A	Cadmium, Copper, & Zinc
	B	Copper & Zinc
	C	Copper & Zinc
3A	A	Cadmium, Copper, Zinc, & PCBs
	B	Copper & Zinc
	C	Copper & Zinc
3B	A	Copper, Zinc, & PCBs
	B	Copper & Zinc
	C	Copper & Zinc
4	A	Copper & Zinc
	B	Copper & Zinc
	C	Copper & Zinc
5A	A	Cadmium, Copper, & Zinc
	B	Copper & Zinc
	C	Copper & Zinc
5B	A	Cadmium, Copper, Zinc, PCBs, & Dioxins
	B	Zinc
	C	Copper & Zinc
6A	A	Cadmium, Copper, Zinc, PAHs, & PCBs
	B	Copper & Zinc
	C	Copper, Zinc, Lead, & TPH
6B	A	Cadmium, Copper, Zinc, & PAHs
	B	Copper & Zinc
	C	Copper & Zinc
6C	A	Cadmium, Copper, & Zinc
	B	Copper & Zinc
	C	Copper, Zinc, & TPH
6D	A	Cadmium, Copper, Zinc, & Dioxins
	B	Copper & Zinc
	C	Copper, Zinc, & TPH
RS-1	A	Copper, Zinc, & Dioxins
	B	Copper, Zinc, PAHs, & PCBs
	C	Copper, Zinc, PAHs, & PCBs
RS-2	A	Cadmium, Copper, Zinc, & PCBs
	B	Copper & Zinc
	C	Copper & Zinc
RS-3	A	Copper, Zinc, & Dioxins
	B	Copper & Zinc
	C	Copper & Zinc

Soil Test Methods

- TPH Diesel and Heavy Oil Range Hydrocarbons by NWTPH-Dx
- PAHs Polynuclear Aromatic Hydrocarbons by EPA Method 8270C (modified)
- Metals Cadmium, Copper, Lead & Zinc by EPA Method 6010B or EPA Method 6020
- PCBs Polychlorinated Biphenyls by EPA Method 8082
- Dioxin EPA Method 1613B