

**Interim Action Work Plan
Bothell Paint and Decorating Site
Revision No. 2**



City of Bothell™

**April 2010
Parametrix**

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Interim Action Work Plan Bothell Paint and Decorating Site Revision No. 2

Prepared for

City of Bothell
9654 NE 182nd Street
Bothell, WA 98011

Prepared by

Parametrix
411 108th Avenue NE, Suite 1800
Bellevue, WA 98004-5571
T. 425.458.6200 F. 425.458.6363
www.parametrix.com

CITATION

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Bothell Paint and Decorating Site
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Bellevue, Washington. April 2010.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.



3/14/10

Blaine Hardy

Prepared by Blaine Hardy, PE

Sandra Matthews

Checked by Sandra Matthews, LG, LHG

Ken Fellows

Approved by Ken Fellows, PE

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ACRONYMS AND ABBREVIATIONS

ARAR	applicable relevant and appropriate requirement
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CFR	Code of Federal Regulations
City	City of Bothell
COPC	contaminant of potential concern
cPAH	carcinogenic polyaromatic hydrocarbon
Ecology	Washington State Department of Ecology
HWA	HWA GeoSciences Inc
IAWP	Interim Action Work Plan
LUST	leaking underground storage tank
mg/kg	milligrams per kilogram
MRC™	Metals Remediation Compound
MTCA	Model Toxics Control Act
RAO	remedial action objective
RI/FS	remedial investigation/feasibility study
sf	square feet
Site	Bothell Paint and Decorating site
SR	State Route
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbons
UST	underground storage tank
WAC	Washington Administrative Code

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1. INTRODUCTION

This Interim Action Work Plan (IAWP) has been prepared for the Bothell Paint and Decorating site (Site) in Bothell, Washington (Figure 1-1). The IAWP is being conducted under Agreed Order DE 6296, as amended in April 2010, between the City of Bothell (City) and the Washington State Department of Ecology (Ecology). The purpose of the Agreed Order was to conduct a remedial investigation/feasibility study (RI/FS), submit a cleanup plan to address known contamination related to historical releases of hazardous substances, and implement interim action(s).

The City currently owns the Site, a portion of which will accommodate the realignment of State Route (SR) 522, which is scheduled for construction in summer 2010. The 0.79-acre property consisting of two parcels is located on the south side of existing SR 522, between SR 522 and 180th Street NE. Although currently vacant, recent property use was mixed commercial and retail. The interim action will be implemented during the construction window of the roadway realignment project. Remnant portions of the property will be redeveloped as part of the City's overall Downtown Revitalization Plan. In general, cleanup approaches discussed in this document will address anticipated future property uses as envisioned in the Downtown Revitalization Plan. Figure 1.1 from the Bothell Downtown Subarea Plan is provided in Appendix A for reference. The figure shows proposed future land uses in the vicinity of the Site.

1.1 PURPOSE

This IAWP was completed per the Agreed Order and Washington Administrative Code (WAC) 173-340-380, Model Toxics Control Act (MTCA) (Ecology 2007). Under WAC 173-340-430, an interim action is a remedial action that is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance, that corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed, or that is needed to provide for completion of a site hazard assessment, RI/FS, or design of a cleanup action.

The purpose of the IAWP is to present a general conceptual-level description of an interim action for soil developed after the City submitted a draft RI/FS (Parametrix 2009). Any additional cleanup action that may be required at the Site will be addressed as an additional interim action and/or after the RI/FS is completed (see Section 2.2.3). The IAWP was developed using information obtained during Site investigations that began in 1988 and are ongoing. This IAWP includes the following:

- Applicable state and federal laws for the interim action.
- Remediation standards for each hazardous substance and for each medium of concern.
- A brief summary of the other cleanup alternatives evaluated in the draft RI/FS.
- A description of the proposed interim action and a summary of the rationale used for selecting the proposed alternative.
- A schedule for implementation of the interim action.

This IAWP also includes the Compliance Monitoring Plan (including a Sampling and Analysis Plan/Quality Assurance Project Plan) (Appendix B), which will be used during completion of the interim action at the Site. The Health and Safety Plan (submitted under separate cover) guidelines will also be followed.

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2. SITE CONDITIONS

This section summarizes the Site history and the human health and environmental concerns.

2.1 SITE HISTORY

The Paint and Decorating site is located on the south side of SR 522, between downtown Bothell and the Sammamish River Slough (Figure 2-1), and comprises 0.79 acre. The property consists of two parcels: the Victory parcel (0.54 acre) and the Giannola parcel (0.25 acre). Historical operations on the Victory parcel included automobile repair and dealerships, retail paint and flooring, and sand blasting. Documented historical site use of the Giannola parcel is limited to residential usage and parking.

2.1.1 Victory Parcel

According to historical information and interviews, the Site has been developed since 1914. A leaking underground storage tank (LUST) removal was conducted in 1988. The tank containing gasoline and Stoddard solvent (petroleum distillates) was found to have released product to soil and groundwater.

A sand blasting contractor operated on this parcel for approximately 40 years. According to tenant information, sand blast grit and soil staining reportedly related to compressor blowdown have been observed to the west and south of the tenant space now occupied by McVay Welding. Sand blasting grit was reportedly removed, but stained soils were not assessed or removed.

Historical information indicates that one of the buildings was used as a garage and body shop, and that petroleum companies were listed as lessees of the property in the 1920s and 1930s.

Various Site soil and groundwater investigations have taken place since 1988. For a more detailed discussion of the Site history, physical characteristics, and previous investigations, see the draft RI/FS (Parametrix 2009).

2.1.2 Giannola Parcel

According to historical information and interviews, the subject property has been developed since at least 1919, and use was originally residential. In the 1960s, the residence was demolished and the property has been used for parking since that time.

2.2 HUMAN HEALTH AND ENVIRONMENTAL CONCERNS

The following sections include a discussion of the nature and extent of Site contamination to be addressed by the proposed interim action, a summary of the Site contaminants of potential concern (COPCs), and an assessment of risk.

2.2.1 Soil

This section summarizes the nature and extent of soil contaminated with COPCs that will be addressed by the proposed interim action.

2.2.1.1 Metals

Sampling for metals was conducted during the 2008 HWA GeoSciences Inc (HWA) investigation and RI. Specifically, samples were analyzed for arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury.

Elevated metals concentrations were observed from the center to over the southeastern portion of the Site to a depth of 4 to 5 feet. Based on the results of sampling during the 2008 HWA investigation (HWA 2008a, 2008b) and September 2009 RI/FS investigation, arsenic, cadmium, and lead above MTCA Method A cleanup levels remain in the soil. Barium, chromium, silver, lead, and mercury remain in the soil above ecological indicator concentrations.

2.2.1.2 Petroleum Hydrocarbons (including benzene, toluene, ethylbenzene, and xylenes [BTEX])

The LUST removal completed in 1988 removed an underground storage tank (UST) containing gasoline and Stoddard solvent (petroleum distillates) from the Site. Affected soil was left on the Site due to the proximity of the excavation to the building and a rock wall adjacent to the west and north sides of the UST excavation. A composite soil sample collected from the north and south sidewalls of the excavation contained 1,400 milligrams per kilogram (mg/kg) of gasoline-range petroleum hydrocarbons above MTCA Method A cleanup levels.

During the HWA Phase II investigation (HWA 2008b), motor oil concentrations next to the blowdown compressor pipe at VB-9 were 180,000 mg/kg at 0.5 foot and 29,000 mg/kg at 1.5 feet below ground surface (bgs). During the RI sampling, motor oil was detected in the two soil samples analyzed from borings BP-20 and BP-21 adjacent to VB-9, at concentrations less than MTCA Method A cleanup levels.

In RI boring BP-5, diesel-range hydrocarbon concentrations were detected at less than the MTCA Method A cleanup levels but greater than the ecological indicator at depths of 1 to 4 feet bgs. Benzene above the MTCA Method A cleanup levels was detected in BP-26 at a depth of 1 to 2 feet bgs. Motor oil hydrocarbons were detected in the shallow soil at the three new well locations (BPMW-1 through BPMW-3). All the soil samples (0.5 foot, 2 feet, and 5 feet) from BPMW-3 showed concentrations of motor oil hydrocarbons. The sample at 2 feet bgs exceeded Method A cleanup levels for motor oil.

2.2.1.3 Semivolatile Organic Compounds

Semivolatile organic compounds (SVOCs) were detected in the one soil sample analyzed at BP-26. Total carcinogenic polyaromatic hydrocarbons (cPAHs) were above the MTCA Method A cleanup levels. This sample was a shallow soil sample collected in an area of potential future redevelopment outside of the new road alignment. Further investigation is required to determine the possible source of the cPAHs.

2.2.2 Groundwater

This section summarizes the nature and extent of groundwater contaminated with COPCs that will be addressed by the proposed interim action.

2.2.2.1 Metals

Historical data from 2008 compiled by HWA showed MTCA Method A cleanup level exceedances of total arsenic in the groundwater at VB-11, BC-10, and BC-12; dissolved arsenic in the groundwater at VB-3 and VB-11; and total lead in groundwater at BC-10 and BC-12. A total of six groundwater samples collected during the RI were analyzed for metals; either total or dissolved arsenic was detected in all the samples at a concentration above MTCA Method A cleanup levels, except the samples from BPMW-2 and BC-11.

2.2.2.2 Petroleum Hydrocarbons (including BTEX)

Historical data from 2008 compiled by HWA showed MTCA Method A cleanup level exceedances of motor-oil-range petroleum hydrocarbons in BC-10. No other groundwater samples collected and analyzed for petroleum hydrocarbons had concentrations above the MTCA Method A cleanup levels. No groundwater samples collected during the RI had concentrations above the MTCA Method A cleanup levels.

2.2.3 Summary of Contaminants of Potential Concern

Based on the draft RI/FS, COPCs for soil at the Site to be addressed by the proposed interim action include:

- Metals (arsenic, barium, cadmium, chromium, lead, silver, and mercury)
- Total petroleum hydrocarbons (diesel- and motor oil-range)
- Aromatic hydrocarbons (benzene)

For groundwater, COPCs include:

- Metals (arsenic and lead)

Cleanup of arsenic in groundwater will be addressed in the RI/FS. To the extent arsenic in soil at the Site is contributing to area-wide arsenic in the groundwater, the interim action described in this IAWP is expected to improve overall groundwater quality.

2.2.4 Assessment of Risk

Complete exposure pathways developed under the draft RI/FS (Parametrix 2009) for the COPCs include the following:

- Current/future indoor retail worker:
 - Inhalation of vapors from the subsurface (groundwater and soil) in indoor air
 - Direct ingestion of contaminated groundwater used as drinking water
- Current/future construction/utility worker:
 - Incidental soil ingestion and dermal contact
 - Inhalation of dust from the subsurface soil in outdoor air
 - Inhalation of vapors or dermal contact with groundwater in a trench or excavation
- Current/future Site visitor or residence (adult and child):
 - Inhalation of dust from surface soil
- Ecological receptors:
 - Incidental soil ingestion and dermal contact
 - Inhalation of vapors from the subsurface soil in outdoor air or in a burrow
 - Inhalation of vapors from or dermal contact with groundwater in a burrow
 - Impacted groundwater to surface water

Exposure to contaminants could occur via the complete exposure pathways described above. Based on the nature of the Site and the extent of contamination, current risks appear limited. The likely greatest potential risk to human receptors is inhalation of contaminant vapors and dust in the workplace. Note, however, that only one of the occupied buildings on the Site is underlain (partially) by contaminated soil and groundwater with the potential to cause vapor intrusion. The second most likely exposure risk is to construction workers during soil-disturbing activities. Ecological receptors have limited risk of exposure because the majority of the Site contains buildings or pavement.

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3. APPLICABLE STATE AND FEDERAL LAWS

This section discusses the applicable state and federal laws for the Site including applicable or relevant and appropriate requirements (ARARs), cleanup standards, and remedial action objectives (RAOs).

3.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Cleanup actions under MTCA (WAC 173-340-710) require the identification of all ARARs. Potential ARARs were identified for each medium of concern in the draft RI/FS (Parametrix 2009). The applicable state and federal laws specific to the proposed interim action are shown in Table 3-1.

3.2 REMEDIATION LEVELS

Based on the COPCs developed in the draft RI/FS, a list of specific hazardous substances and their associated remediation levels was developed. Selected remediation levels are listed below and are also provided for each individual COPC in Table 3-2.

- MTCA Method A Soil Cleanup Levels for Unrestricted Land Use (WAC 173-340, Table 740-1)

MTCA Method A cleanup standards are appropriate for soil because they are protective of human health and groundwater. Terrestrial ecological receptors will be largely protected under the future property development scenario, which includes the placement of pavement, buildings, and associated hardscape over the majority of the IA footprint (refer to Figure 1-1 in Appendix A). The placement of these types of soil covers qualifies the IA area for an exclusion from a terrestrial ecological evaluation under WAC 173-340-7491(1)(b). It is acknowledged that an institutional control is required for this exclusion. Risks to terrestrial ecological receptors in areas to be landscaped in future will be evaluated following the IA using a terrestrial ecological evaluation performed as part of the ongoing RI.

Table 3-2 shows the remediation levels of the specific COPCs determined under the draft RI/FS (Parametrix 2009) for each hazardous substance of concern and each medium of concern. The values listed for each hazardous substance are the remediation levels relevant to the Site. Where N/A is listed, regulatory values typically exists; however, those values are not applicable to the Site.

3.3 REMEDIAL ACTION OBJECTIVES

The following RAOs have been established for remediation alternatives:

- Achieve the MTCA Method A soil cleanup standards for heavy oil-range total petroleum hydrocarbons (TPH), benzene, arsenic, cadmium, and lead.
- Reduce or eliminate human exposure through direct contact (incidental ingestion, skin contact, and inhalation of vapors) with contaminated soil and groundwater that exceed protective regulatory levels.
- Reduce or eliminate risks to ecological receptors from contaminated soil and groundwater.
- Use permanent solutions to the maximum extent practicable (which includes consideration of cost-effectiveness).

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4. REMEDIAL ALTERNATIVES SUMMARY

This section summarizes the remediation alternatives developed under the draft RI/FS (Parametrix 2009) in accordance with MTCA requirements and guidelines. These alternatives have been revised from what was presented in the draft RI/FS to reflect an interim action for soil only. The draft RI/FS is still undergoing Ecology review and comment. Although five alternatives were presented in the draft RI/FS, Alternatives 4 and 5 are the same if no groundwater remedy is considered. Therefore, only four alternatives are presented below.

4.1 REMEDIAL ALTERNATIVE DEVELOPMENT

Three remedial alternatives for metals and petroleum-contaminated soil remediation were developed that meet the RAOs and MTCA requirements. Alternatives are summarized below.

4.1.1 Alternative 1 – Chemical Oxidation, Electrokinetic Separation, and Low Permeability Cap

Alternative 1, involving chemical oxidation, electrokinetic separation, and low permeability cap, would consist of the following:

- Chemical oxidation would be used within the soil around monitoring well BPMW-3 at a depth of approximately 3 feet and an area with a radius of approximately 30 feet from the well up to the property line to remediate heavy oil-range TPH.
- Chemical oxidation would be used within the soil around historical boring VB-9 at a depth of approximately 4 feet and an area with a radius of approximately 25 feet from the boring to remediate heavy oil-range TPH.
- Electrokinetic separation would be used within the soil outside the SR 522 realignment footprint to a depth of approximately 4 feet and an area of approximately 1,200 square feet (sf) to remediate arsenic, cadmium, and lead. The liquid generated by electrokinetic separation would be treated via three ion exchange media vessels in series in a small treatment building.
- A low permeability cap (i.e., realignment of SR 522) with institutional controls would limit exposure to the majority of the metals-contaminated soil.

RegenOx™ by Regenesis is the product used as the basis for Alternative 1 for the remediation of the organic soil contamination.

Electrokinetic separation for the metals soil contamination would consist of installing specialized monitoring wells that would include either an anode or cathode and liquid removal assembly to extract the concentrated metals from the saturated subsurface for ex situ treatment and disposal. Ex situ treatment would consist of ion exchange media. The ion exchange media was chosen because it is the only single media that can remove arsenic, cadmium, and lead from a waste stream. The treated liquid would be recirculated back into the liquid removal assemblies to allow the removal of additional metals from the subsurface.

MRC™, also by Regenesis, is the product used as the basis for Alternative 1 for the remediation of the metals groundwater contamination. The product is injected into the subsurface via injection wells organized in a grid pattern.

Bench-scale treatability and pilot tests would be conducted to help refine the full-scale treatment approach for Alternative 1. Results of the treatability and pilot tests would be used to refine the full-scale treatment approach for both contaminated soil and groundwater.

The planned realignment of SR 522 would be maintained directly over the untreated soil contamination in order to eliminate exposure pathways associated with surface and subsurface soil. Groundwater monitoring would be conducted for four quarters after contaminated soil treatment and realignment of the roadway is complete to evaluate the effectiveness of the soil remedial action and to assess the need for groundwater remedial action. In order to adequately monitor the area, five downgradient wells would be installed and seven wells would be monitored for four successive quarters.

The capital costs for Alternative 1 total \$2,806,000 and the operations and maintenance costs total \$191,000 for a total alternative cost of \$2,997,000.

4.1.2 Alternative 2 – Excavation and Off-Site Disposal

Alternative 2, involving excavation and off-site disposal, would consist of the following:

- Excavation of the soil around monitoring well BPMW-3 at a depth of approximately 3 feet and an area with a radius of approximately 30 feet from the well up to the property line to remove heavy oil-range TPH.
- Excavation of the soil to a depth of approximately 4 feet and an area of approximately 10,800 sf to remove heavy oil-range TPH, arsenic, cadmium, and lead in the southeastern portion of the Site.

Approximately 1,900 cubic yards or 3,000 tons of contaminated soil would be excavated with heavy equipment. The contaminated soil would be trucked to a permitted landfill for final disposal. Confirmation soil sampling would take place on the sidewalls and bottom of the excavations. The excavated areas would then be backfilled with clean material.

After excavation and backfill, the planned realignment of SR 522 would be constructed over the excavated area. Groundwater monitoring would be conducted for a minimum of four quarters after contaminated soil treatment and realignment of the roadway is complete to evaluate the effectiveness of the soil remedial action and to assess the need for groundwater remedial action. In order to adequately monitor the area, five downgradient wells would be installed and a total of seven wells would be monitored quarterly for 1 year.

The capital costs for Alternative 2 total \$553,000 and the operations and maintenance costs total \$49,000 for a total alternative cost of \$602,000.

4.1.3 Alternative 3 – Limited Excavation, Off-Site Disposal, and Low Permeability Cap

Alternative 3, involving limited excavation, off-site disposal, and low permeability cap, would consist of the following:

- Excavation of the soil around monitoring well BPMW-3 at a depth of approximately 3 feet and an area with a radius of approximately 30 feet from the well up to the property line to remove heavy oil-range TPH.
- Excavation of the soil to a depth of approximately 4 feet and an area of approximately 2,200 sf to remove arsenic, cadmium, and lead in the southeastern portion of the site. A low permeability cap (i.e., realignment of SR 522) with institutional controls would limit exposure to the majority of the contaminated soil.

Approximately 330 cubic yards or 530 tons of contaminated soil would be excavated with heavy equipment. The contaminated soil would be trucked to a permitted landfill for final disposal. Confirmation soil sampling would take place on the sidewalls and bottom of the excavations. The excavated areas would then be backfilled with clean material.

After excavation and backfill, the planned realignment of SR 522 would be constructed over the excavated area. Groundwater monitoring would be conducted for a minimum of four quarters after contaminated soil treatment and realignment of the roadway is complete to evaluate the effectiveness of the soil remedial action and to assess the need for groundwater remedial action. In order to adequately monitor the area, five downgradient wells would be installed and a total of seven wells would be monitored quarterly.

The capital costs for Alternative 3 total \$273,000 and the operations and maintenance costs total \$119,000 for a total alternative cost of \$392,000.

4.2 REMEDIAL ALTERNATIVES COMPARISON

The four alternatives were compared in accordance with MTCA WAC 173-340-430(7)(b)(ii) regarding the following criteria:

- Each of the alternatives would be protective of human health and the environment through a combination of physical barriers, contaminant destruction or removal, and compliance monitoring.
- Each of the alternatives were evaluated on the permanency of the remedial action to the maximum extent practicable.
- Each of the alternatives were evaluated on potential to meet anticipated cleanup levels at the point of compliance for known areas of contamination.
- Each of the alternatives would be designed and implemented to meet the requirements of the ARARs.
- Each of the alternatives would conduct health and safety protection monitoring during implementation to ensure that the safety of workers, surrounding populations, and the environment are protected. All alternatives would also provide performance and confirmation monitoring to confirm remediation standards have been attained and to monitor the long-term effectiveness of the interim action.

Table 4-1 summarizes the comparison of the alternatives. Effectiveness was evaluated in terms of protectiveness and ability to achieve the RAOs. The implementability of the alternatives depends on their technical feasibility, the availability of required resources, and administrative feasibility. Public concern reflects the anticipated level of adverse public reaction to each alternative. Costs were developed based on Engineer's estimates and experience from past similar projects. Additional details appear in the draft RI/FS.

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5. PROPOSED INTERIM ACTION

Based on the analysis discussed above, Alternative 2, involving excavation and off-Site disposal is the proposed interim remedial action. Alternative 2 would consist of the following:

- Excavation of the soil around monitoring well BPMW-3 at a depth of approximately 3 feet and an area with a radius of approximately 30 feet from the well up to the property line to remove heavy oil-range TPH. BPMW-3 is located adjacent to the northern property line and additional contamination may be present underneath the existing roadway.
- Excavation of the soil to a depth of approximately 4 feet and an area of approximately 10,800 sf to remove heavy oil-range TPH, arsenic, cadmium, and lead in the southeastern portion of the Site.

Approximately 1,900 cubic yards or 3,000 tons of contaminated soil would be excavated with heavy equipment (see Figure 5-1). The contaminated soil would be trucked to a permitted landfill for final disposal. Confirmation soil sampling would take place on the sidewalls and bottom of the excavations. The excavated areas would then be backfilled with clean material.

After excavation and backfill, the planned realignment of SR 522 would be constructed over the IA area. Groundwater monitoring would be conducted for four quarters after contaminated soil treatment and realignment of the roadway is complete to evaluate the effectiveness of the soil remedial. In order to adequately monitor the area, five downgradient wells would be installed and a total of seven wells would be monitored quarterly for 1 year. The appropriateness of further groundwater monitoring for the IA will be evaluated following completion of the four rounds of quarterly monitoring.

This proposed IA for soil is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, complies with anticipated cleanup standards, meets the threshold criteria, provides a high likelihood of achieving the RAOs within a reasonable restoration time frame, and meets the additional performance criteria. Furthermore, the risks discussed in Section 2.2.4 are mitigated under the proposed interim action because the action either removes the contaminants to levels that are protective to receptors or the action places engineering and administrative controls to prevent exposure.

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6. SCHEDULE

The proposed action is planned to be implemented during the construction window of the realignment of SR 522. Construction activities for the realignment of SR 522 are anticipated to begin during the second quarter of 2010, including the excavation, removal and disposal of contaminated soil and backfill in the remediation areas. The environmental remediation activities will commence within 90 days of the start of construction.

Groundwater monitoring in the area of the excavation will be conducted for a minimum of one year after the completion of the SR 522 realignment to verify the soil contamination has been removed and remediation levels for Site contamination have been met.

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7. REFERENCES

Ecology (Washington State Department of Ecology). 2007. Model Toxics Control Act Cleanup Regulations. Washington Administrative Code (WAC) 173-340. November 2007.

HWA. 2008a. Phase II Environmental Site Assessment, Giannola Parcel/Parcel No. 9457200072, Bothell, Washington. Prepared for City of Bothell. April 30, 2008.

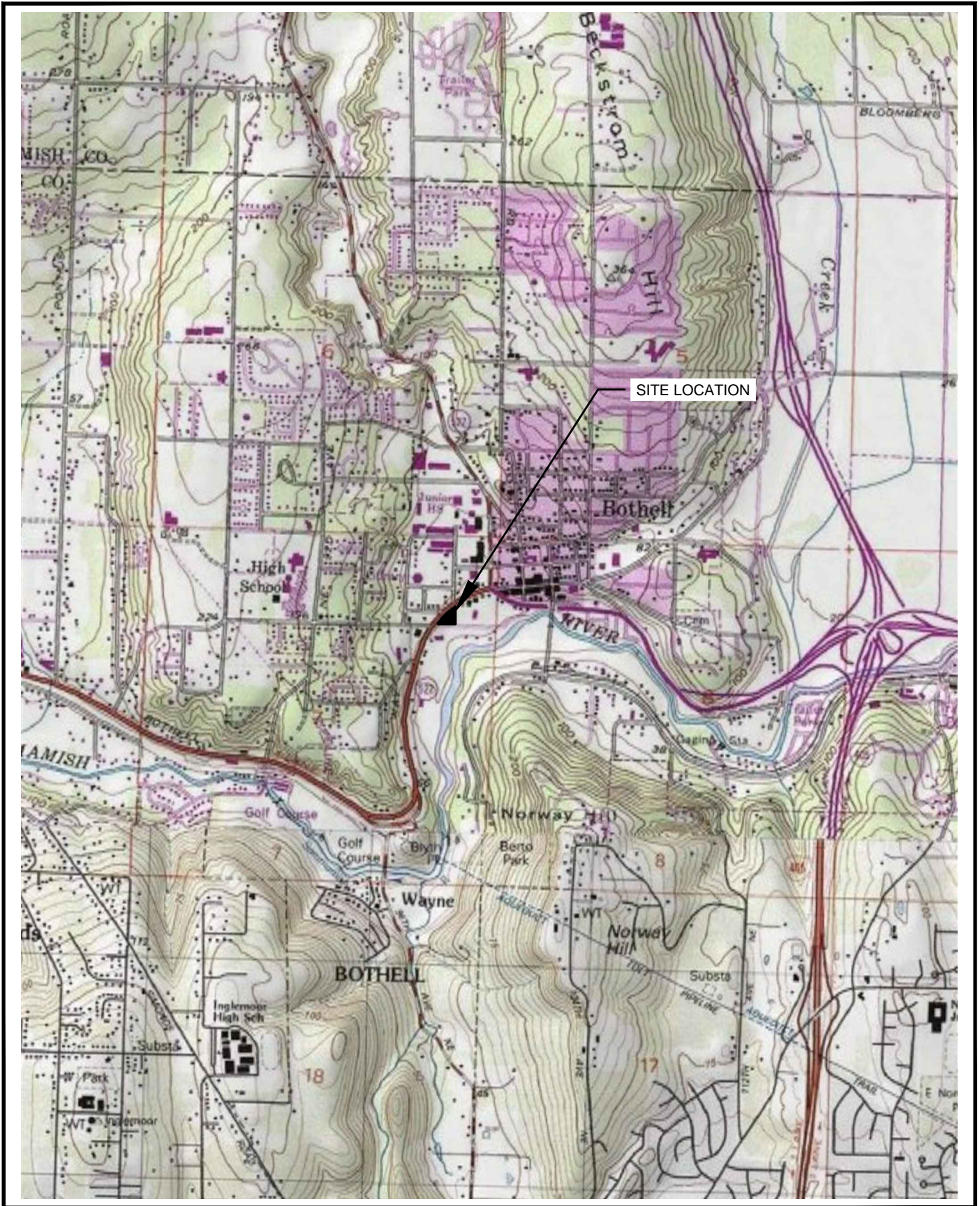
HWA. 2008b. Phase II Environmental Site Assessment, Victory Development Property Parcel No. 9457200081, Bothell, Washington. Prepared for City of Bothell. April 30, 2008.

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FIGURES

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Parametrix DATE: Apr 01, 2010 FILE: BR1647019P02T0412_F-01-1 Image Source: USGS Bothell Quadrangle 1981

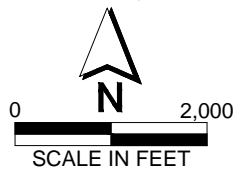
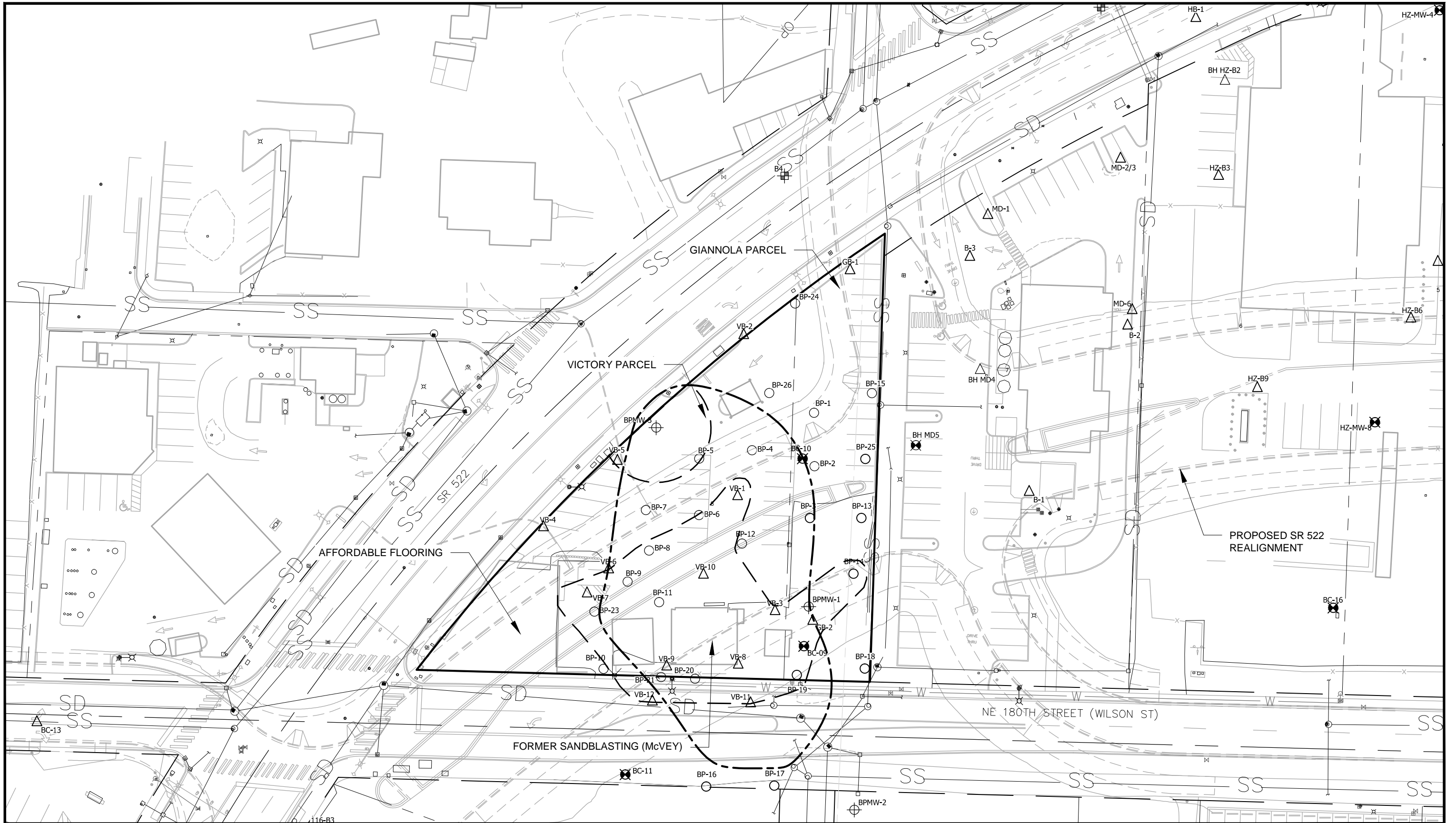
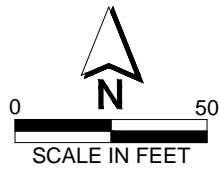


Figure 1-1
City of Bothell
Bothell Paint & Decorating Site
Site Vicinity

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LEGEND

- | | | |
|--|---|--|
| △ HWA 2007 PHASE II ESA BORINGS | ⊕ PMX 2009 RI/FS WELL LOCATIONS | — PROPERTY BOUNDARY |
| ⊗ HWA 2007 PHASE II ESA WELL LOCATIONS | ⊕ CDM 2009 ROW BORING LOCATIONS | — PARCEL BOUNDARY |
| ○ PMX 2009 RI/FS BORING LOCATIONS | - - - APPROX LIMITS OF CONTAMINATED SOILS | - - - ESTIMATED AREA OF GROUNDWATER CONTAMINATED WITH ARSENIC ABOVE MTCA METHOD A CLEAN UP LEVEL |
| — EXISTING BUILDING | | |

Figure 2-1
City of Bothell
Bothell Paint & Decorating Site
Site Plan

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LEGEND

- PROPOSED NEW MONITORING WELLS
- ESTIMATED AREAS OF SOIL REMEDIATION VIA EXCAVATION
- ESTIMATED AREA OF GROUNDWATER CONTAMINATED WITH ARSENIC ABOVE MTCA METHOD A CLEAN UP LEVEL
- PROPERTY BOUNDARY
- EXISTING MONITORING WELL TO BE USED FOR LONG TERM MONITORING

Figure 5-1
City of Bothell
Bothell Paint & Decorating Site
Proposed Interim Remedial Action

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TABLES

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Table 3-1. Applicable or Relevant and Appropriate Requirements (ARARs)

ARAR	Applicability
Soil	
Model Toxics Control Act (WAC 173-340-740, -747)	MTCA cleanup levels are applicable to Site soil.
Groundwater	
Model Toxics Control Act (WAC 173-340-720)	MTCA cleanup levels are applicable to Site groundwater.
Surface Water	
Model Toxics Control Act (WAC 173-340-730)	MTCA cleanup levels are applicable to the Site if remedial activities cause a release to surface water.
Air	
Washington Clean Air Act and Implementing Regulations (WAC 173-400; WAC 173-460; WAC 173-490)	Applicable for excavation activities.
Model Toxics Control Act (WAC 173-340-750)	MTCA cleanup levels are applicable to the Site if remedial activities cause a release to air.
Miscellaneous	
Protection of Wetlands, Executive Order 11990 (40 Code of Federal Regulations [CFR] Part 6, Appendix A)	This Act would be potentially applicable to remedial activities at the Site.
Native American Graves Protection and Repatriation Act (43 CFR Part 10)	This Act is applicable to remedial actions at the Site because it is possible that the disturbance of Native American materials could occur as a result of work in the subsurface excavations at the Site. Such materials are not known to be present at the Site, but could be inadvertently uncovered during soil removal.
National Historic Preservation Act (36 CFR Parts 60, 63, and 800)	This Act is applicable to subsurface work at the Site. No such sites are known to be present in the area.
Washington Hazardous Waste Management Act (WAC 173-303)	This regulation is applicable to handling of contaminated media at the Site. The contamination policy allows contaminated media to be consolidated within the same area of a site without triggering Resource Conservation and Recovery Act or Washington dangerous waste regulations.
Department of Transportation of Hazardous Wastes (49 CFR 105 – 180)	Applicable to remedial activities that involve the off-site transportation of hazardous waste.
Washington Solid Waste Handling Standards (WAC 173-350)	These regulations are applicable to solid nonhazardous wastes and are relevant and appropriate to on-site remedial actions governing contaminated media management.
Washington Water Well Construction Act Regulations (WAC 173-160)	These regulations are potentially applicable to the installation, operation, or closure of monitoring and treatment wells at the Site.

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Table 3-2. Remediation Levels

Hazardous Substance	Medium of Concern Soil	
	MTCA A (mg/kg)	Background Concentration ^a (mg/kg)
Benzene	0.030	None
Diesel	2,000	None
Motor Oil	2,000	None
Arsenic	20	7.30
Tetrachloroethylene	0.05	Not Available
Barium	N/A	Not Available
Cadmium	2	0.77
Chromium	19	48.15
Lead	250	16.83
Silver	N/A	Not Available
Mercury	2	0.07

N/A – Not Applicable

^a Ecology (Washington State Department of Ecology). 1994. Natural Background Soil Metals Concentrations in Washington State. Publication #94-115. October 1994.

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Table 4-1. Detailed Alternatives Analysis

Alternative	Description	Effectiveness	Implementability	Public Concern	Estimated Cost
1. Chemical Oxidation, Electrokinetic Separation, and Low Permeability Cap	Treat contamination adjacent to the proposed roadway in situ using soil chemical oxidation and electrokinetic separation. Use roadway as cap for remaining contamination. Monitor groundwater quarterly for 1 year.	Low to Medium	Low	Medium	\$2,997,000
2. Excavation Off-site and Disposal	Excavate and remove contaminated soils. Monitor groundwater quarterly for 1 year.	High	Medium	Low	\$602,000
3. Limited Excavation, Off-site Disposal, and Low Permeability Cap	Excavate and remove contaminated soils outside proposed roadway. Use roadway as cap for remaining contamination. Monitor groundwater quarterly for 1 year.	Medium	Medium	Low	\$392,000

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APPENDIX A

Bothell Downtown Subarea Plan (Figure 1.1)

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C. THE ENVISIONED FUTURE DOWNTOWN

This section provides an overview of the desired physical outcomes intended to result from implementing the combined regulations and planned public actions contained in this Plan.

The Downtown Subarea is composed of a multitude of privately held properties and miles of public rights-of-way under public ownership. The overarching purpose of the Downtown Plan is to orchestrate investment in changes made to this multiplicity of properties to produce greater value than any separate development could achieve, by providing a common purpose that all investors can rely upon, contribute to, and derive value from. This section describes the common purpose to which all investments shall be directed: a vision of the future that is sufficiently specific to provide a common purpose, yet broad enough to respond to opportunities and to the changes in the marketplace that will inevitably arise.

Note: The specific outcomes described and illustrated in this section are not part of the formal regulating code, and new development proposals will not be required to mimic the specific designs presented in the illustrations.



FIG. 1.1 A VISION OF POTENTIAL FUTURE DEVELOPMENT IN DOWNTOWN BOTHELL SHOWING ONE SCENARIO FOCUSING ON REDEVELOPMENT IN THE CORE AREA

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APPENDIX B
Compliance Monitoring Plan

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

TECHNICAL MEMORANDUM

Date: April 2, 2010
To: City of Bothell Project File
From: Scott Elkind
Subject: Bothell Paint and Decorating Interim Action Compliance Monitoring Plan
cc: Ken Fellow
Steve Fuller
Sandra Matthews
Project Number: 555-1647-019 (02/0412)
Project Name: Bothell Paint IAWP

INTRODUCTION

In conjunction with the realignment of State Route (SR) 522 and the southward extension of SR 527, the City of Bothell (City) is redeveloping the City's downtown core, which includes the Bothell Paint and Decorating Site (Site). The Site is currently under Agreed Order (AO) No. 6296 with the Washington State Department of Ecology (Ecology) to perform a Remedial Investigation/Feasibility Study (RI/FS), implement interim cleanup action(s), and develop a cleanup action plan (CAP) that will address known contamination, related to historical releases of hazardous substances at the site. Excavation of contaminated soils is to take place in compliance with the AO as an Interim Action (IA) for the remediation of petroleum-hydrocarbon-contaminated soils and groundwater at the site. The IA will be implemented during the construction window of the roadway realignment project. Remnant portions of the property will be redeveloped as part of the City's overall Downtown Revitalization Plan. At the current time, the IA for the Site is planned to consist of the following:

- Source removal by excavation of contaminated soils.
- Quarterly groundwater monitoring.

This Compliance Monitoring Plan (CMP) has been prepared in accordance with Washington Administrative Code (WAC) 173-340-410, Compliance Monitoring Requirements. The CMP will be used to:

- Ensure contaminated soil exceeding appropriate cleanup standards is removed during the IA through sampling of the excavation sidewalls and bottom.
- Ensure IA activities are conducted in a safe manner.
- Confirm the effectiveness of the IA through groundwater monitoring following completion of the IA.

There are three types of compliance monitoring: protection, performance, and confirmational monitoring. A description of each is presented in the following sections.

PROTECTION MONITORING

The purpose of protection monitoring is to confirm that human health is adequately protected during construction. Health and safety protocols including monitoring requirements are specified in the site-specific health and safety plan (HASP). The HASP has been completed as a separate document.

PERFORMANCE MONITORING

The purpose of performance monitoring is to confirm that the IA has attained appropriate cleanup standards. For the Site, this will include the collection of soil samples from the sidewalls and bottom of the excavation to confirm complete removal of contaminated soil during the IA and collection of soil stockpile samples to help determine proper disposal and/or re-use options. Sample collection procedures, required chemical analyses, and other requirements for performance monitoring are presented in the Compliance Monitoring Quality Assurance Project Plan (CMQAPP) included as Attachment 1 to this technical memorandum. The CMQAPP includes the appropriate cleanup levels necessary to assess soil quality and evaluate the need for continued excavation to achieve the necessary cleanup goals.

CONFIRMATIONAL MONITORING

The purpose of confirmational monitoring is to confirm the effectiveness of the soil IA. This will be accomplished by conducting four quarters of groundwater monitoring following completion of the soil IA. Groundwater purging and sample collection procedures, required chemical analyses, and other requirements for confirmational monitoring are presented in the CMQAPP included as Attachment 1 to this technical memorandum.

ATTACHMENT 1

Compliance Monitoring Quality Assurance Project Plan

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Compliance Monitoring Quality Assurance Project Plan Bothell Paint and Decorating Site Revision No. 2

Prepared for

City of Bothell
9654 NE 182nd Street
Bothell, WA 98011

Prepared by

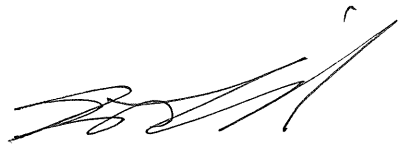
Parametrix
411 108th Avenue NE, Suite 1800
Bellevue, WA 98004-5571
T. 425.458.6200 F. 425.458.6363
www.parametrix.com

CITATION

Parametrix. 2010. Compliance Monitoring Quality Assurance
Project Plan
Bothell Paint and Decorating Site
Revision No. 2.
Prepared by Parametrix, Bellevue, Washington. April 2010.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned.



Prepared by Scott Elkind, PE



Checked by Sandra Matthews, LG, LHG



Approved by Ken Fellows, PE

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ACRONYMS AND ABBREVIATIONS

AO	Agreed Order
CFR	Code of Federal Regulations
City	City of Bothell
CLP	Contract Laboratory Program
COPCs	contaminants of potential concern
CMQAPP	Compliance Monitoring Quality Assurance Project Plan
cPAHs	Carcinogenic polycyclic aromatic hydrocarbons
cy	cubic yard
DQIs	data quality indicators
DQOs	Data Quality Objectives
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EIM	Environmental Information Management
EPA	U.S. Environmental Protection Agency
gpm	gallon per minute
GPS	global positioning system
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HVOCs	halogenated volatile organic compounds
IA	interim action
IAWP	Interim Action Work Plan
ID	inside diameter
IDW	investigation derived waste
MS/MSD	matrix spike/matrix spike duplicate
MTCA	Model Toxics Control Act
NTUs	nephelometric turbidity units
OD	outside diameter
ORP	oxidation-reduction potential
PID	photoionization detector
PQL	practical quantitation limit
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RI/FS	Remedial Investigation/Feasibility Study

ACRONYMS AND ABBREVIATIONS (CONTINUED)

RPD	relative percent difference
Site	Bothell Paint and Decorating Site
SOPs	standard operating procedures
SR	State Route
WAC	Washington Administrative Code

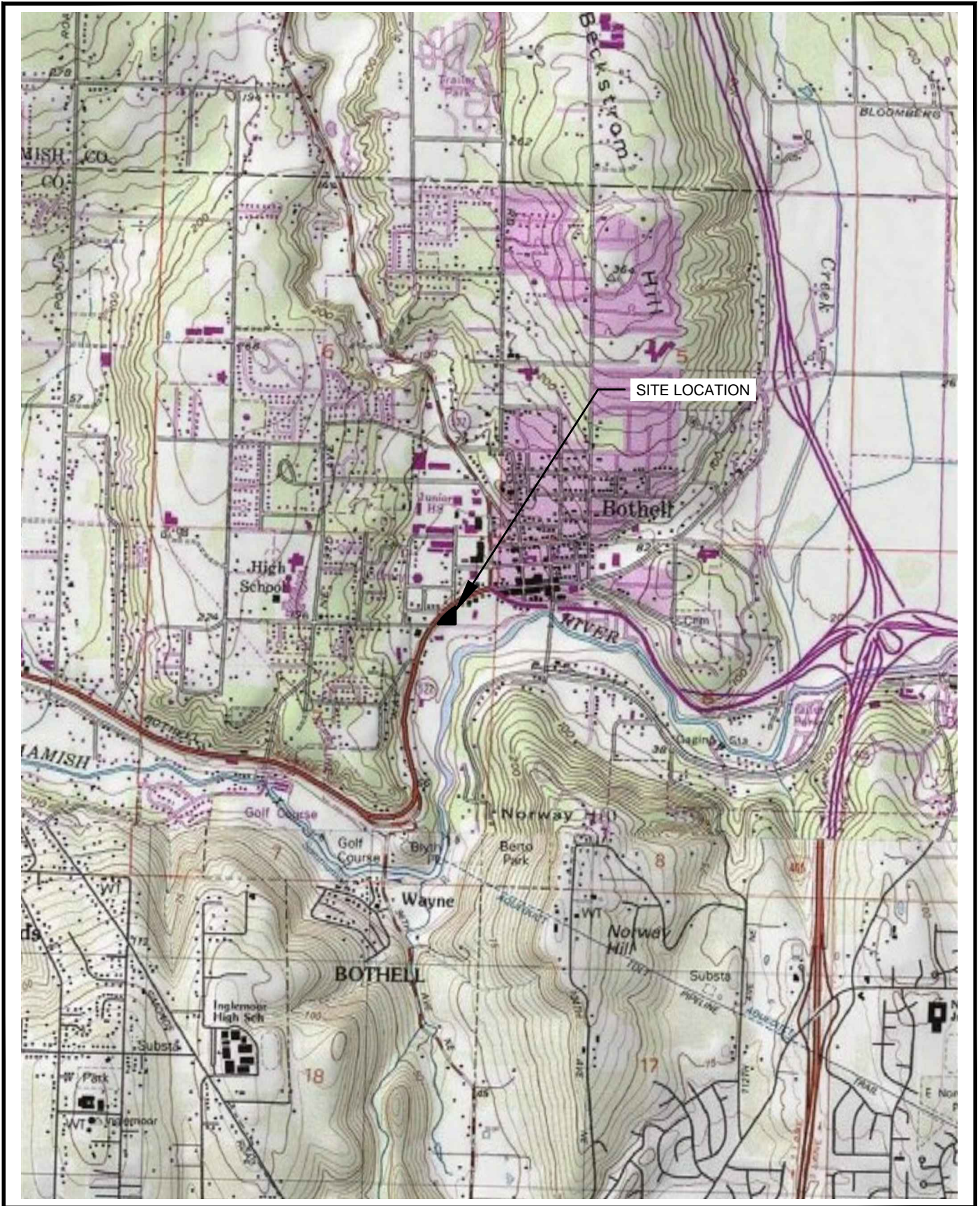
1. INTRODUCTION

In conjunction with the realignment of State Route (SR) 522 and the southward extension of SR 527, the City of Bothell (City) is redeveloping the City's downtown core, which includes the Bothell Paint and Decorating Site (Site). The Site, located in Bothell, Washington, (Figure 1-1) is under an Agreed Order (AO) Number DE 6296 between the City and the Washington State Department of Ecology (Ecology) to conduct a remedial investigation/feasibility study (RI/FS), implement interim action(s), and submit a cleanup plan to address known soil contamination related to historical releases of hazardous substances at the Site.

This Compliance Monitoring Quality Assurance Project Plan (CMQAPP) is incorporated within the Interim Action Work Plan (IAWP) for the site, and has been prepared to fulfill the requirements of the Agreed Order per Washington Administrative Code (WAC) 173-340-410(1)(b), Performance Monitoring, and WAC 173-340-410(1)(c), Confirmational Monitoring. This CMQAPP describes the sample collection procedures, analysis, and defines the Data Quality Objectives (DQOs) and criteria for the project. Parametrix prepared this CMQAPP in accordance with the U.S. Environmental Protection Agency (EPA) and Ecology requirements contained in the following:

- EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans, Final, March 2001
- EPA QA/G-5, EPA Guidance for Quality Assurance Project Plans, December 2002
- EPA QA/G-4, EPA Guidance on Systematic Planning Using the Data Quality Objectives Process, February 2006
- Ecology Model Toxics Control Act (Ecology 2007)

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Parametrix DATE: Apr 01, 2010 FILE: BR1647019P02T0412_F-01-1 Image Source: USGS Bothell Quadrangle 1981

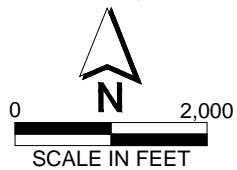


Figure 1-1
City of Bothell
Bothell Paint & Decorating Site
Site Vicinity

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2. PROJECT ORGANIZATION AND MANAGEMENT

2.1 PROJECT ORGANIZATION

Specific project roles and responsibilities for oversight and sampling are described in Table 2-1.

Table 2-1. Project Roles and Responsibilities

Personnel	Responsibilities
City of Bothell (Owner) Project Manager	Provides project and construction oversight and performs contract administration
Contractor	Implements cleanup/remedial actions and coordinates with environmental consultant for confirmational sampling during construction
Owner's Representative (Consultant Construction Manager or Environmental Consultant)	Coordinates with Contractor to obtain confirmational sampling during remedial construction; coordinates analytical laboratory testing of samples; prepares interim action reports.

2.2 PROBLEM DEFINITION/BACKGROUND

The Site is located on the south side of SR 522, between downtown Bothell and the Sammamish River (Figure 2-1) and is 0.79 acres. The property consists of two parcels: the Victory parcel (0.54 acre) and the Giannola parcel (0.25 acre). Historical operations on the Victory parcel included automobile repair and dealerships, retail paint and flooring, and sand blasting. Documented historical site use of the Giannola parcel is limited to residential usage and parking.

The Site was the subject of several environmental investigations beginning in 2008 which included:

- Phase I Environmental Site Assessment completed by HWA on the Victory parcel in February 2008.
- Phase II Environmental Site Assessment conducted by HWA on the Victory parcel in February 2008.
- Phase II Environmental Site Assessment conducted by HWA on the Giannola parcel in February 2008.
- Phase I Environmental Site Assessment completed by HWA on the Giannola parcel in March 2008.
- Remedial Investigation and Feasibility Study (RI/FS) performed by Parametrix in 2009 (Parametrix 2009).

Based on evaluation of analytical data from Site investigations, the primary contaminants of potential concern (COPCs) for soil include:

- Metals (arsenic, barium, cadmium, chromium, lead, silver, and mercury)
- Total petroleum hydrocarbons (diesel/heavy oil-range)
- Aromatic hydrocarbons (benzene)
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs)

For groundwater, COPCs include:

- Metals (arsenic, barium, cadmium, chromium, lead, silver, and mercury)
- Total petroleum hydrocarbons (diesel/heavy oil-range)
- Aromatic hydrocarbons (benzene)
- Halogenated volatile organic compounds (HVOCs)

To satisfy the AO requirements, an IAWP was developed for the implementation of an Interim Action (IA) which will be performed to remediate COPCs (except lead) which are present in soil and which are originating from on-site sources.

This CMQAPP describes sample collection procedures and quality assurance and control methods to ensure representative data is collected during the IA.

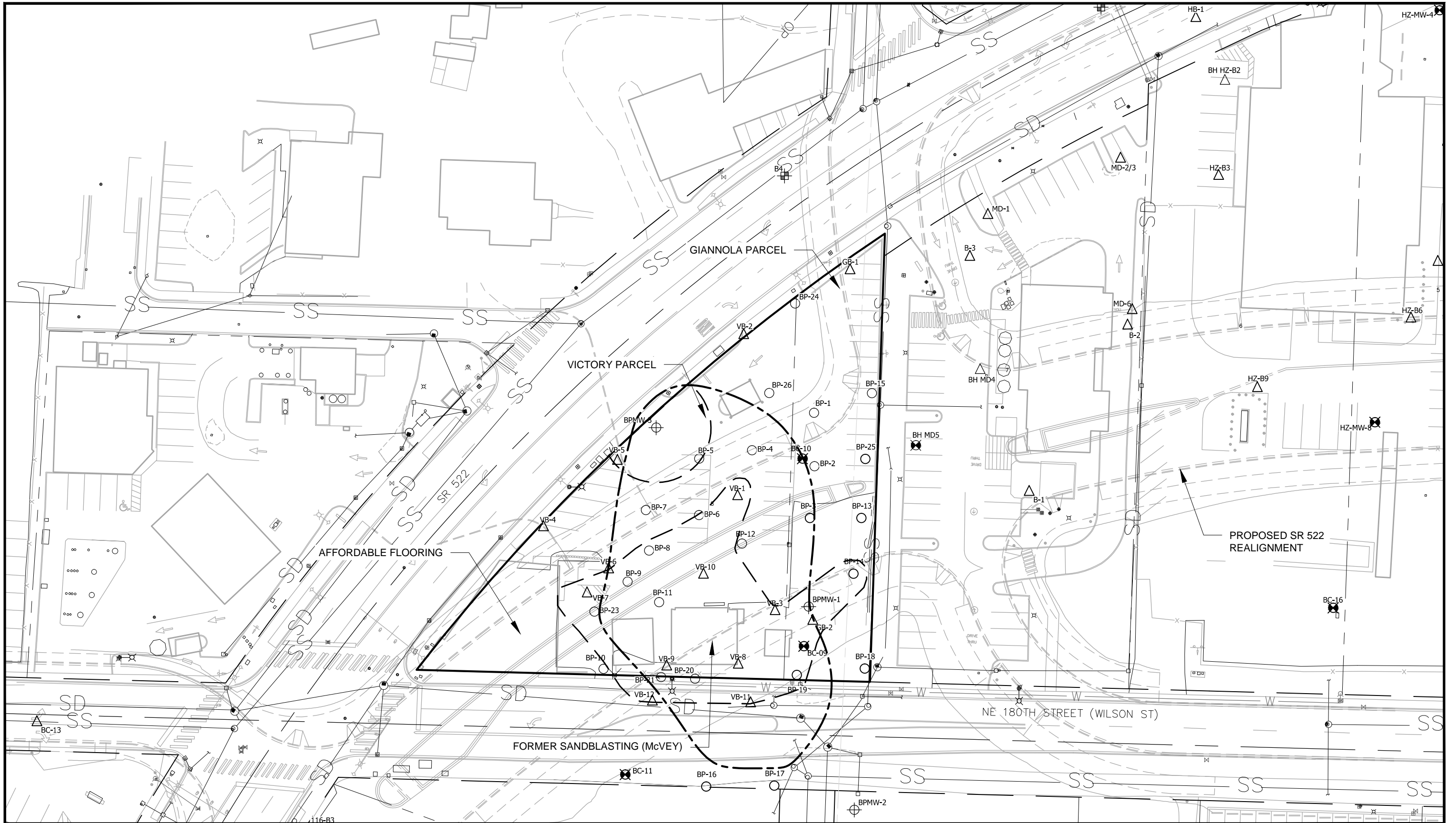
2.3 TASK DESCRIPTION

Based on the results of the RI/FS, the recommended alternative for soil cleanup was excavation and off-site disposal. At the current time, the IA is planned to consist of:

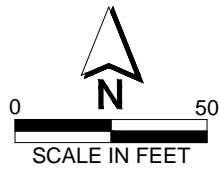
- Source removal by excavation in the area outlined in Figure 3-1.
- Quarterly groundwater monitoring to assess groundwater quality following the interim action.

In source excavations, performance monitoring samples will be collected at the bottom and sidewalls of excavations to confirm that the remediation levels have been met. Stockpiles will also be sampled to confirm and characterize contaminant levels for disposal purposes. Sample results will be compared to remediation levels provided in Section 3.

Confirmational monitoring will be completed by conducting four quarters of groundwater monitoring following completion of soil removal.



Parametrix DATE: Apr 01, 2010 FILE: BR1647019P02T0412_F-02-1



LEGEND

- | | | |
|--|---|--|
| △ HWA 2007 PHASE II ESA BORINGS | ⊕ PMX 2009 RI/FS WELL LOCATIONS | — PROPERTY BOUNDARY |
| ⊗ HWA 2007 PHASE II ESA WELL LOCATIONS | ⊠ CDM 2009 ROW BORING LOCATIONS | — PARCEL BOUNDARY |
| ○ PMX 2009 RI/FS BORING LOCATIONS | - - - APPROX LIMITS OF CONTAMINATED SOILS | - - - ESTIMATED AREA OF GROUNDWATER CONTAMINATED WITH ARSENIC ABOVE MTCA METHOD A CLEAN UP LEVEL |
| — EXISTING BUILDING | | |

Figure 2-1
City of Bothell
Bothell Paint & Decorating Site
Site Plan

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2.4 QUALITY OBJECTIVES AND CRITERIA

2.4.1 Data Quality Objectives

DQOs were developed according to EPA’s DQOs Process (EPA 2006), to provide data of known and appropriate quality. The DQO process is a seven-step planning approach to develop sampling designs for data collection activities that support decision-making. It provides a systematic procedure for defining the criteria that a data collection design should satisfy. The DQOs for the project are shown in Table 2-2.

Table 2-2. Design Characterization Sampling DQOs

DQO	Description
State the Problem	Was the contaminated soil within the footprint of the remediation area removed?
Identify the Goal of the Study	Does contamination still exist at the selected locations? Are the contaminant levels above applicable cleanup levels? Is the collected chemical data adequate to identify and determine if contamination still exists?
Identify Information Inputs	Analytical results (what are the detected concentrations? are they above cleanup levels? was QA/QC criteria met?). Actual sample locations (correct location and depth?).
Define the Study Boundaries	The Paint and Decorating site and adjacent offsite areas containing monitoring wells.
Develop the Analytical Approach	Sampling and analysis strategies will be developed to support the decision making process. Analytical results will be used to determine the presence or absence of contamination. Results will be compared to Model Toxics Control Act (MTCA) Method A (residential) cleanup levels.
Specify Performance or Acceptance Criteria	Ensure through data review and validation that the analytical data for collected samples are within acceptable quality limits as defined by applicable EPA and Ecology data quality protocols.
Develop the Plan for Obtaining Data	Presented in this CMQAPP.

2.4.2 Data Quality Indicators

Data quality and usability are evaluated in terms of performance criteria. Performance and acceptance criteria are expressed in terms of data quality indicators (DQIs). The principal indicators of data quality are precision, accuracy, bias, sensitivity, completeness, comparability, and representativeness. Table 2-3 provides a description of project DQIs.

Table 2-3. General Description of DQIs

DQI	Description
Precision:	A measure of agreement among repeated measurements of the same property under identical conditions. Usually assessed as a relative percent difference (RPD) between duplicate measurements. RPD guidelines for laboratory duplicate analyses are contained in the standard operating procedures (SOPs) for each analytical method and will be obtained from the laboratory for validation purposes.
Accuracy:	A measure of the overall agreement of a measurement to a known value. Analytical accuracy is assessed as percent recovery from matrix spike or reference material measurements. Percent recovery guidelines are contained in laboratory SOPs for each analytical method.
Bias:	The systematic or persistent distortion of a measurement process that causes error in one direction. Usually assessed with reference material or matrix spike measurements. Bias as reported by the laboratory will be used to assess data validity.
Sensitivity:	The capability of a method or instrument to meet prescribed reporting limits. Assessed by comparison with risk-based reporting limits, method reporting limits, instrument reporting limits, or laboratory quantitation limits, as appropriate. In general, reporting limits for the analytical methods used will be at or below applicable criteria.
Completeness:	A measurement of the amount of valid data needed to be obtained for a task. Assessed by comparing the amount of valid results to the total results set. Project requirements for completeness are 90%.
Comparability:	A qualitative term that expresses the measure of confidence that one data set can be compared to another. Assessed by comparing sample collection and handling methods, sample preparation and analytical procedures, holding times, reporting units, and other QA protocols. To ensure comparability of data collected for the Bus Barn to previous data, standard collection and measurement techniques will be used.
Representativeness:	A qualitative term that expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variation at a sample point, or environmental condition. To ensure representativeness, the sampling design will incorporate sufficient samples so that contamination is detected, if present. Additionally, all sampling procedures detailed in this CMQAPP will be followed.

2.5 SPECIAL TRAINING AND CERTIFICATION

All personnel conducting sampling activities on the project site must be 40-hour Hazardous Waste Operation (HAZWOPER) trained per 29 Code of Federal Regulations (CFR) 1910.120 and be current with their annual 8-hour refresher course.

All personnel working at the project site will be briefed on potential site hazards, health and safety procedures, and sampling procedures. Following completion of this training, all personnel will be required to sign an acknowledgement form verifying that they have completed the task-specific training.

A Project Health and Safety Plan (HASP) has also been prepared for this project, as required by WAC 296-62-3010. The Contractor and Owner’s Representative will prepare their own HASP to be consistent with the Project HASP.

2.6 SAMPLING DOCUMENTATION AND RECORDS

Sampling documentation will be accomplished according to the procedures provided in Table 2-4.

Table 2-4. Sampling and Sample Handling Records

Record	Use	Responsibility/Requirements
Field Notebook	Record significant events and observations.	Maintained by field sampler/geologist; must be bound; all entries must be factual, detailed, objective; entries must be signed and dated.
Sampling Field Data Sheet	Provide a record of each sample collected (Appendix A).	Completed, dated, and signed by sampler; maintained in project file.
Sample Label	Accompanies sample; contains specific sample identification information.	Completed and attached to sample container by sampler.
Chain-of-Custody Form	Documents chain-of-custody for sample handing (Appendix A).	Documented by sample number. Original accompanies sample. A copy is retained by QA Manager.
Chain-of-Custody Seal	Seals sample shipment container (e.g., cooler) to prevent tampering or sample transference. Individual samples do not require custody seals, unless they are to be archived, before going to the lab for possible analysis at a later date.	Completed, signed, and applied by sampler at time samples are transported.
Sampling and Analysis Request	Provides a record of each sample number, date of collection/transport, sample matrix, analytical parameters for which samples are to be analyzed.	Completed by sampler at time of sampling/transport; copies distributed to laboratory project file.

2.6.1 Field Logs and Forms

A bound field notebook will be maintained to provide daily records of significant events and observations that occur during field investigations. All entries are to be made in waterproof ink, signed, and dated. Pages of the field notebook are not to be removed, destroyed, or thrown away. Corrections will be made by drawing a single line through the original entry (so that the original entry can still be read) and writing the corrected entry alongside. The correction will be initialed and dated. Most corrected errors will require a footnote explaining the correction.

If an error made on a document is assigned to one person, that individual may make corrections simply by crossing out the error and entering the correct information. The erroneous information should not be obliterated. Any error discovered on a document should be corrected by the person who made the entry.

All field logs and forms will be retained in the project files.

2.6.2 Photographs

All photographs taken of field activities will be documented with the following information noted in the field notebook:

- Date, time, and location of photograph taken
- Description of photograph taken
- Reasons photograph was taken
- Viewing direction

Digital photographs will be reviewed in the field to assess quality and need to re-shoot the photograph.

2.7 REPORTING

Following completion of the confirmation sampling and analysis, the results will be included in an interim remedial action report. Reporting will include the following:

- Summary of field activities completed.
- Figures showing sampling locations.
- Summary of laboratory analytical results and a comparison to relevant regulatory criteria.
- Field log forms and sampling forms.
- Laboratory data sheets and the results of data review/validation.
- Recommendations for further sampling, such as groundwater monitoring, if needed.

Preliminary results will be communicated verbally as they become available.

3. SAMPLING PROCESS DESIGN

3.1 SAMPLING PROCESS DESIGN

A Site-specific sampling approach has been developed to provide performance and confirmational monitoring in support of the IA. The IA will target the area of significant petroleum contamination identified during the RI (Figure 3-1). The approach used for the IA will involve source removal by excavation, followed by four quarters of groundwater monitoring to assess short-term groundwater quality following source removal.

A summary of the sampling approach for the IA is provided in Table 3-1. Groundwater monitoring locations and required chemical analyses are presented in Table 3-2.

Table 3-1. Sampling Approach

Area	No. Locations	COPCs (Soil and Groundwater)	
		Soil	Groundwater
Pot Hole Samples	4	EPH/VPH, gasoline, diesel, and heavy oil	N/A
Interim Action Footprint - Excavation Sidewalls	13 ^a	Diesel and heavy oil-range petroleum hydrocarbons, HVOCs ^b , RCRA metals, cPAHs	N/A
Interim Action Footprint - Excavation Bottom	7 ^a		
Contaminated Soil Stockpile (1,900 cy estimated)	10 ^c	Diesel and heavy oil-range petroleum hydrocarbons, RCRA metals, cPAHs ^d	N/A
Groundwater	7	N/A	Gasoline, BTEX, diesel and heavy oil-range petroleum hydrocarbons, RCRA metals ^e , and HVOCs ^f

^a Additional performance monitoring sampling may be required based on the results for the initial sampling round.

^b Three bottom and two sidewall samples will be analyzed for HVOCs.

^c The actual number of stockpile samples required for disposal may change based on the acceptance requirement of the proposed disposal facility.

^d Additional analyses may be necessary based on disposal facility acceptance requirements.

^e Groundwater will be analyzed for total and dissolved RCRA metals.

^f For selected sampling locations only.

BTEX: Benzene, toluene, ethylbenzene, and xylenes.

cPAHs = carcinogenic polycyclic aromatic hydrocarbons.

EPH/VPH = extractable petroleum hydrocarbons/volatile petroleum hydrocarbons.

COPCs = contaminants of potential concern.

HVOCs = halogenated volatile organic compounds.

N/A = not applicable.

RCRA = Resource Conservation and Recovery Act list metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag).

Table 3-2. Groundwater Monitoring Locations and Analysis

Well	Analytes	Analytical Method
BC-11	Gasoline-Range Petroleum Hydrocarbons	NWTPH-Gx
	BTEX	EPA Method 8021B
	Diesel/Heavy Oil-Range Petroleum Hydrocarbons	NWTPH-Dx
	Total/Dissolved RCRA Metals ^a	EPA Method 200.8/7470A
BPMW-3	Gasoline-Range Petroleum Hydrocarbons	NWTPH-Gx
	BTEX	EPA Method 8021B
	Diesel/Heavy Oil-Range Petroleum Hydrocarbons	NWTPH-Dx
	Total/Dissolved RCRA Metals ^a	EPA Method 200.8/7470A
	HVOCs	EPA Method 8260B
BPMW-4 ^b	Gasoline-Range Petroleum Hydrocarbons	NWTPH-Gx
	BTEX	EPA Method 8021B
	Diesel/Heavy Oil-Range Petroleum Hydrocarbons	NWTPH-Dx
	Total/Dissolved RCRA Metals ^a	EPA Method 200.8/7470A
BPMW-5 ^b	Gasoline-Range Petroleum Hydrocarbons	NWTPH-Gx
	BTEX	EPA Method 8021B
	Diesel/Heavy Oil-Range Petroleum Hydrocarbons	NWTPH-Dx
	Total/Dissolved RCRA Metals ^a	EPA Method 200.8/7470A
BPMW-6 ^b	Gasoline-Range Petroleum Hydrocarbons	NWTPH-Gx
	BTEX	EPA Method 8021B
	Diesel/Heavy Oil-Range Petroleum Hydrocarbons	NWTPH-Dx
	Total/Dissolved RCRA Metals ^a	EPA Method 200.8/7470A
BPMW-7 ^b	Gasoline-Range Petroleum Hydrocarbons	NWTPH-Gx
	BTEX	EPA Method 8021B
	Diesel/Heavy Oil-Range Petroleum Hydrocarbons	NWTPH-Dx
	Total/Dissolved RCRA Metals ^a	EPA Method 200.8/7470A
BPMW-8 ^b	Gasoline-Range Petroleum Hydrocarbons	NWTPH-Gx
	BTEX	EPA Method 8021B
	Diesel/Heavy Oil-Range Petroleum Hydrocarbons	NWTPH-Dx
	Total/Dissolved RCRA Metals ^a	EPA Method 200.8/7470A

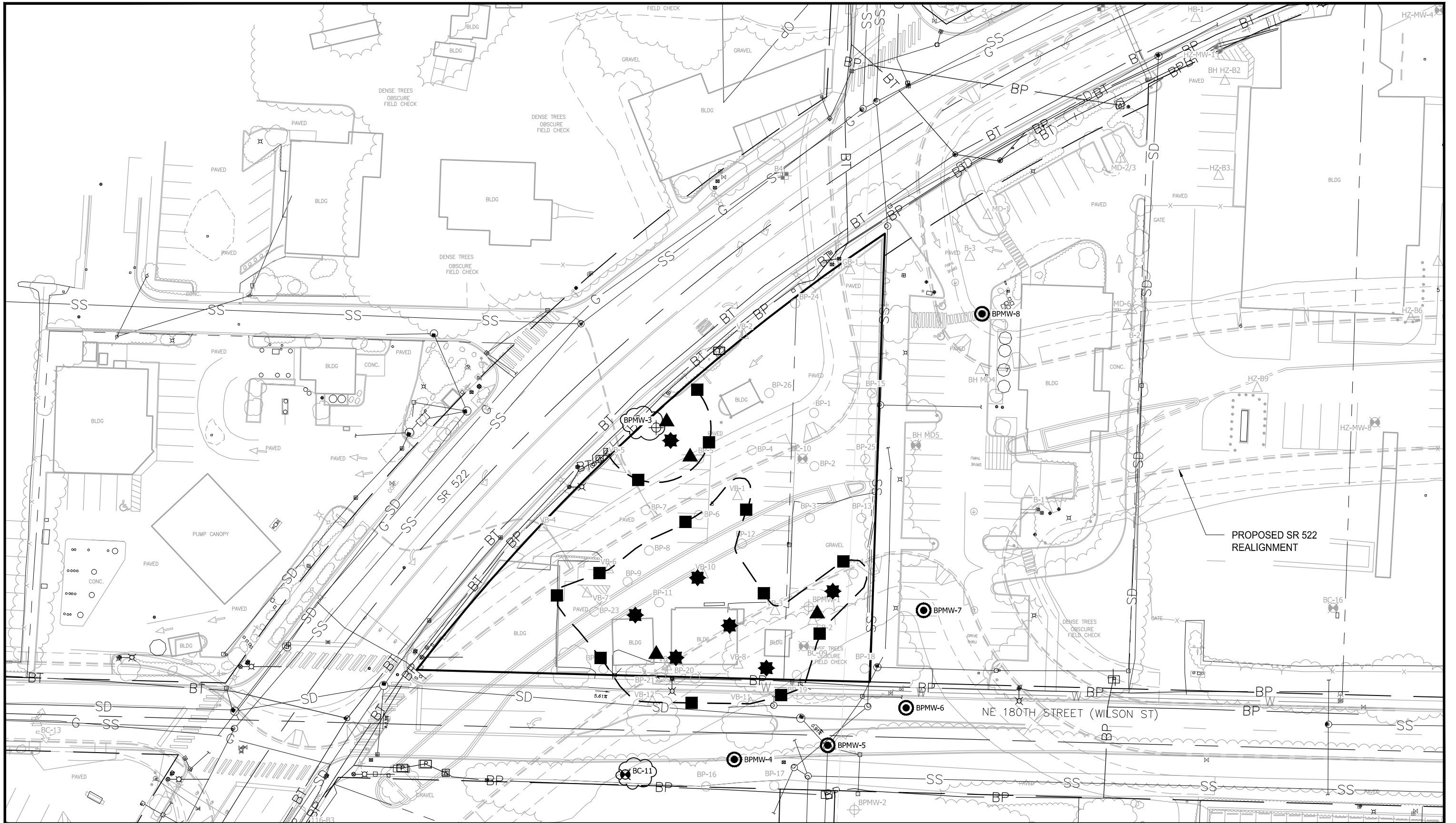
^a MTCA metals includes arsenic, cadmium, chromium, lead, and mercury.

^b New well to be installed.

BTEX = benzene, toluene, ethylbenzene, total xylenes

HVOCs = halogenated volatile organic compounds.

RCRA = Resource Conservation and Recovery Act list metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag).



Parametrix DATE: Apr 12, 2010 FILE: BR1647019P02T0412_F-03-1

LEGEND

- PROPOSED NEW MONITORING WELLS
- PROPERTY BOUNDARY
- ESTIMATED AREAS OF SOIL REMEDIATION VIA EXCAVATION
- EXISTING MONITORING WELL TO BE USED FOR LONG TERM MONITORING
- PROPOSED EXCAVATION SIDEWALL SAMPLE LOCATION
- PROPOSED EXCAVATION BOTTOM SAMPLE LOCATION
- PROPOSED EPH / VPH SAMPLE LOCATION



Figure 3-1
City of Bothell
Bothell Paint & Decorating Site
Proposed Interim Remedial Action
Sampling Locations

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The objectives of the sampling are to confirm that all COPCs have met established remediation levels in soil, to confirm that all landfill disposal requirements are met for soil disposal, and to monitor groundwater conditions to determine the effectiveness of the remedial action. Details of the cleanup are provided in the following sections.

Flexibility will be incorporated into the field work so that modifications can be made in the field to refine the strategy. An example would be adjusting the location of samples based on field observations.

Descriptions of the specific sampling methods for the above activities are presented in Sections 3.2. In addition, all sampling will be conducted in accordance with standard operating procedures.

3.1.1 Excavation and Soil Removal

The concept for remediation of source soils within the contaminated area (Figure 3-1) is to remove them by excavation. The extent of the excavation will be determined in the field by real-time observation and field screening. Once the apparent limit of contaminated soil is reached, the bottom and sidewalls of the excavation will be sampled to confirm removal. Both clean and contaminated soils will be stockpiled separately and sampled. Based on the Phase II ESA and RI results, it is assumed that no clean soils are present and that no clean soil stockpile will be generated. Contaminated soils will be transported to a permitted landfill. The remaining excavation will be backfilled with clean pit run. Removal of all contaminated soils will require excavation dewatering. Contaminated groundwater removed during dewatering will be monitored and treated to meet permit effluent standards and will be disposed of into the City's sanitary sewer system.

3.1.1.1 Contaminated Soil Removal

The following are the planned steps for contaminated soil removal:

- Prior to beginning excavation, collect soil samples for EPH/VPH analysis from pot holes excavated within in the contaminated soil footprint. Four soil samples for EPH/VPH analysis will be collected from the approximate locations shown on Figure 3-1. The samples will be analyzed on a two-day turnaround basis. A range of contaminated soils from moderately to highly contaminated will be targeted for sample collection. Field screening will be used to aid in sample selection. It is anticipated that the samples will be collected from an average of 2 feet bgs (average depth to groundwater). The results of the EPH/VPH analyses will be input into Ecology's MTCATPH 11.1 spreadsheet model to determine TPH cleanup levels that are protective of direct contact and groundwater. All three samples will also be analyzed for gasoline, diesel, and heavy oil to provide additional information to be used in the evaluation. Protective concentrations derived using the model will be compared to the remediation levels established for the site. The results of the comparison will be reported in a brief technical memorandum that will be submitted to Ecology. At this time, an evaluation of the appropriateness of the remedial levels will be made in consultation with Ecology. Changes to the remedial levels will be established by agreement between the City and Ecology and will be implemented during the IA. The evaluation will be completed prior to the start of mass soil excavation activities on the Site.
- Excavate contaminated soils from the footprint shown on Figure 3-1. Field screen all excavated soils so that potentially clean and contaminated soils can be segregated and stockpiled separately. Conduct field screening using visual/olfactory methods and headspace measurements using a photoionization detector (PID). It is assumed that no clean soils are present and that no clean soil stockpile will be generated.

- Excavate contaminated soils to limits defined by confirmational sampling. Note that the contaminated soil footprint shown on Figure 3-1 is an estimate; the excavated footprint may change based on actual conditions encountered in the field. Determine the limits of the excavation using field screening and professional judgment. The proposed depth of excavation is 3 to 4 feet below ground surface.
- Conduct excavations during the dry summer months (May through September) so that the groundwater table is at the seasonal low. Plan excavations to occur as one of the initial steps in the grading phase of the SR 522 road realignment.
- Collect performance monitoring soil samples from the base and sidewalls of the excavations. A total of 13 confirmation soil samples will be collected and analyzed for diesel and heavy oil-range petroleum hydrocarbons, RCRA metals, cPAHs, and HVOCs at selected locations. Proposed confirmation sample locations are shown on Figure 3-1. Sample results will be compared to the remediation levels provided in Table 3-3 (as modified following the EPH/VPH evaluation if appropriate). A second round of performance monitoring sampling may be required if the results of the first round exceed remediation levels and additional excavation is completed.
- Stockpile “contaminated” soil on plastic sheeting. Cover un-worked stockpiles with sheeting at the end of each workday to prevent windblown dust migration and to prevent rainwater infiltration. It is anticipated that the contaminated soils will remain in the stockpile for less than 30 days.
- Collect soil samples from the contaminated stockpile. An estimated 1,900 cubic yards (cy) of contaminated soils will be stockpiled. Based on this estimate, a total of ten stockpile soil samples will be collected and analyzed for diesel and heavy oil-range petroleum hydrocarbons, MTCA metals, TCLP, and cPAHs. Sample numbers may be reduced based on Ecology guidelines if stockpile volumes are less than estimated. Dispose of contaminated soil at a permitted landfill. At the current planning level, it is assumed that no soil will require disposal as hazardous waste.
- Restore site by backfilling using the stockpiled clean soil and imported pit run. Backfill using lifts no greater than 12 inches loose thickness. Compact backfilled soil to a density of at least 90 percent of the maximum value as determined by the Modified Proctor test. Perform a minimum of five density tests for each material type to confirm compaction.

3.1.2 Groundwater Monitoring

At the conclusion of the IA, four quarters of groundwater monitoring will be conducted using the seven wells shown on Figure 3-1. Following these four events, the appropriateness of additional groundwater sampling events under the IA will be evaluated. Note that two of the wells currently exist and that five new wells will be installed following completion of road construction. Groundwater samples collected will be analyzed as shown in Table 3-2. Well installation and sampling shall be performed according to the procedures in Section 3.2.5.

3.1.3 Remediation Levels

As described in the draft RI/FS report (Parametrix 2009), the remediation levels listed in Table 3-3 are applicable under the IA.

Table 3-3. Remediation Levels

Hazardous Substance	Medium of Concern		
	Soil		Groundwater
	MTCA A ^a (mg/kg)	Background Concentration ^b (mg/kg)	MTCA A ^c (µg/L)
Benzene	0.030	NA-	5
Toluene	7	NA	1,000
Ethylbenzene	6	NA	700
Xylenes (total)	9	NA	1,000
Tetrachoroethylene	0.05	NA	5
Gasoline	30/100 ^d	NA	800/1,000 ^e
Diesel	2,000	NA	500
Heavy Oil	2,000	NA	500
Arsenic	20	7	5
Cadmium	2	1	5
Chromium	2,000 ^g	48	50
Lead	250	17	15
Mercury	2	0.07	2
Benzo(a)pyrene	0.1 ^h	NA	0.1 ⁱ

NA = not available.

mg/kg = milligrams per kilogram.

µg/L = micrograms per liter.

^a Model Toxics Control Act Method A Unrestricted Land Uses Table 740-1 (WAC 173-340-900).

^b Puget Sound concentrations from Table 1: Statewide & Regional 90th Percentile Values from Natural Background Soil Metals Concentrations in Washington State, Ecology Publication #94-115, October 1994.

^c Method A Cleanup levels for groundwater Table 720-1 (WAC 173-340-900).

^d If benzene detected then 30 mg/kg, if no benzene then 100 mg/kg.

^e If benzene detected then 800 µg/l, if no benzene then 1,000 µg/l.

^g Chromium III concentration.

^h Total using toxicity equivalency for all cPAHs.

3.2 SAMPLING METHODS AND PROCEDURES

Descriptions of the specific sampling and laboratory methods for the project are presented in this section. The methods described are intended to supplement the SOPs provided in Appendix B. Sampling field forms are provided in Appendix A.

3.2.1 General Sampling Procedures

Excavation sidewall and bottom soil samples will be collected with aid of the excavator or backhoe. Samples will be collected directly from the excavator or backhoe bucket. For excavation less than 4 feet deep, samples may be collected directly from the sidewalls and bottom using hand tools. Samples for non-volatiles analysis will be thoroughly homogenized before being placed in sample containers.

For soil stockpiles, one 5-point composite sample will be collected at a rate of approximately one sample per 150 to 200 cy. The actual rate of stockpile sampling may be revised based on the acceptance requirement of the proposed disposal facility. Each of the five sub-samples will be collected with stainless steel or disposable hand tools, placed in a stainless steel mixing bowl and composited. Sub-samples will be collected at least 6-inches below the surface of the stockpile.

All soil samples will be placed into the appropriate sample containers using dedicated, disposable stainless steel or polyethylene spoons. All sample containers will be provided by the analytical laboratory. Bowls used during sample collection will be dedicated, disposable, and constructed of stainless steel, polyethylene, or aluminum. Following sample collection, the location of all samples will be recorded using a handheld global positioning system (GPS) and sketched in the field logbook.

3.2.2 Summary of Sample Media, Numbers, and Analyses

Total numbers of samples to be collected are summarized by medium in Table 3-4. Numbers of samples include four consecutive quarters of groundwater monitoring.

Table 3-4. Summary of Sample Types, Analyses, and Number

Sample Medium	Analysis	No. Field Samples	No. Duplicate Samples	No. Trip Blanks	No. Rinsate Blanks	Total No.
Soil ^a	Diesel/Heavy Oil	32	2	-	-	31
	RCRA metals	29	2	-	-	31
	Gasoline	3	-	-	-	3
	cPAHs	29	1	-	-	30
	EPH/VPH	4	-	-	-	4
	HVOCs	5	1	-	-	6
Groundwater	Gasoline/BTEX	28	8	4	4	44
	Diesel/Heavy Oil	28	8	-	4	40
	RCRA metals ^b	28	8	-	4	40
	HVOCs	4	4	4	4	16

^a Includes compliance monitoring samples and stockpile samples.

^b Groundwater will be analyzed for total and dissolved RCRA metals.

cPAHs = carcinogenic polycyclic aromatic hydrocarbons.

HVOCs = halogenated volatile organic compounds.

RCRA = Resource Conservation and Recovery Act list metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag).

3.2.3 Sample Containers, Preservation, and Holding Times

The following Table 3-5 provides a summary of potential sample analyses and specifications for containers, preservation, and holding times.

Table 3-5. Sample Containers, Preservation, and Holding Times

Analysis	Method	Matrix	Container	Preservation	Holding Time
Gasoline-Range Petroleum Hydrocarbons/BTEX	NWTPH-Gx/8021B	Soil	2 – pre-weighed 40 mL vials (5 grams of sample per vial)	Cool to 4°C	48 hrs
		Groundwater	2 – 40 mL vials ^a , zero headspace	HCL < pH 2 Cool to 4°C	14 days
Diesel and Heavy Oil-Range Petroleum Hydrocarbons	NWTPH-Dx	Soil	1 – 4 oz cwm	Cool to 4°C	14 days
		Groundwater	2 – 500 mL amber	HCL < pH 2 Cool to 4°C	14 days
HVOCs	8260B	Soil	2 – pre-weighed 40 mL vials w/ stir-bar (5 grams of sample per vial)	Cool to 4°C	48 hrs
		Groundwater	3 – 40 mL vials ^a , zero headspace	HCL < pH 2 Cool to 4°C	14 days
EPH	WDOE EPH	Soil	1 – 4 oz cwm	Cool to 4°C	14 days
VPH	WDOE VPH	Soil	2 – pre-weighed 40 mL vials w/ stir-bar (5 grams of sample per vial)	Cool to 4°C	48 hrs
RCRA Metals	6010B/7470A	Soil	1 – 4 oz cwm	Cool to 4°C	6 months
	200.8/7470A	Groundwater ^b	1 – 500 mL HDPE Dissolved samples field filtered through 0.45 µm filter	HNO ₃ < pH 2 Cool to 4°C	6 months
cPAHs	8270C	Soil	1 – 4 oz cwm	Cool to 4°C	14 days

^a Teflon-lined silicon septum cap

^b Groundwater will be analyzed for total and dissolved metals.

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

cwm = clear, wide-mouth jar.

HCL = hydrochloric acid.

HDPE = high-density polyethylene.

HNO₃ = nitric acid.

HVOCs = volatile organic compounds.

mL = milliliter.

MTCA = Model Toxics Control Act

Oz = ounce.

RCRA = Resource Conservation and Recovery Act list metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag).

µm = micron

WDOE = Washington Department of Ecology

3.2.4 Field Screening

During excavation, periodic screening of the excavation sidewalls and will be conducted using a PID and visual/olfactory methods. Each periodic sample will be placed in a re-sealable plastic bag for headspace screening using the PID. The headspace sample will be allowed to heat in the sun for approximately 10 minutes and will then be shaken vigorously. A headspace vapor measurement will be then be collected and recorded on the field sampling form. During sampling, observations will also be made for signs of contamination such as odors, staining, or sheen on saturated samples from below the water table. Such observations will also be recorded on the field sampling form. Field screening information will be used to aid in the determination of the excavation limits.

3.2.5 Monitoring Well Installation, Development, and Sampling

Monitoring wells will be installed by a licensed driller according to applicable Ecology regulations (Chapter 173-160 WAC). The monitoring wells will be constructed using 2-inch inside diameter (ID) polyvinyl chloride (PVC) casings fitted with 10-foot screens (with 0.01-inch or 0.02-inch slots). Well screens will be completed between the depths of 5 and 15 feet bgs. Completed well monuments will be flush-mounted; a 2-foot square concrete pad will be constructed around the monument as a surface seal.

Completed monitoring wells will be allowed to set for at least 24 hours before development to allow grout or bentonite chip seals to set. Development will be achieved by over-pumping at a flow rate of up to 1 gallon per minute (gpm) using an 5/8-inch outside diameter (OD) inertial lift pump fitted with a surge block. New polyethylene tubing shall be used for developing each well.

Water quality parameters (specific conductance, pH, temperature, and turbidity) will be measured during development. Development will be continued until the parameters stabilize as determined by the lack of appreciable change in measurement over several 3-minute monitoring periods or if a turbidity reading of 10 nephelometric turbidity units (NTUs) or less is attained. The 10 NTU criterion is based on EPA sampling guidelines.

Groundwater sampling will be conducted no earlier than 24 hours following development to allow undisturbed water to enter the well column. Groundwater will be collected using a decontaminated, positive-displacement down-hole pump. New, disposable polyethylene tubing will be used at each sample location. For samples collected near the groundwater table, the sample pump will be lowered to 2-feet below the water surface.

Groundwater will be purged and sampled from the wells using low flow techniques. The measured purging and sampling flow rate shall be 0.5 liters per minute or less. Water quality parameters will be measured during sampling; purging shall be considered complete when the criteria shown in Table 3-6 are met over at least three 3-minute monitoring periods.

Table 3-6. Purging Stabilization Criteria

Parameter	Stabilization Criteria
pH	+/- 0.1 unit
Specific conductance	+/- 3%
Oxidation-reduction potential (ORP)	+/- 10 millivolts
Turbidity	+/- 10% (when greater than 10 NTUs)
Dissolved Oxygen	+/- 0.3 milligrams per liter

Filtered samples will be collected using a 0.45 micron filter placed in line with the sample tubing.

New well locations will be surveyed with an accuracy of +/- 1 foot horizontally and +/- 0.01 foot vertically.

3.2.6 Decontamination Procedures

Decontamination of all non-disposable tools and equipment will be conducted prior to each sampling event and between each sampling location in accordance with the standard operating procedures. The following steps will be taken during decontamination of sampling equipment used during field investigations:

- Scrub with non-phosphate detergent (i.e., Alconox or similar)
- Rinse with tap water

- Rinse thoroughly with deionized water
- Allow to air dry and place in a new plastic bag for storage

For decontamination of larger tools and equipment, such as push-probe rods, a high-pressure, hot water washer or similar device will be used. Loose soil materials will be removed from equipment using a “dry” decontamination technique consisting of the removal of loose soil using a shovel or brush.

3.2.7 Investigation-Derived Waste

Investigation derived waste (IDW) from sampling activities will be containerized onsite in 55-gallon drums and staged onsite. A single composite sample from both water and soil will be collected for waste characterization. Disposal options for the IDW will be based on the analytical results of the IDW samples. Disposal shall be managed by the Owner’s representative using a licensed waste disposal contractor.

All drums will be labeled indicating date filled, content, location, company, and a unique identification number. All drums and containers will be tracked on a waste-tracking log.

All disposable sampling materials and personal protective equipment, such as disposable coveralls, gloves, and paper towels used in sample processing will be placed inside polyethylene bags or other appropriate containers. Disposable materials will be placed in a normal refuse container and disposed of as normal solid waste in accordance with standard operating procedures for IDW.

3.3 SAMPLE HANDLING AND CUSTODY

The following sections describe sample handling and custody procedures.

3.3.1 Sample Identification and Labeling

Prior to the field investigation, each sample location will be assigned a unique code. Each sample collected at that location will be pre-assigned an identification code using the sampling site followed by other specific information describing the sample. The sample numbering protocol is shown in Table 3-7.

Table 3-7. Sample Numbering Protocol

Site	BP = Bothell Paint
Matrix	SO = Soil GW = Groundwater TB = Trip blank water
Sampling Station	BPSW01 = Bothell Paint Sidewall Station 01 BPBT02 = Bothell Paint Bottom Station 02 BPMW09 = Bothell Paint Monitoring Well 09 BPSP04 = Bothell Paint Stockpile Station 04
Sample Type/Sample Depth	0000 = Field sample collected at the surface 0000 = Trip blank water provided by the laboratory 1010 = Field duplicate collected at a depth of 1.0 feet 4115 = Rinsate sample.

Example:

BP-SO-SW01-0120 = Soil sample collected from the excavation sidewall station 01 at a depth of 12.0 feet.

3.3.2 Sample Storage, Packaging, and Transportation

Samples will be placed in a cooler following collection and chilled to approximately 4°C. Following completion of each days sampling, all samples will be transported and/or shipped to the analytical laboratory, as appropriate. Samples which are routinely delivered to the laboratory on the same day as collection may not have sufficient time to chill to 4°C.

3.3.3 Sample Custody

The chain-of-custody procedures used for this project provide an accurate written or computerized record that can be used to trace the possession of each sample from the time each is collected until the completion of all required analyses. A sample is in custody if it is in any of the following places:

- In someone's physical possession
- In someone's view
- In a secured container
- In a designated secure area

The following information will be provided on the chain-of-custody form:

- Sample identification numbers
- Matrix type for each sample
- Analytical methods to be performed for each sample
- Number of containers for each sample
- Sampling date and time for each sample
- Names of all sampling personnel
- Signature and dates indicating the transfer of sample custody

All samples will be maintained in custody until formally transferred to the laboratory under a written chain-of-custody. Samples will be kept in sight of the sampling crew or in a secure, locked vehicle at all times. Samples that leave the custody of field personnel will be sealed by placing a signed and dated Custody Seal across the seam of the shipping container.

3.4 ANALYTICAL METHODS

All samples will be submitted to a commercial analytical laboratory certified by Ecology to perform the required analyses. Analytical methods are listed in Table 3-5. Laboratory reporting limits will be verified prior to analyses to ensure that, at a minimum, reporting limits for each analyte are equal to or lower than MTCA Method A cleanup levels for soil and groundwater. Matrix interferences may make it impossible to achieve the desired reporting limits and associated quality control (QC) criteria. In such instances, the laboratory shall report the reason for noncompliance with QC criteria or elevated detection limits.

3.5 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance (QA)/QC checks consist of measurements performed in the field and laboratory. The analytical methods referenced in Section 3.4 specify routine methods required to evaluate data precision and accuracy, and determine whether the data are within acceptable limits.

3.5.1 Field Methods

Guidelines for minimum samples for field QA/QC sampling are summarized in Table 3-8.

Table 3-8. Guidelines for Minimum QA/QC Samples for Field Sampling

Media	Field Duplicate	Field	
		Trip Blank	Equipment Blank
Soil and Groundwater	1 in 20	1 per cooler containing water HVOCs and/or gasoline-range petroleum hydrocarbons/BTEX samples	1 in 20 per equipment type, if reusable equipment is utilized

3.5.1.1 Field Duplicates

A minimum of one blind field duplicate will be analyzed per 20 samples. Field duplicates will be collected following field samples. Soil duplicate samples for non-volatiles analysis will be homogenized and split. Duplicate samples will be coded so the laboratory cannot discern which samples are field duplicates.

3.5.1.2 Trip Blanks

A trip blank shall accompany each cooler containing groundwater samples for gasoline-range petroleum hydrocarbons and/or HVOCs analysis. The trip blank shall be obtained from the laboratory or will be made by filling the appropriate sample containers with certified analyte-free deionized water. Trip blanks will be analyzed for gasoline-range petroleum hydrocarbons and/or HVOCs with the field samples.

3.5.1.3 Equipment/Rinsate Blanks

One equipment blank will be collected per 20 samples collected with non-disposable sampling equipment. Equipment blanks will be collected by capturing deionized water rinsed over (or through) sampling equipment after decontamination. Equipment blanks will be analyzed for the same constituents as the field samples.

3.5.2 Laboratory Methods and Quality Control

Specific procedures and frequencies for laboratory QA procedures and QC analyses are detailed in the laboratory's QA Plan and SOPs for each method. QC analyses will be performed by the laboratory according to their Ecology-approved SOPs.

Accuracy and precision are determined through QC parameters such as surrogate recoveries, matrix spikes, QC check samples, and blind field duplicates. A blind field duplicate sample will be analyzed as a QC sample for verification of precision and accuracy. If results of the blind field duplicate are outside the control limits, corrective action and/or data qualification will be determined after review by the Data QA Manager or his/her designee. Blind field duplication can be of poor quality because of sample heterogeneity. Therefore, the Data QA Manager will determine corrective action. Field QC sample requirements are listed in Table 3-8.

All analyses performed for this project must reference QC results to enable reviewers to validate (or determine the quality of) the data. Sample analysis data, when reported by the laboratory, will include QC results. All data will be checked for internal consistency, transmittal errors, laboratory protocols, and for complete adherence to the QC elements.

3.5.3 Laboratory Instruments

All instruments and equipment used during analysis will be operated, calibrated, and maintained according to manufacturer's guidelines and recommendations, and in accordance with procedures in the analytical method cited, as documented in the laboratory QA plan. Properly trained personnel will operate, calibrate, and maintain laboratory instruments. Calibration blanks and check standards will be analyzed daily for each parameter to verify instrument performance and calibration before beginning sample analysis.

Where applicable, all calibration procedures will meet or exceed regulatory guidelines. The Data QA Manager must approve any variations from these procedures before beginning sample analysis.

After the instruments are calibrated and standardized within acceptable limits, precision and accuracy will be evaluated by analyzing a QC check sample for each analysis performed that day. Acceptable performance of the QC check sample verifies the instrument performance on a daily basis. Analysis of a QC check standard is also required. QC check samples containing all analytes of interest will be either purchased commercially or prepared from pure standard materials independently from calibration standards. The QC check samples will be analyzed and evaluated according to the EPA method criteria.

Instrument performance check standards and calibration blank results will be recorded in a laboratory instrument logbook that will also contain evaluation parameters, benchmark criteria, and maintenance information. If the instrument logbook does not provide maintenance information, a separate maintenance logbook will be maintained for the instrument.

3.6 FIELD INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

The types of field instruments and equipment that are anticipated to be used during sampling include, but are not limited to:

- PIDs
- Personal air monitors, as needed
- GPS

Equipment maintenance will be performed according to manufacturers' specifications by Parametrix or as directed by Parametrix. The frequency of inspection, testing, and maintenance will be established, based on operation procedures and manufacturers' specifications. Field personnel will be responsible for inspection, testing, and maintenance of field equipment. A hard copy of procedures and manufacturer's specifications will be provided to all field personnel working with the equipment. All equipment will be inspected and tested prior to use.

The results of inspection and testing, as well as any problems encountered and corrective actions, will be documented in the activity field notebook. The equipment serial number and date of activity will be included in notebooks so that a complete record is maintained. If problems are encountered, they will be reported to the Manager.

3.7 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Field supplies such as sample containers and trip/rinsate blank water shall be obtained from reputable suppliers and shall be certified analyte-free. Records of certification shall be kept by the laboratory (for laboratory-supplied supplies) or by the Owner's representative in the project file. Sampling spoons and bowls shall be food-grade and shall be purchased new.

3.8 NON-DIRECT MEASUREMENTS

The need for non-direct measurements is not anticipated for the Site Investigation. However, if the need does arise during task execution, the previously collected data will be evaluated to assess consistency with project DQOs and DQIs. Data from non-direct sources will be evaluated by the Data QA Manager prior to the data being used in analyses or in data reports.

3.9 DATA MANAGEMENT

The objectives of data management are to assure that large volumes of information and data are technically complete, accessible, and efficiently handled.

3.9.1 Field Data

The original hard (paper) copies of all field notes and laboratory reports will be stored in the project file. Photocopies of these documents should be prepared for working copies as needed.

Field data should be recorded in bound notebooks or individual sampling sheets. The field team members should review the field data for completeness prior to placing it in the files.

3.9.2 Laboratory Data

The laboratory data reports will be archived in the project files. The electronic data will be incorporated into Excel spreadsheets and archived on electronic media and placed in the project file.

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4. ASSESSMENT AND OVERSIGHT

This section describes activities to be conducted to assess the effectiveness of project implementation and associated QA/QC activities. The purpose of the assessment is to ensure that the CMQAPP is properly implemented.

4.1 ASSESSMENTS AND RESPONSE ACTIONS

A performance and system audit may be conducted at anytime. Audits will consist of direct observation of work being performed and inspection of field and laboratory equipment. The performance and system audits will also review the sample custody procedures in the field and laboratory.

If implemented, internal audits of both the field and laboratory activities will be conducted by the Data QA Manager. Audits will be unannounced to assure a true representation of the technical and QA procedures employed.

Checklists for both field and laboratory audits will be based on National Enforcement Investigation Center (EPA 1984) Audit Checklists. The audits will be performed by persons having no direct responsibilities for the activities being performed.

The auditor or designee will prepare an audit report that includes findings, non-conformances, observations, and recommended corrective action, and a schedule for completion of such action.

For each identified nonconformance, a corrective action report will be issued as part of the audit report to notify the individual responsible for implementing the recommended corrective action and its schedule for completion. If a field corrective action is required, the Manager will be notified. If a laboratory corrective action is required, the Data QA Manager will be notified.

The audit will be distributed to the Manager.

Corrective actions may be needed for two categories of nonconformance:

- Deviations from the methods or QA requirements established in the CMQAPP.
- Equipment or analytical malfunctions.

During field operations and sampling procedures, the Field Sampler will be responsible for taking and reporting required corrective action. A description of any such action taken will be entered in the field notebook. If field conditions are such that conformance with the CMQAPP is not possible, the Manager will be consulted immediately. Any corrective action or field condition resulting in a major revision of the CMQAPP will be communicated to the Manager for review and concurrence.

During laboratory analysis, the Laboratory QA Manager will be responsible for taking required corrective actions in response to equipment malfunctions. If an analysis does not meet data quality goals outlined in the CMQAPP, corrective action will follow the guidelines in SW-846 (EPA 1986). If analytical conditions do not conform to this CMQAPP, the Data QA Manager will be notified as soon as possible so that additional corrective actions can be taken.

Corrective Action Reports will document response to any reported non-conformances. These reports may be generated from internal or external audits or from informal reviews of project activities. Corrective Action Reports will be reviewed for appropriateness of recommendations and actions by the Data QA Manager for QA matters, and the Task Manager for matters of technical approach.

4.2 REPORTS TO MANAGEMENT

The Data QA Manager will be responsible for data quality assessments and associated QA Reports. All reports will be submitted to the Manager for review. Final task or investigative reports will contain a separate QA section summarizing data quality information.

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5. DATA VERIFICATION AND VALIDATION

Data verification is confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Validation is confirmation by examination and provision of objective evidence that the particular requirement for a specific intended use have been fulfilled. Techniques for data verification and validation will be in accordance with the Guidance on Environmental Data Validation and Verification (EPA 2001b).

5.1 DATA REVIEW, VERIFICATION, AND VALIDATION

All data packages provided by the laboratory must provide a summary of quality control results adequate to enable reviewers to validate or determine the quality of the data. The Data QA Manager is responsible for conducting checks for internal consistency, transmittal errors, and for adherence to the quality control elements specified in the CMQAPP.

Field measurements (pH, specific conductance, temperature) will be verified and checked through review of instrument calibration, measurement, and recording procedures.

A verification level validation will be performed on all field documentation and analytical data reports. The data validation process will be used to verify the data quality. The following QC elements will be reviewed, as appropriate:

- Trip blank and rinsate blank results.
- Analytical holding times.
- Preparation blank contamination.
- Check standard precision.
- Analytical accuracy (blank and matrix spike recoveries and laboratory control sample recoveries).
- Analytical precision (comparison of replicate sample results, expressed as relative percent difference [RPD]).
- Each data package will be assessed to determine whether the required documentation is of known and verifiable quality. This includes the following items:
 - Field chain-of-custody record is present, complete and signed.
 - Certified analytical report.
 - QA/QC sample results.

Data will be qualified using guidance provided in the Contract Laboratory Program (CLP) functional guidelines for assessing data (EPA 1994a, 1994b).

The Data QA Manager will prepare a quality assurance memorandum for each site describing the results of the data validation and describing any qualifiers that are added to the data.

5.2 VERIFICATION AND VALIDATION METHODS

The Data QA Manager will review the following:

- Chain-of-custody documentation
- Holding times

- Equipment/trip blank results
- Field Duplicate results
- Method blank results

A limited review (minimum 10 percent) of the following laboratory QC data results will be conducted:

- Laboratory matrix spike/matrix spike duplicate (MS/MSD) and/or matrix duplicate results
- Laboratory surrogate recoveries
- Laboratory check samples

If, based on this limited review the QC data results indicate potential data quality problems, further evaluations will be conducted.

5.2.1 Precision

Precision measures the mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. QA/QC sample types that measure precision include field duplicates, MSD, and matrix duplicates. The estimate of precision of duplicate measurements is expressed as a RPD (Relative Percent Difference), which is calculated:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2) \div 2} \times 100$$

Where D1 = First sample value

D2 = Second sample value.

The RPDs will be routinely calculated and compared with DQOs.

5.2.2 Accuracy

Accuracy is assessed using the results of standard reference material, linear check samples, and MS analyses. It is normally expressed as a percent recovery, which is calculated:

$$\text{Percent Recovery} = \frac{(\text{Total Analyte Found} - \text{Analyte Originally Present}) \times 100}{\text{Analyte Added}}$$

The percent recovery will be routinely calculated and checked against DQOs.

5.2.3 Bias

Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias will be assessed with field duplicate and laboratory matrix spike samples, similar to that described for accuracy. Bias measurements are usually carried out with a minimum frequency of 1 in 20, or one per batch of samples analyzed, under the same sampling episode.

5.2.4 Sensitivity

Sensitivity expresses the capability of a method or instrument for meeting prescribed measurement reporting limits. Sensitivity will be assessed by comparing data reporting limits with applicable cleanup criteria and analytical or instrument method reporting limits.

5.2.5 Completeness

The amount of valid data produced will be compared with the total analyses performed to assess the percent of completeness. Completeness will be routinely calculated and compared with the DQOs.

5.2.6 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data will be comparable with other measurement data for similar samples and sample conditions. Comparability of the data will be maintained by using consistent methods and units.

5.2.7 Representativeness

Sample locations and sampling procedures will have been chosen to maximize representativeness. A qualitative assessment (based on professional experience and judgment) will be made of sample data representativeness based on review of sampling records and QA audit of field activities.

5.3 RECONCILIATION AND USER REQUIREMENTS

The Data QA Manager will prepare a technical memorandum for each data package describing the results of the data review and describing any qualifiers that were added to the data. The technical memorandum will also summarize the laboratory's QC criteria and will include recommendations on whether additional actions such as re-sampling are necessary. Technical memoranda will be submitted with the FS report.

5.4 DATA REPORTING

All laboratory data packages will contain the following information:

- Cover letter
- Chain-of-custody forms
- Summary of sample results
- Summary of QC results
- Ecology Environmental Information Management (EIM) electronic data deliverable (EDD)

The minimum information to be presented for each sample for each parameter or parameters group:

Client sample number and laboratory sample number

- Sample matrix
- Date of analysis
- Dilution factors (as reflected by practical quantitation limits (PQL))
- Analytical method
- Detection/quantitation limits
- Definitions of any data qualifiers used

Additionally, sample weights/volumes used in sample preparation/analysis and identification of analytical instrument will not be reported but will be kept in laboratory records for future reference.

The minimum QC summary information to be presented for each sample for each parameters or parameter group will include:

- Surrogate standard recovery results
- Matrix QC results (matrix spike/matrix spike duplicate, duplicate)
- Method blank results

EIM EDDs will be in accordance with the most recent version of the results spreadsheet submittal capable of being quickly uploaded into the Ecology EIM database.

6. SCHEDULE

An estimated project schedule is provided below in Table 6-1. Note that the Contractor's schedule may vary as they will be working on multiple sites within the project vicinity.

Table 6-1. Schedule

Work Element	Commence/Implement By
Interim Action (Soil Excavation)	August 1, 2010
Install New Monitoring Wells	September 1, 2010
1st Quarter Groundwater Sampling	September 30, 2010
2nd Quarter Groundwater Sampling	December 31, 2010
3rd Quarter Groundwater Sampling	March 30, 2011
4th Quarter Groundwater Sampling	June 30, 2011
Draft Interim Action Memorandum	August 15, 2011

Note: Groundwater monitoring memoranda will be submitted 6 weeks following completion of each groundwater monitoring event.

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