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MEMORANDUM

To:	Paul Skyllingstad, Washington State Department of Ecology	**Date:**	August 23, 2011
From:	Rebecca Gardner, Nicole LaFranchise, Leslie McKee, and Mark Larsen, Anchor QEA, LLC		
Cc:	Mark Stiffler and Steve Shaw, Northwest Alloys, Inc. Kristin Gaines, Millennium Bulk Terminals – Longview, LLC		
Re:	Former Reynolds Metals Reduction Plant Work Plan Addendum		

INTRODUCTION

In June 2007, the Washington State Department of Ecology (Ecology) entered into an Agreed Order (No. DE4263) for the completion of a Remedial Investigation and Feasibility Study (RI/FS) at the Former Reynolds Metals Reduction Plant (Reynolds) located at 4029 Industrial Way in Longview, Washington (Figure 1). Signatories to the Agreed Order included the landowner, Northwest Alloys, Inc. (NWA), and Chinook Ventures, Inc. (Chinook), which leased the land from NWA and operated the site.

RI/FS data collection and reporting activities were completed during 2007, consistent with the Ecology approved Work Plan (Anchor 2007a). The RI and FS reports were submitted to Ecology in 2007 (Anchor 2007b, 2007c, respectively). During 2011, after completion of its review of the RI and FS reports, Ecology requested that supplemental investigations be performed prior to finalizing the RI and FS documents for the site.

This Work Plan Addendum describes the work to be conducted in response to Ecology's requests. This document was prepared consistent with the process defined under the Model Toxics Control Act (MTCA), as outlined in the Agreed Order. The work described in this Work Plan Addendum will be performed by Anchor QEA, LLC on behalf of NWA and Millennium Bulk Terminals - Longview, LLC (MBTL), the current tenant at the site. MBTL entered into a lease agreement with NWA for the site after purchasing certain assets from Chinook in January 2011. Current site features are shown on Figure 2.

The following sections describe investigation needs, chemicals of potential concern, and data collection activities for each of the supplemental study activities (SSAs) to be performed prior to finalization of the RI/FS. This Work Plan Addendum is supported by a Sampling and Analysis Plan Addendum (SAP; Attachment A) and a Quality Assurance Project Plan Addendum (QAPP; Attachment B). The SAP provides details for conducting the sampling and characterization field program, and the QAPP provides details regarding the applicable quality control protocols for laboratory analysis. Laboratory analyses will be performed by an Ecology-accredited laboratory. All work will be performed consistent with a project Health and Safety Plan (in preparation) that describes the safety measures for the planned site investigation activities.

SUPPLEMENTAL STUDY ACTIVITIES

This Work Plan Addendum includes 10 SSAs that will augment previous sampling information. Previous sampling activities performed in support of the RI/FS included extensive characterization work conducted throughout the site as shown on Figure 3. In addition to these previous soil, groundwater, lysimeter, and surface water investigations, Figure 3 also shows additional geotechnical borings and test pit locations placed during multiple MBTL activities during 2010 (Anchor QEA 2010a, 2010b), as well as soil samples placed during 2010 by Chinook during a cleanup of Heat Transfer Media (HTM) oil (Chinook 2010).

Figure 4 shows the areas targeted for sampling work under this Work Plan Addendum, including eight site locations where supplemental investigation is considered appropriate to address data gaps. Activities will also include monitoring groundwater wells and surface water sampling locations previously evaluated during RI/FS sampling events. The work to be performed as part of each of these 10 SSAs is described in the following sections. The proposed sampling locations are shown on Figure 5, and proposed analytical parameters are listed in Table 1.

Field Southwest of Cable Plant (SSA 1)

Ecology requested that an additional investigation be performed in the field located southwest of the Cable Plant (refer to SSA 1 on Figure 4). Based on interviews with personnel previously employed by Chinook, soils from a temporary stockpile may have been regraded as fill in this area during Chinook's tenancy at the site. The original source and chemical composition of the placed soils are not known but could potentially have included black-colored cryolite recovery plant wastes containing fluoride and cyanide (i.e., black mud).

In order to investigate potential impacts to soils in this study area, a minimum of five test pits will be excavated in the area where the regrading activity is reported to have occurred. Field activities will include observations of soil color, odor, and type within the fill horizon. Should field observations indicate the presence of black mud in a test pit, one grab sample of the suspect material will be collected and analyzed for polycyclic aromatic hydrocarbon (PAH) compounds, fluoride, and total cyanide. Should field observations indicate the presence of petroleum hydrocarbons, a field sheen test per Ecology guidance document 91-30 (Ecology 1994) will be conducted and one grab sample will be collected from the test pit(s) where suspected petroleum hydrocarbon presence is encountered. These samples will be analyzed for total petroleum hydrocarbons diesel range and heavy oils (NWTPH-dx). Where soil impacts are observed, additional test pits will be excavated outside the perimeter of the target area in order to delineate an outer boundary. In test pits where observations indicate no impacts to soil, the test pits will be backfilled and no samples will be collected.

Each test pit will be excavated to a minimum of 4 feet below ground surface (bgs) or to the apparent native soil contact under supervision of former Reynolds staff. Field observations and sample collection details, such as depth of sample collection and GPS coordinates, will be documented.

MBTL completed a series of geotechnical borings in fall 2010 located west and southwest of the Cable Plant, adjacent to SSA 1. These borings are noted as AQB01 through AQB19 on Figure 3. Ecology has requested submittal of these boring logs to reference soil lithology. These logs will be provided to Ecology under separate cover.

Thin Stillage Application Areas (SSA 2)

During its tenancy, Chinook land-applied a liquid agricultural product known as thin stillage to the low-lying areas located just east of the closed black mud pond (CBMP; refer to SSA 2 on Figure 4). Thin stillage was pumped from a fire hose that was located in the southeast corner of the CBMP and was dispensed primarily in parallel to the dike in a northwesterly direction. Ecology requested that additional sampling be conducted to determine whether any accumulations of the thin stillage remain at a level that could potentially impact site conditions.

Thin stillage is a nutrient-containing liquid byproduct generated during ethanol production from grain substrates (e.g., wheat, triticale, and corn; Mustafa et al. 2000). The ethanol production process involves enzymatic pre-treatment of grains to sugars followed by yeast fermentation of sugars to ethanol. Thin stillage is one of the byproducts of yeast fermentation. The specific chemical composition of thin stillage can vary based on the grain or starch used in the ethanol production process (Mustafa et al. 2000), but available studies indicate the following general alterations to soils after land application (Sheehan and Greenfield 1980; Jenkins et al.1987; Nguyen 2003):

- Elevated nutrient levels, including total nitrogen, nitrate, and ammonia phosphates and potassium
- Increased total salt content of soil (e.g., calcium, magnesium, potassium, and phosphorus)

In order to investigate potential thin stillage impacts to site soils, hand tools will be used to excavate shallow test plots within locations where thin stillage was applied. Grab samples of shallow soils (0 to 6 inches in depth) from within the test plots will be analyzed for nutrient compounds typically associated with thin stillage. Four test plots will be excavated along two transects as shown on Figure 5. Soils from each test plot will be analyzed for total nitrogen, nitrate, nitrite, ammonia, total and available phosphate, and potassium (Table 1). Prior to analysis, samples will be field-sieved to remove root matter, which may interfere with the analysis. Reference samples will also be obtained from two shallow test plots located away from areas of thin stillage application, specifically southwest of SSA 2, between the Consolidated Diking and Improvement District (CDID) levee and the Columbia River

(Figure 5). Reference samples will be analyzed for the same constituents as the samples from the target area.

Northwestern Site Area Soils (SSA 3)

During previous groundwater sampling conducted immediately northwest of the CBMP, elevated concentrations of fluoride have been noted in shallow groundwater. Previous fate and transport evaluations indicated that these concentrations do not pose a risk to surface water in the CDID ditch, and this conclusion has been further verified by sampling of surface waters.

Supplemental soil sampling will be performed in this northwestern site area (refer to SSA 3 on Figures 4 and 5) to verify that no soil impacted by black mud constituents are present. Shallow soils will be sampled using test pits excavated along four sampling transects, with between one and three test pits per transect. Each of the eight test pits will be excavated to a minimum of 4 feet bgs or to the water table, whichever is encountered first.

Grab samples will be collected from each test pit for chemical analysis. Analyzed samples will be collected from soils at 2 to 3 feet bgs. However, sampling depths may be adjusted if potentially impacted fill materials are identified in the test pits. The submitted samples will be analyzed for fluoride and cyanide (total and weak acid dissociable [WAD]; Table 1), which are the constituents observed in nearby shallow groundwater monitoring wells.

Flat Storage Area (SSA 4)

The flat storage area was constructed by Chinook for stockpiling bulk products, such as petroleum coke (pet-coke) and coal. This area includes a storage pad that consists of cement-amended soils and a cement-bermed containment wall. Coal is currently stored in the northeastern quadrant of the flat storage area, with pet-coke stored in the remaining areas. Ecology requested that soil sampling be conducted to determine if contaminants associated with the pet-coke product stored on the pad may have leached into underlying soils. Soil sampling will also include areas adjacent to the storage pad where stormwater runoff may have accumulated during Chinook operations.

As shown on Figure 5, investigation activities will be performed throughout the storage pad footprint. Sampling will be performed within each of the nine quadrants that cover the entire storage pad area and in two adjacent areas. Prior to sampling, stored product will be removed from the sample locations and the composition and integrity of the pad will be visually assessed. Sampling will include coring or cutting of the pad to expose underlying soils for access.

Soil will be collected from each of the 11 sampling locations using a direct push drilling rig or hand tools from a test pit excavation. Selection of the final sampling method will be based on field conditions. Final locations may be adjusted from those shown on Figure 5, as necessary based on field conditions. Soil samples from beneath the storage pad will be collected at 1-foot intervals to a maximum sampling depth of 5 feet bgs or the observed depth to groundwater, whichever is encountered first. The first two sample intervals from each location will be analyzed for PAHs (as an indicator of pet-coke). Samples collected from below the first two sample intervals will be archived and may be analyzed if elevated PAHs are detected in the second sampling interval.

In addition to soil investigations, one down-gradient shallow well (RL-4S) will be sampled to assess levels of PAHs[1]. Depending on the results of chemical constituents present in this well, a second down-gradient well may be installed to further characterize groundwater in SSA 4; the location will be determined in coordination with Ecology.

Casting Pit Soils (SSA 5)

Casting pits are located within the former Cast Houses in the South Plant (refer to SSA 5 on Figure 4). These pits are concrete-lined structures approximately 20 to 30 feet bgs that were formerly used in direct chill casting of molten aluminum. Two of these casting pits were recently decommissioned by Chinook by filling them with sandy on-site soils and capped with concrete. Ecology requested that soil sampling be performed within two of the filled casting pits to ensure that no materials that exceed proposed site cleanup levels were disposed of in the pits during this fill activity.

[1] Additional groundwater monitoring at well RL-4S is discussed in the Groundwater Sampling (SSA 9) section.

The pit soils will be investigated using a direct push drilling rig to collect samples to confirm the presence of clean fill material. Three borings will be placed in each of the two casting pits areas. Two borings will be advanced to a minimum of approximately 20 feet bgs, with the third advanced to a minimum of 8 feet bgs. Target sample intervals from the deeper borings include 8 to 10 and 14 to 16 feet bgs; the shallower boring sampling interval is 4 to 6 feet bgs. Sample intervals may be adjusted if potentially impacted fill material is identified by field personnel.

Approximately 10 samples will be submitted to the laboratory for PAHs and fluoride analyses.

HTM Oil Area (SSA 6)

HTM oil is a heat transfer fluid similar in composition to mineral oil. It was used as part of an enclosed, recirculating heating system associated with storage tanks for anode and cathode pitch. Pitch is solid at cooler ambient temperatures and must be heated to allow product transfers. During Chinook operations at the site, a release of HTM oil from the heating system's plumbing was discovered within the containment area between the two easternmost pitch storage tanks. Chinook conducted soil sampling and removed accessible impacted soils from the release area. Data from Chinook's historical records contained total petroleum hydrocarbon (TPH) sampling results collected during soil removal, indicating diesel range TPH (TPH-dx) concentrations up to 25,000 milligrams per kilogram (mg/kg) and residual oil TPH (TPH-ro) range concentrations up to 5,100 mg/kg (Chinook 2010). The most recent sampling conducted in this area is believed to have occurred in October and December 2010, after additional excavation activities had continued. Those results indicated remaining TPH-dx concentrations of 13.4 to 557 mg/kg, and TPH-ro concentrations ranging from 26.7 to 580 mg/kg. These concentrations are less than MTCA Method A unrestricted land use cleanup levels for these constituents.

Additional sampling will be conducted within the HTM oil area to complete soil characterization and to verify that this study area has been adequately remediated. Sampling will be performed using a limited-access, direct push drilling rig to collect samples within the containment area at three locations between the pitch storage tanks, in three locations south of the tanks, and if necessary, two additional locations that will be assessed by field personnel

based on field screening. Soils from each boring will be continuously sampled and field screened. Field screening will involve visual inspection of samples and sheen testing. A minimum of two soil samples will be collected from each boring from depths of 1 to 2 and 3 to 4 feet bgs, with additional samples targeted for potentially impacted soil intervals. Approximately 12 to 16 soil samples will be analyzed for NWTPH-dx with silica gel cleanup to assess petroleum concentrations. Additional sample intervals will be analyzed if field screening indicates the presence of TPH-impacted soil.

Based on the results of the NWTPH-dx analyses, subsequent sampling may include one sample of the HTM oil product contained within the heating system reservoir. The reference oil sample and two to three soil samples (archived from the samples analyzed for NWTPH-dx with silica gel cleanup) would be analyzed for TPH-dx and extractable petroleum hydrocarbons (EPH). These samples will be selected based on the results of initial TPH testing in comparison to MTCA Method A criteria. These data will be used to develop site-specific cleanup levels, as necessary, consistent with current MTCA and Ecology requirements.

In addition to soil investigations, up to two wells may be completed in order to assess whether HTM oil entered groundwater beneath the tank farm. Installation of these wells is contingent on results of soil sampling and would occur as a phased approach once soil data has been reviewed. Locations will be determined in coordination with Ecology. Groundwater from these contingent wells would be sampled for NWTPH-dx with silica gel cleanup and EPH.

Southeastern Fill Area (SSA 7)

An area of fill containing apparent construction debris was identified in the southeastern portion of the site during excavations completed by Chinook when removing sands from near the dredged material storage area (DMSA). The approximate location of the fill material—based on the completed excavations and review of historical aerial photographs—is shown on Figures 4 and 5. Based on available data, the fill area may extend west from the DMSA between the CDID levee and toward the shoreline.

Test pits will be used to evaluate the lateral extent and composition of the fill material. Test pits will be excavated to the base of the apparent fill material, where practicable.

Anticipated excavation depths range from approximately 12 feet in the test pits closest to the CDID levee to between 6 and 8 feet in the test pits located closer to the river. Former Reynolds staff will supervise the test pit excavations to document the nature of the fill material. In the event that fill material is identified in a test pit (i.e., the material removed from the test pit does not consist of native soil or Columbia River sand associated with the DMSA), field personnel will collect samples of the observed fill material. Sampling depths will depend on the location of the observed fill. Samples will be analyzed for PAHs, polychlorinated biphenyls (PCBs), fluoride, sulfate, and total cyanide. In test pits where observations indicate no impacts to soil, the test pits will be backfilled and no samples will be analyzed.

All test pits will be backfilled to original conditions after sampling, with the soils replaced in the order in which they were excavated. Should analytical results indicate the presence of soil contamination, then groundwater will be characterized.

Dock Visual Inspection Area (SSA 8)

During Chinook operations, alleged releases of pet-coke and potentially of cement products occurred at the dock. In response to Ecology Enforcement Order No. 7392, physical/chemical sampling was completed to assess potential impacts to biota in sediments in the vicinity of the dock. Sampling and analysis of sediments adjacent to and downstream from the dock was completed in 2010, consistent with a SAP approved by multiple agencies (i.e., Ecology, Washington Department of Natural Resources, U.S. Army Corps of Engineering, and U.S. Environmental Protection Agency) SAP (Anchor QEA 2010c). Sampling activities included both core sampling of subsurface sediments and grab sampling of surface sediments. No chemical contamination was identified in either surface or subsurface sediments; however, traces of pet-coke were observed in the surface grabs in the laboratory after grain size classification testing was performed (Anchor QEA 2010d). In addition, during the collection of one grab sample located behind the dock, an isolated patch of hardened material was identified.

Ecology requested that a follow-up visual assessment be performed to evaluate the composition and lateral extent of the hardened material behind the dock area. This survey will be performed by a team of divers, a towed camera, or a remotely operated vehicle in the

areas shown on Figure 5. The final method will be chosen based on site conditions and subcontractor availability. The video survey will document any apparent surface accumulations of deleterious materials.

Groundwater Sampling (SSA 9)

Groundwater sampling activities at the site currently include quarterly monitoring of the R and RL series wells. Additional groundwater wells (G series) and piezometers (PZ series) were installed and sampled as part of various investigative activities that have occurred throughout the years. These four series of wells will be sampled to assess potential changes in constituent levels that may be present since previous sampling events associated with the 2007 RI (Anchor 2007b). Sampling will occur during two events: a July collection event and an October collection event to capture seasonal differences, if applicable. The existing third quarter R and RL well monitoring event was partially completed at the time this Work Plan was drafted; therefore, the R and RL series wells will only be analyzed for the extended geochemical parameters (i.e., dissolved aluminum, calcium, iron, magnesium, potassium, silicon, and sodium) during the October event. In addition, the RLSW series wells located approximate to the old industrial landfill will also be monitored as part of the October event as noted in Table 1.

The wells will be sampled in accordance with the procedures and methods approved in the 2007 RI Work Plan (Anchor 2007a) and as described in the SAP (Attachment A). Water elevations will be measured in each well at the time of sampling. Field measurements will include temperature, pH, sulfide, dissolved oxygen, ferrous iron, oxidation-reduction potential (ORP), and conductivity. Laboratory analyses will include total dissolved solids, total suspended solids, alkalinity, fluoride, total chloride, total phosphorus, cyanide (total, WAD, and free cyanide by micro-diffusion), sulfate, and dissolved metals, including aluminum, calcium, iron, magnesium, manganese, potassium, silicon, and sodium. In addition, several wells will be tested for PAHs (i.e., PZ-1 to PZ-5; G6-S and G6-D; the R series wells; and RL-4S).

Well locations are shown on Figure 5. A full list of the wells to be sampled and analytical parameters are summarized in Table 1.

Surface Water Sampling (SSA 10)

Surface water within the Columbia River and in the CDID ditches was previously analyzed for fluoride and cyanide (total, WAD, and free cyanide by micro-diffusion) during the 2007 RI/FS activities. No constituent concentrations were identified that exceeded preliminary site-specific cleanup levels during that sampling. Surface water in CDID ditches is also monitored quarterly to assess the CBMP conditions.

Surface water sampling will be conducted in accordance with the procedures and methods approved in the 2007 RI Work Plan (Anchor 2007a) and as described in the SAP (Attachment A) to further evaluate whether or not the surface water contained in the CDID ditches has been impacted by constituents contained in groundwater beneath the CBMP. The sampling will be conducted in parallel with the July and October groundwater monitoring event described in the previous section (SSA 9). Field measurements will include temperature, pH, sulfide, dissolved oxygen, ferrous iron, ORP, and conductivity. Laboratory analyses will include total dissolved solids, total suspended solids, alkalinity, fluoride, total chloride, total phosphorus, cyanide (total, WAD, and free cyanide by micro-diffusion), sulfate, and dissolved metals, including aluminum, calcium, iron, magnesium, manganese, potassium, silicon, and sodium.

SCHEDULE

The sampling and analysis schedule for completion of key activities and deliverables associated with this Work Plan Addendum are summarized below. These dates are estimated based on the proposed sampling activities, anticipated Ecology review times, and assumed site access. The project schedule could vary if these assumptions change or if sampling is delayed by project permitting requirements. Any changes to this schedule will be communicated to Ecology as early as practicable.

Project Schedule

Task or Deliverable	Anticipated Duration/ Completion Date(s)
Final Work Plan Addendum	August 2011
Field Data Collection: Soil sampling and Dock Survey	Summer 2011
Field Data Collection: Groundwater and Surface Water Sampling	Summer/Fall 2011
Preliminary Data Transmittal to Ecology	Fourth quarter 2011
RI/FS Reports Submitted to Ecology	First quarter 2012

REFERENCES

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TABLE

Table 1
Supplemental Study Activity Sampling Design

Station ID	Sample Method	Investigation Depth[1]	Target Sampling / Well Screening Interval[1]	Soil		Groundwater / Surface Water		Comments
				Primary Analyses[2,3]	Contingency[2,4]	July Event Analyses[5,6,7]	October Event Analyses[5,6,7]	
SSA 1: Field Southwest of Cable Plant								
AQ-SSA1-01	Test Pit	Minimum 4 feet bgs or native soil contact	To be determined in the field in order to target dark soils and potentially impacted fill material	PAHs, Total CN, FL where dark soils are identified	TPH-Dx where field screening indicates hydrocarbon presence	--	--	Former Reynolds staff will supervise excavations.
AQ-SSA1-02	Test Pit	Minimum 4 feet bgs or native soil contact		PAHs, Total CN, FL where dark soils are identified	TPH-Dx where field screening indicates hydrocarbon presence	--	--	
AQ-SSA1-03	Test Pit	Minimum 4 feet bgs or native soil contact		PAHs, Total CN, FL where dark soils are identified	TPH-Dx where field screening indicates hydrocarbon presence	--	--	
AQ-SSA1-04	Test Pit	Minimum 4 feet bgs or native soil contact		PAHs, Total CN, FL where dark soils are identified	TPH-Dx where field screening indicates hydrocarbon presence	--	--	
AQ-SSA1-05	Test Pit	Minimum 4 feet bgs or native soil contact		PAHs, Total CN, FL where dark soils are identified	TPH-Dx where field screening indicates hydrocarbon presence	--	--	
AQ-SSA1-## *Contingency*[4]	Test Pit	Minimum 4 feet bgs or native soil contact		PAHs, Total CN, FL where dark soils are identified	Multiple test pits will be excavated if dark soils or potentially impacted fill material are identified at AQ-SSA1-01 to AQ-SSA1-05 and will continue until an outer boundary is delineated	--	--	
SSA 2: Thin Stillage Application Areas								
AQ-SSA2-01	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	Overlying vegetation will be removed by sieving as practicable prior to sample collection.
AQ-SSA2-02	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	
AQ-SSA2-03	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	
AQ-SSA2-04	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	
AQ-SSA2-05	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	
AQ-SSA2-06	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	
AQ-SSA2-07	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	
AQ-SSA2-08	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	
AQ-SSA2-REF-01	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	
AQ-SSA2-REF-02	Test Plots	0.5 feet bgs	0-0.5 feet bgs	Nutrients	--	--	--	
SSA 3: Northwestern Site Area								
AQ-SSA3-01	Test Pit	Minimum 4 feet bgs or water table	2-3 feet bgs	FL, CN (WAD and Total)	--	--	--	Sampling depths may be adjusted if potentially impacted fill material is identified.
AQ-SSA3-02	Test Pit	Minimum 4 feet bgs or water table	2-3 feet bgs	FL, CN (WAD and Total)	--	--	--	
AQ-SSA3-03	Test Pit	Minimum 4 feet bgs or water table	2-3 feet bgs	FL, CN (WAD and Total)	--	--	--	
AQ-SSA3-04	Test Pit	Minimum 4 feet bgs or water table	2-3 feet bgs	FL, CN (WAD and Total)	--	--	--	
AQ-SSA3-05	Test Pit	Minimum 4 feet bgs or water table	2-3 feet bgs	FL, CN (WAD and Total)	--	--	--	
AQ-SSA3-06	Test Pit	Minimum 4 feet bgs or water table	2-3 feet bgs	FL, CN (WAD and Total)	--	--	--	
AQ-SSA3-07	Test Pit	Minimum 4 feet bgs or water table	2-3 feet bgs	FL, CN (WAD and Total)	--	--	--	
AQ-SSA3-08	Test Pit	Minimum 4 feet bgs or water table	2-3 feet bgs	FL, CN (WAD and Total)	--	--	--	
SSA 4: Flat Storage Area								
AQ-SSA4-01	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	Additional intervals may be archived and/or analyzed based on visual observations and the results of initial chemical testing. Sampling methods will be based on field conditions. Locations may be adjusted within the designated sampling grid in order to obtain sampling access.
AQ-SSA4-02	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	
AQ-SSA4-03	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	
AQ-SSA4-04	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	
AQ-SSA4-05	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	
AQ-SSA4-06	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	
AQ-SSA4-07	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	
AQ-SSA4-08	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	

Table 1
Supplemental Study Activity Sampling Design

Station ID	Sample Method	Investigation Depth[1]	Target Sampling / Well Screening Interval[1]	Soil		Groundwater / Surface Water		Comments
				Primary Analyses[2,3]	Contingency[2,4]	July Event Analyses[5,6,7]	October Event Analyses[5,6,7]	
AQ-SSA4-09	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	
AQ-SSA4-10	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	
AQ-SSA4-11	Direct Push / Test Pit	5 feet bgs or water table	0-1 feet, 1-2 feet bgs	PAHs	--	--	--	
RL-4S	Low flow	--	8.5-13.5 feet bgs	--	--	Refer to SSA 9		A second shallow well may be installed depending on results of RL-4S monitoring
SSA 5: Casting Pit Soils								
AQ-SSA5-01	Direct Push	20 feet bgs	8-10 feet bgs, 14-16 feet bgs	PAHs, FL	--	--	--	Sampling intervals may be adjusted if potentially impacted fill is identified (i.e., sampling will target potentially impacted fill layers if present).
AQ-SSA5-02	Direct Push	8 feet bgs	4-6 feet bgs	PAHs, FL	--	--	--	
AQ-SSA5-03	Direct Push	20 feet bgs	8-10 feet bgs, 14-16 feet bgs	PAHs, FL	--	--	--	
AQ-SSA5-04	Direct Push	20 feet bgs	8-10 feet bgs, 14-16 feet bgs	PAHs, FL	--	--	--	
AQ-SSA5-05	Direct Push	8 feet bgs	4-6 feet bgs	PAHs, FL	--	--	--	
AQ-SSA5-06	Direct Push	20 feet bgs	8-10 feet bgs, 14-16 feet bgs	PAHs, FL	--	--	--	
SSA 6: HTM Oil Area								
AQ-SSA6-01	Direct Push	Minimum 6 feet bgs or water table	1-2 feet, 3-4 feet bgs	NWTPH-Dx with silica gel cleanup	Two to three samples may be selected for EPH Petroleum Fractioning	--	--	Field screening will include visual inspection and sheen testing. Additional intervals will be analyzed if field screening indicates contamination. Sampling intervals may be adjusted if potentially impacted soil is identified.
AQ-SSA6-02	Direct Push	Minimum 6 feet bgs or water table	1-2 feet, 3-4 feet bgs	NWTPH-Dx with silica gel cleanup		--	--	
AQ-SSA6-03	Direct Push	Minimum 6 feet bgs or water table	1-2 feet, 3-4 feet bgs	NWTPH-Dx with silica gel cleanup		--	--	
AQ-SSA6-04	Direct Push	Minimum 6 feet bgs or water table	1-2 feet, 3-4 feet bgs	NWTPH-Dx with silica gel cleanup		--	--	
AQ-SSA6-05	Direct Push	Minimum 6 feet bgs or water table	1-2 feet, 3-4 feet bgs	NWTPH-Dx with silica gel cleanup		--	--	
AQ-SSA6-06	Direct Push	Minimum 6 feet bgs or water table	1-2 feet, 3-4 feet bgs	NWTPH-Dx with silica gel cleanup		--	--	
AQ-SSA6-07 *Contingency4*	Direct Push	Minimum 6 feet bgs or water table	1-2 feet, 3-4 feet bgs	NWTPH-Dx with silica gel cleanup	These borings will be completed only if visibly impacted soil is identified at the perimeter of stations AQ-SSA6-01 to AQ-SSA6-06.	--	--	
AQ-SSA6-08 *Contingency4*	Direct Push	Minimum 6 feet bgs or water table	1-2 feet, 3-4 feet bgs	NWTPH-Dx with silica gel cleanup		--	--	
AQ-SSA6-HTM-RES	Grab	--	--	--	NWTPH-Dx with silica gel cleanup, EPH Petroleum Fractioning	--	--	
SSA 7: Southeastern Fill Area								
AQ-SSA7-01	Test Pit	12 to 15 feet bgs or depth practicable	To be determined in the field in order to target potentially impacted fill material	PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	Former Reynolds staff will supervise excavations. Should analytical results indicate the presence of contamination, groundwater will then be characterized.
AQ-SSA7-02	Test Pit	12 to 15 feet bgs or depth practicable		PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	
AQ-SSA7-03	Test Pit	12 to 15 feet bgs or depth practicable		PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	
AQ-SSA7-04	Test Pit	12 to 15 feet bgs or depth practicable		PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	
AQ-SSA7-05	Test Pit	12 to 15 feet bgs or depth practicable		PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	
AQ-SSA7-06	Test Pit	6 to 8 feet bgs or depth practicable		PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	
AQ-SSA7-07	Test Pit	6 to 8 feet bgs or depth practicable		PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	
AQ-SSA7-08	Test Pit	6 to 8 feet bgs or depth practicable		PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	
AQ-SSA7-09	Test Pit	6 to 8 feet bgs or depth practicable		PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	
AQ-SSA7-10	Test Pit	6 to 8 feet bgs or depth practicable		PAHs, FL, Total CN, SO[4], PCBs where fill material is identified	--	--	--	
SSA 8: Dock Visual Inspection Area								
AQ-SSA8	Video Survey	--	--	Visual Observations	--	--	--	

Table 1
Supplemental Study Activity Sampling Design

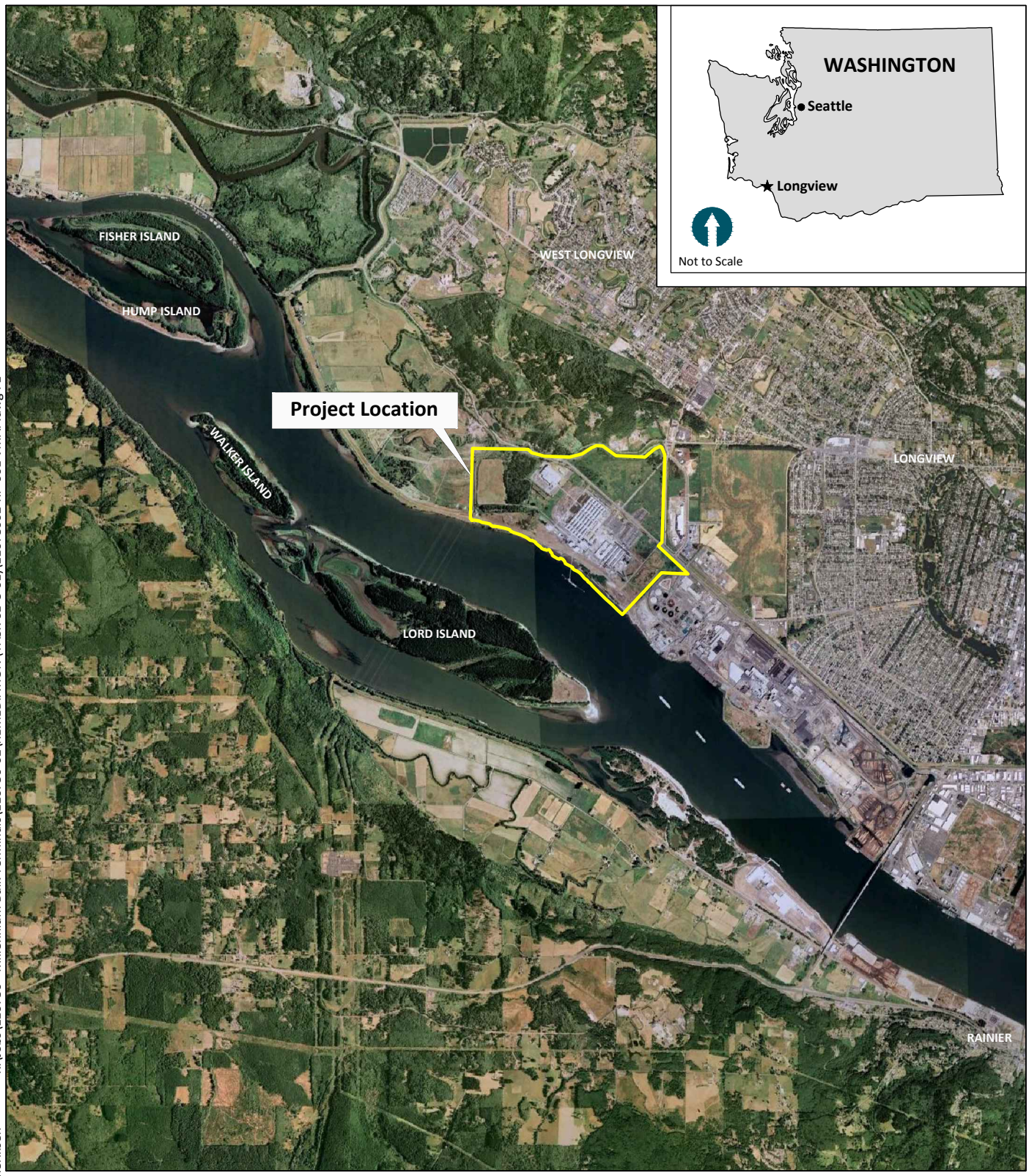
Station ID	Sample Method	Investigation Depth[1]	Target Sampling / Well Screening Interval[1]	Soil		Groundwater / Surface Water		Comments
				Primary Analyses[2,3]	Contingency[2,4]	July Event Analyses[5,6,7]	October Event Analyses[5,6,7]	
SSA 9: Groundwater Sampling								
G Series Monitoring Wells								
G1-S	Low flow	--	13-18 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G1-D	Low flow	--	28-33 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G2-S	Low flow	--	5-10 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G2-D	Low flow	--	20-25 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G3-S	Low flow	--	8-13 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G3-D	Low flow	--	23-28 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G4-S	Low flow	--	15-20 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G4-D	Low flow	--	30-35 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G5-S	Low flow	--	14-19 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G5-D	Low flow	--	29-34 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
G6-S	Low flow	--	15-20 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
G6-D	Low flow	--	30-35 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
G7-D	Low flow	--	20-30 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
PZ Series Monitoring Wells								
PZ-1	Low flow	--	8.6-13 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
PZ-2	Low flow	--	20.2-24.6 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
PZ-3	Low flow	--	5.1-9.5 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
PZ-4	Low flow	--	13-17.4 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
PZ-5	Low flow	--	18.4-22.8 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
PZ-6	Low flow	--	7.5-11.9 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
PZ-7	Low flow	--	8.4-17.8 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
R Series Monitoring Wells[8]								
R-1S	Low flow	--	7-12 feet bgs	--	--	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
R-1D	Low flow	--	20-24 feet bgs	--	--	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
R-2	Low flow	--	9-14 feet bgs	--	--	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
R-3	Low flow	--	19-24 feet bgs	--	--	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	

Table 1
Supplemental Study Activity Sampling Design

Station ID	Sample Method	Investigation Depth[1]	Target Sampling / Well Screening Interval[1]	Soil		Groundwater / Surface Water		Comments
				Primary Analyses[2,3]	Contingency[2,4]	July Event Analyses[5,6,7]	October Event Analyses[5,6,7]	
R-4S	Low flow	--	14-19 feet bgs	--	--	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
R-4D	Low flow	--	23-27 feet bgs	--	--	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
RL Series Monitoring Wells[8]								
RL-1S	Low flow	--	8-18 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RL-1D	Low flow	--	28-38 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RL-2S	Low flow	--	7.5-17.5 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RL-2D	Low flow	--	23-33 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RL-3S	Low flow	--	7.5-17.5 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RL-3D	Low flow	--	23-38 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RL-4S (see also SSA-4)	Low flow	--	8.5-13.5 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	
RL-4D	Low flow	--	25-35 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RL-5	Low flow	--	12-22 feet bgs	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RLSW Series Monitoring Wells[8]								
RLSW1	Low flow	--	9-18 feet bgs	--	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RLSW2	Low flow	--	9-18 feet bgs	--	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RLSW3	Low flow	--	9-18 feet bgs	--	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
RLSW4	Low flow	--	18-28.5 feet bgs	--	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
SSA 10: Surface Water Sampling								
W1	Weighted Peristaltic Pump	--	Just above mudline	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
W2	Weighted Peristaltic Pump	--	Just above mudline	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
W3	Weighted Peristaltic Pump	--	Just above mudline	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
W4-A	Weighted Peristaltic Pump	--	Just above mudline prior to Reynolds Pump Operation	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
W4-B (Conditional Sample)	Weighted Peristaltic Pump	--	Just above mudline, after Reynolds Pump Operation for 30 Minutes (if applicable)	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
W5 (Columbia River)	Weighted Peristaltic Pump	--	Minimum of 2 feet below water surface	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
W6	Weighted Peristaltic Pump	--	Just above mudline	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	
W7	Weighted Peristaltic Pump	--	Just above mudline	--	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	

Notes:
1 bgs = below ground surface. Actual soil testing depth interval will be determined in the field based on visual observations. Well screens are fixed.
2 Soil chemistry: PAHs = polycyclic aromatic hydrocarbons, CN = cyanide, FL = fluoride, TPH-Dx = diesel and residual-range hydrocarbons, EPH = extractable petroleum hydrocarbons, SO4 = sulfate, PCBs = polychlorinated biphenyls
3 Nutrients = total nitrogen, nitrate, nitrite, ammonia, phosphate (total and available), potassium
4 Contingency analyses will be triggered as noted.
5 Water chemistry: CL = chloride, SO4 = sulfate, FL = fluoride, CN = cyanide, WAD = weak acid dissociable, P = phosphorous, TDS = total dissolved solids, TSS = total suspended solids, PAHs = polycyclic aromatic hydrocarbons
6 GeoChem = dissolved metals including aluminum, calcium, iron, magnesium, manganese, potassium, silicon, and sodium
7 Field parameters analyzed at each groundwater / surface water location include: temperature, pH, sulfide, dissolved oxygen, oxidation reduction potential, conductivity, and ferrous iron (Fe^{2+})
8 These wells are sampled for other constituents as part of an ongoing quarterly monitoring program. Additional data may be generated as a result of those requirements.
-- = not applicable

FIGURES



AERIAL SOURCE: Google Earth Pro, 2010.

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Scale in Feet

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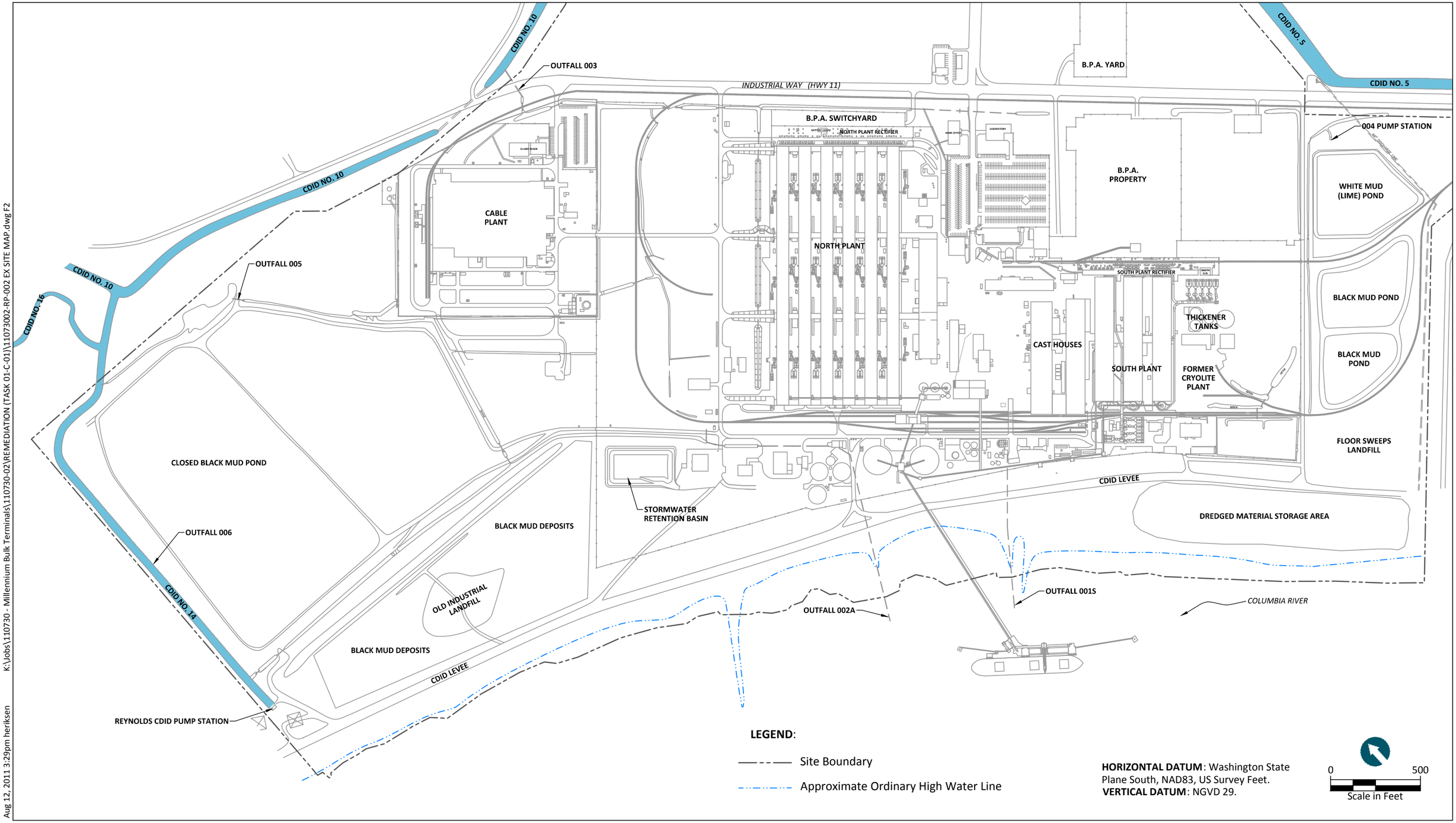
Jul 13, 2011 2:56pm heriksen

Figure 1
Vicinity Map
Work Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington



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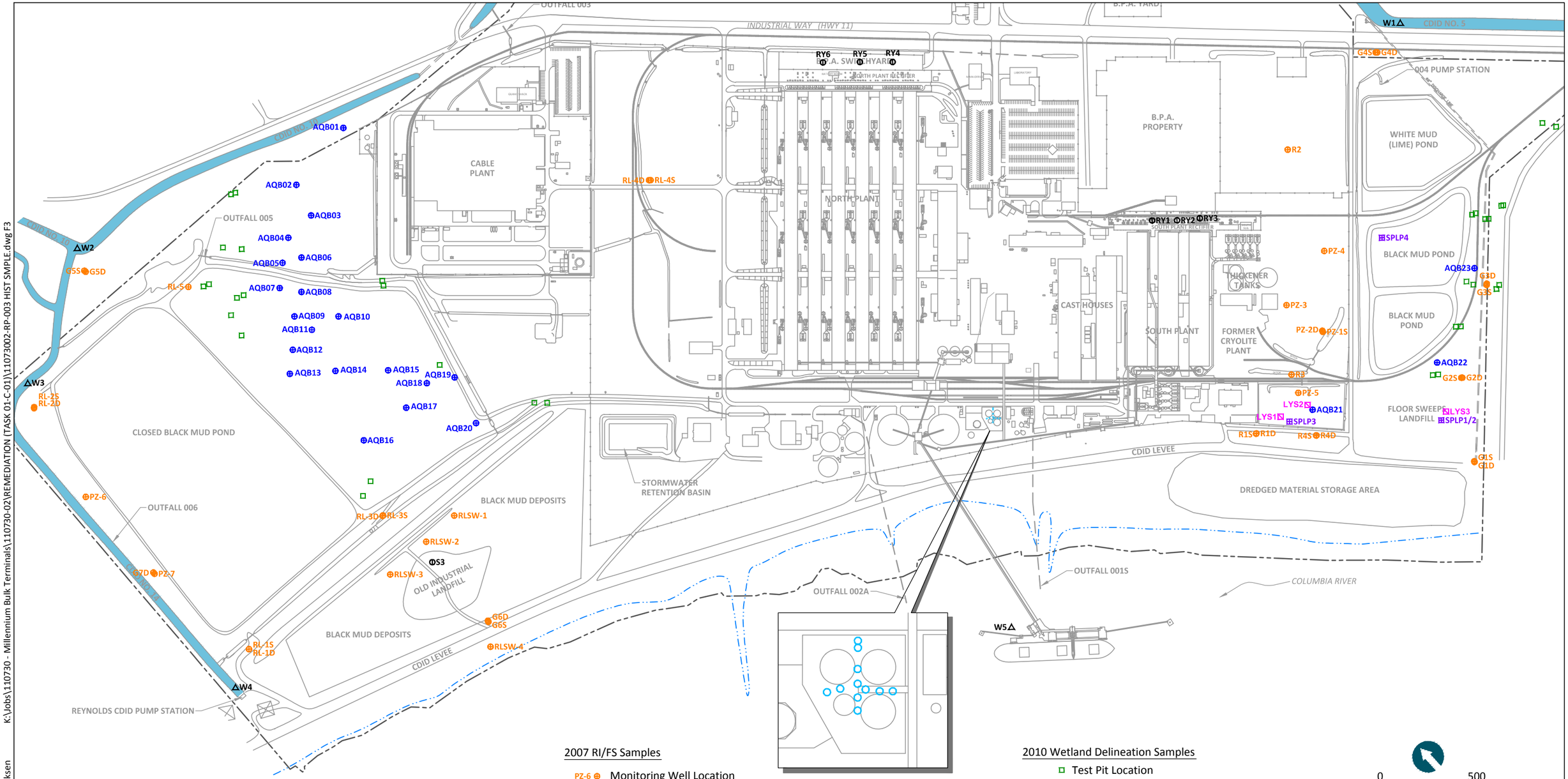
ANCHOR QEA

Figure 2
Existing Site Features Map
Work Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington



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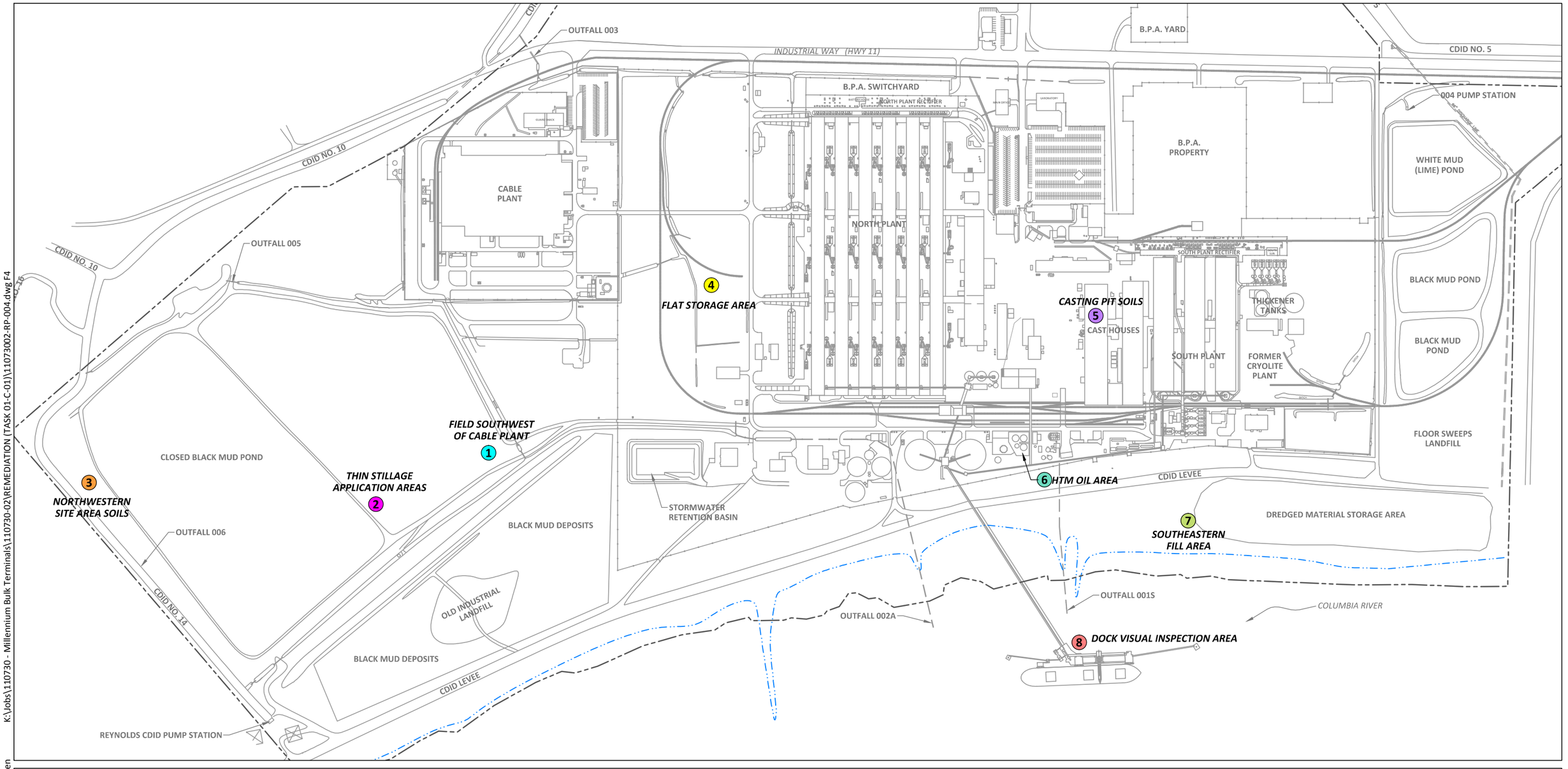
Aug 12, 2011 3:30pm heriksen

ANCHOR QEA

Figure 3
Previously Sampled Locations
Work Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington



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Aug 12, 2011 3:46pm heriksen

LEGEND:

- Site Boundary
- Approximate Ordinary High Water Line

Supplemental Study Activities:

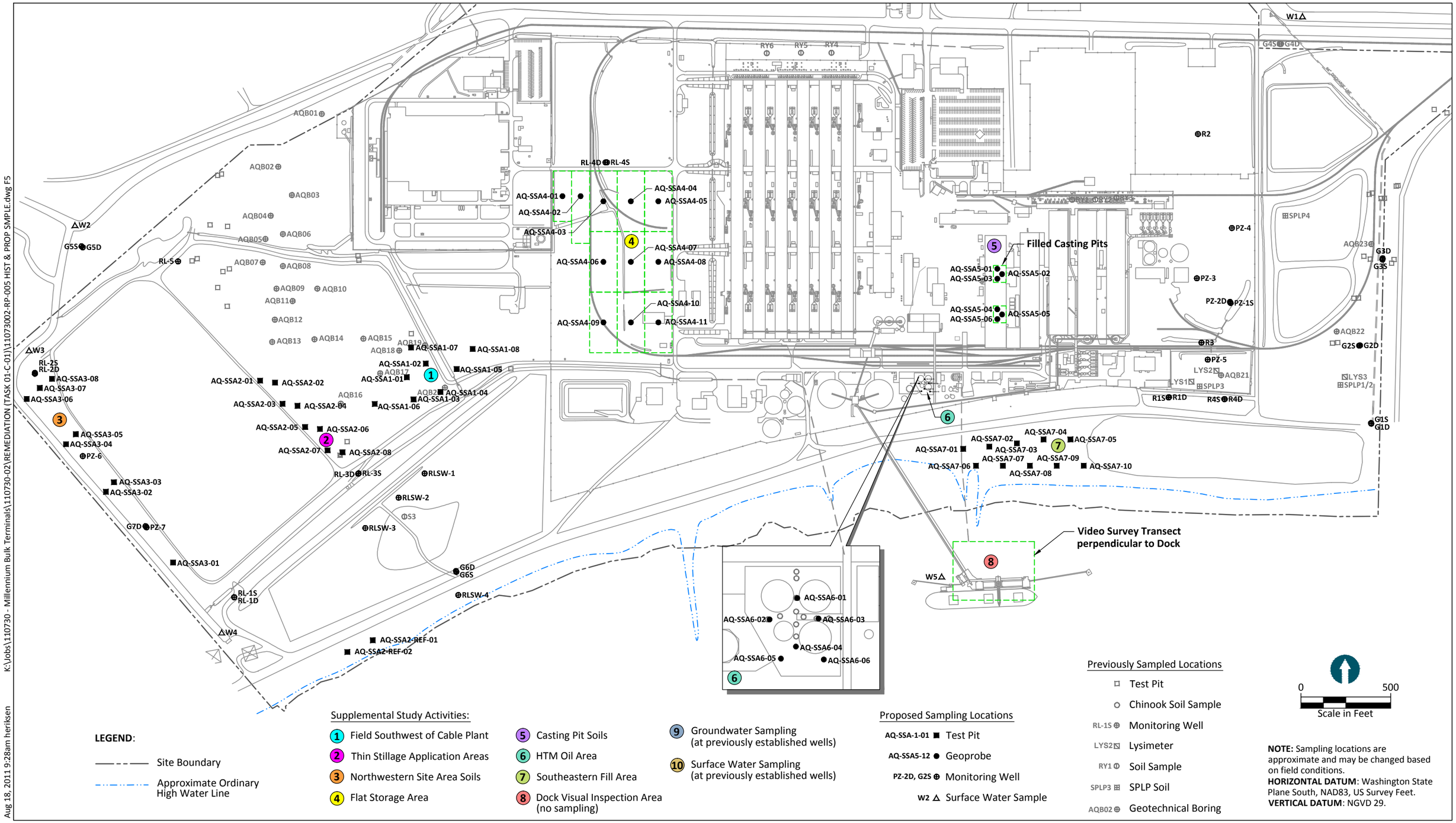
1. Field Southwest of Cable Plant
2. Thin Stillage Application Areas
3. Northwestern Site Area Soils
4. Flat Storage Area
5. Casting Pit Soils
6. HTM Oil Area
7. Southeastern Fill Area
8. Dock Visual Inspection Area (no sampling)
9. Groundwater Sampling (at previously established wells)
10. Surface Water Sampling (at previously established locations)

0 500
Scale in Feet

NOTE: Activities 9 and 10 cover broad areas; sampling locations associated with these activities are depicted on Figure 5.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

ANCHOR QEA

Figure 4
Supplemental Sampling Activities
Work Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington



LEGEND:

- Site Boundary
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Supplemental Study Activities:

1. Field Southwest of Cable Plant
2. Thin Stillage Application Areas
3. Northwestern Site Area Soils
4. Flat Storage Area
5. Casting Pit Soils
6. HTM Oil Area
7. Southeastern Fill Area
8. Dock Visual Inspection Area (no sampling)
9. Groundwater Sampling (at previously established wells)
10. Surface Water Sampling (at previously established wells)

Proposed Sampling Locations

- AQ-SSA-1-01 ■ Test Pit
- AQ-SSA5-12 ● Geoprobe
- PZ-2D, G2S ⊕ Monitoring Well
- W2 △ Surface Water Sample

Previously Sampled Locations

- Test Pit
- Chinook Soil Sample
- RL-1S ⊕ Monitoring Well
- LYS2 ▨ Lysimeter
- RY1 Ⓘ Soil Sample
- SPLP3 ⊞ SPLP Soil
- AQB02 ⊕ Geotechnical Boring

NOTE: Sampling locations are approximate and may be changed based on field conditions.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

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Aug 18, 2011 9:28am heriksen

ANCHOR QEA

Figure 5
Proposed and Previously Sampled Locations
Work Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington

ATTACHMENT A
SAMPLING AND ANALYSIS PLAN ADDENDUM

SAMPLING AND ANALYSIS PLAN ADDENDUM

FORMER REYNOLDS METALS REDUCTION PLANT – LONGVIEW, WASHINGTON

Prepared for

Millennium Bulk Terminals – Longview, LLC

Northwest Alloys, Inc.

Prepared by

Anchor QEA, LLC

720 Olive Way, Suite 1900

Seattle, Washington 98101

August 2011

TABLE OF CONTENTS

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1 INTRODUCTION

This Sampling and Analysis Plan Addendum (SAP) describes standard field operating procedures for conducting fieldwork at the Former Reynolds Metals Reduction Plant (Site) located at 4029 Industrial Way in Longview, Washington (Figure 1). This SAP is part of the Work Plan Addendum requested by the Washington State Department of Ecology (Ecology) to perform supplemental investigations to finalize the Remedial Investigation and Feasibility Study (RI/FS; Anchor 2007a, 2007b) previously submitted for the Site.

This SAP identifies sampling and analysis protocols, sample location and frequency, equipment, sample handling, and analytical procedures for implementing a supplemental study investigation at the site. Fieldwork will consist primarily of sampling surface soil, subsurface soil, and groundwater and surface water as well as performing an underwater survey of the existing dock and trestle with potential sample collection in the vicinity of these structures. This SAP is Attachment A to the Work Plan Addendum and is supported by a Quality Assurance Project Plan Addendum (QAPP; Attachment B to the Work Plan Addendum) and a Health and Safety Plan (HASP; in progress).

1.1 Purpose and Overview of Supplemental Study Activities

The Work Plan Addendum outlines the scope and rationale for the 10 supplemental study activities (SSAs) to be conducted at the site. The purpose of this SAP is to provide guidance for each of the 10 SSAs identified on Figure 2. The key data collection activities include:

- **Direct Push Soil Borings.** A focused investigation will be conducted using temporary soil borings installed by a direct push drilling rig. Specific areas may require implementation of a limited access rig and tracks for the direct push drilling rig. Various areas will require cement coring prior to advancing soil borings. The direct push sampling scheme is specifically for SSA 4, SSA 5, and SSA 6.
- **Test Pits.** Test pits will be used for select study areas in order to evaluate and collect soil samples. A subcontractor will excavate test pits using a backhoe. The test pit sampling scheme is specifically for SSA 1, SSA 3, and SSA 7.
- **Test Plots.** Shallow soil samples, collected from 0 to 6 inches below ground surface (bgs), will be manually excavated by shovel and sieved of overlying vegetation prior to sample processing. Test plot sampling is specifically for SSA 2.

- **Groundwater Monitoring.** Groundwater monitoring will be performed at the 2007 RI/FS monitoring locations which include five well series: G, PZ, R, RL, and RLSW. The R and RL series wells are monitored quarterly per other Ecology requirements for the closed black mud pond and former spent potliner storage area. The G and PZ wells are paired sets located within the eastern and western property boundaries. The RLSW wells are located adjacent to the old industrial landfill. Wells will be redeveloped as needed prior to groundwater monitoring.
- **Surface Water Sampling.** Surface water monitoring will occur at the 2007 RI/FS locations.
- **Dock Area Visual Inspection and Sampling.** A visual assessment of the riverbed will be performed to evaluate the composition and lateral extent of in the hardened material behind the dock area. The assessment will use one of the following methods: a team of divers, a towed camera, or a remotely operated vehicle. The best method will be selected based on field conditions. The video survey will document any apparent surface accumulations of deleterious materials.

This SAP was prepared consistent with Ecology's Model Toxic Control Act (MTCA) cleanup regulations (Chapter 173-340 WAC; Ecology 2007).

1.2 Sampling and Analysis Schedule

The field sampling program is expected to be completed during summer/fall 2011. Mobilization of field equipment will take place soon after the Final Work Plan Addendum is approved by Ecology and is anticipated to begin in the summer of 2011. The actual start and end dates for sampling will depend on approval of the project plans, coordination with subcontractors, and assumed site access and permitting. Weather and equipment availability are other conditions that may affect the sampling schedule. The project schedule could vary if these assumptions change or if sampling is delayed by project permitting requirements. Any changes to this schedule will be communicated to Ecology as early as practicable.

The chemical and physical laboratory analyses described herein, along with subsequent data validation and documentation/database management tasks, are scheduled to occur during the fourth quarter of 2011. The schedule for primary project tasks and key deliverables are presented in the Work Plan Addendum.

1.3 Document Organization

This SAP is organized into the following sections:

- Section 2 – Project Management and Responsibilities
- Section 3 – Sample Collection and Processing
- Section 4 – Sample Handling Procedures
- Section 5 – Chemical and Physical Analytical Testing
- Section 6 – References

2 PROJECT MANAGEMENT AND RESPONSIBILITIES

This section describes the overall project management strategy for implementing and reporting for the SAP. Additional information about personnel responsible for project management and other roles are identified in the QAPP (Attachment B to the Work Plan Addendum).

The project manager for Anchor QEA, LLC (Anchor QEA, LLC) is Mark Larsen. He will be responsible for overall project coordination, including production of all project deliverables and administrative coordination to ensure timely and successful completion of the project.

The project engineer for Anchor QEA is Rebecca Gardner, P.E. She is responsible for direction and supervision of all RI/FS activities including the supplemental work described in the Work Plan Addendum.

The field coordinator (FC) from Anchor QEA is Tim Stone. He will provide overall direction for the field sampling effort in terms of logistics, personnel assignments, and field operations. The FC will supervise field collection of all samples. This person will also be responsible for positioning samples accurately; recording sample locations, depths, and identification; ensuring conformance to sampling and handling requirements, including field decontamination procedures; physical evaluation and logging of samples; and completing chain-of-custody (COC) forms.

Sampling and analysis will be completed with equipment owned or contracted by Anchor QEA. All subconsultants will follow the protocols established in this SAP. Anchor QEA will be responsible for the submittal of environmental samples to the designated laboratories for chemical and physical analyses. The laboratory project manager at each laboratory will provide analytical support and will be responsible for providing certified, pre-cleaned sample containers and sample preservatives (as appropriate) and for ensuring that all chemical analyses meet the project Data Quality Objectives (DQOs) and other quality specifications of the QAPP (Attachment B of the Work Plan Addendum).

3 SAMPLE COLLECTION AND PROCESSING

This section presents the sample station locations, sample identification design, site access details, sample positioning parameters, and sample collection and processing methodology. The sample handling requirements are detailed in Section 4.

3.1 Sample Station Location and Identification

Supplemental sampling locations are presented on Figures 2 through 11, as detailed here:

- Figure 2 depicts the target area associated with each SSA.
- Figure 3 presents the proposed locations for SSA 1 (the Field Southwest of the Cable Plant), as conducted by test pits.
- Figure 4 presents the proposed locations for SSA 2 (the Thin Stillage Application Areas), as conducted by grab sample.
- Figure 5 presents the proposed locations for SSA 3 (the Northwestern Site Area), as conducted by test pits.
- Figure 6 presents the proposed locations for SSA 4 (the Flat Storage Area), as conducted by direct push drilling rig (or test pits depending on field conditions).
- Figure 7 presents the proposed locations for SSA 5 (the Casting Pit Soils), as conducted by direct push drilling rig.
- Figure 8 presents the proposed locations for SSA 6 (the Heat Transfer Media [HTM] Oil Area), as conducted by direct push drilling rig.
- Figure 9 presents the proposed locations for SSA 7 (the Southeastern Fill Area), as conducted by test pits.
- Figure 10 summarizes the groundwater monitoring well locations.
- Figure 11 summarizes the surface water monitoring locations.

Tables 1 through 9 present a detailed summary of the sampling design, including sample nomenclature, sample depths, analytical chemistry, and field screening. Tables 10 and 11 provide the sample handling and quality control guidelines, respectively. The sample nomenclature for soil, groundwater, and surface water samples is described below.

Each soil sample will be assigned a unique alphanumeric identifier according to the following method. Each soil station identification will be identified as Consultants (AQ)-Supplemental Study Area (SSA No.)-Sample Number. The sample number will be in order of sampling locations beginning with -01. Further nomenclature is as follows:

- Soil sample identification will have the depth interval (in feet) bgs added after the sample number. An example of a site sample based on this nomenclature is:
  - AQ-SSA1-01-1-3, indicating that a soil sample was collected from SSA 1 at a depth interval of 1 to 3 feet bgs
- A field duplicate collected from a sample will be identified by the addition of 50 to the sample number. A duplicate sample of the above-mentioned soil example is:
  - AQ-SSA1-51-1-3
- For rinsate blank samples, RB will be added in front of the sample number. The rinsate blank date (in MMDDYY format) will be added to the end. The resulting nomenclature of a rinsate blank of the decontaminated sample processing equipment after sample collection of the above-mentioned soil example is:
  - AQ-SSA1-RB01-071511
- For reference samples, "REF" will be added before the sample number. The resulting nomenclature of a reference sample using the above-mentioned soil example is:
  - AQ-SSA1-REF-01-1-3

Groundwater monitoring nomenclature will be the same as used during the 2007 RI/FS and is summarized in Table 8[1].

Surface water monitoring nomenclature will be the same as used during the 2007 RI/FS and is summarized in Table 9. Stations include W1 through W7.

[1] An exception is for the July monitoring event for the R and RL wells. Quarterly monitoring nomenclature will be used.

3.1 Site Access

Anchor QEA field personnel will notify on-site staff before beginning each phase of work at the Site. Upon arrival, each worker will sign the visitor's registration log at the guard office and obtain a vehicle permit, if appropriate.

Reasonable efforts will be made to provide access to Ecology's employees, agents, and contractors if so requested. Upon arrival, agency representatives must sign the visitor's log at the guard office and describe their visit. While at the site, they will be escorted by on-site staff and/or Anchor QEA personnel. Access to work areas may be temporarily restricted because of safety concerns related to facility operations or field investigations.

3.2 Site Preparation and Coordination

Before field sampling programs begin at the Site, public and private utility-locating services and other information sources (such as property-specific plans) will be used to check for underground utilities or pipelines near each boring location. Anchor QEA will coordinate fieldwork with on-site staff, both to define the locations of possible utilities and piping located on the site and to avoid interrupting business operations.

3.3 Sample Positioning

Horizontal positioning will be determined in the field by a differential global positioning system (DGPS) based on target coordinates. Anchor QEA will provide the target coordinates as listed in Tables 1 through 9. Target coordinates will not be provided for SSA 8 and instead transect lines will be developed in the field and recorded by DGPS. The horizontal datum will be North American Datum (NAD) 83, Washington State Plane South. Measured geographical coordinates for station positions will be recorded and reported to the nearest 0.01 second. In addition, state plane coordinates will be reported to the nearest foot. The DGPS accuracy is less than 1 meter and generally less than 30 centimeters, depending on the satellite coverage and the number of data points collected. Anchor QEA may photograph the locations to aid in understanding the sample location. The coordinates of existing groundwater monitoring wells and surface water samples are presented in Tables 8 and 9, respectively.

3.4 Soil Sampling (SSA 1 – SSA 7)

This section describes the methods used to obtain discrete soil samples for physical testing and chemical analysis. Soil samples will be obtained from direct push soil borings, test pits, and test plots. Soil sampling schemes are specific to each SSA and details for each area are described with collection methods below.

3.4.1 Direct Push Collection Methods

Direct push soil borings will be advanced by a direct push (e.g., Geoprobe™) drilling rig. Coring will be conducted with a 4-foot or 5-foot-long, 1.5-inch inside-diameter core sampler. The piston tip will be loosened and the sampler advanced into the ground, thereby coring the soil into the inside of the sampler's disposable, single-use plastic liner. The sampler will then be withdrawn to retrieve the liner and the soil sample. The liner will be cut in half lengthwise to remove the soil sample.

For each direct push sample, a new liner will be placed inside the core sampler. The core sampler with the piston tip locked will be advanced to the top of the next sample interval. The piston tip will then be released and the core sampler advanced to obtain the next sample. This process will be repeated until refusal is met or sufficient depth is encountered. Between samples, the core sampler, including the piston tip and attached rod, will be decontaminated, stored, and handled consistent with the procedures specified in Section 4.3.

Cement coring may be required for access to areas where direct push samples will be collected. This collection mention will be conducted by a subcontractor. Cement coring methods will be determined by the subcontractor but may include jack hammering, concrete drilling, and/or direct push drilling.

Direct push core samples will be continuously examined to develop a lithologic boring log. The samples will be described in the field as to their color, structure, texture, mineral composition, moisture, and percent recovery, according to American Society for Testing and Materials (ASTM) Method D-2488. Anchor QEA field staff will also examine samples for evidence of possible contamination, including presence of anthropogenic material, chemical odor, or staining. Anchor QEA field staff will note all observations on field forms (Appendix

A). These procedures will be applied to all soils collected at each direct push sampling location.

Boreholes will be decommissioned in accordance with state regulations (Chapter 173-160 WAC). Each borehole will be abandoned by filling it with bentonite chips and hydrating, or by filling with bentonite grout, concrete, cement grout, or neat cement.

3.4.2 Direct Push Sampling Design

Soil collection by direct push drilling rig is planned for SSA 4, SSA 5, and SSA 6. Figures 6, 7, and 8 depict the sampling locations for each SSA; the sampling design is summarized in Tables 4, 5, and 6.

SSA 4: Flat Storage Area. Eleven direct push borings are proposed for the Flat Storage Area (Figure 6). The sampling method may change and will be determined based on field conditions. Investigation activities will be performed throughout the storage pad footprint. Testing will be performed within nine quadrants that cover the entire storage pad area (AQ-SSA4-03 to AQ-SSA4-09), and in two adjacent areas (AQ-SSA4-01 and AQ-SSA4-02). Prior to sampling, stored product will be removed from the test locations and the composition and integrity of the pad will be visually assessed. Sampling will include coring or cutting of the pad to expose underlying soils for access. Sampling locations may be adjusted within the designated sampling grid in order to obtain access. Field personnel will take precaution to prevent cross contamination of dust from the stockpiles with the underlying soil. A thorough cleaning of the pad surface, using a vacuum or other appropriate device, will be performed prior to drilling.

Soil borings will be sampled at 1 foot intervals below the base of the pad to a maximum depth of 5 feet below ground surface or until groundwater is encountered. Target sampling will include the 0-to-1 and 1-to-2-foot intervals; these samples will be analyzed for polycyclic aromatic hydrocarbons (PAHs, Table 4). Additional intervals will be archived and may be analyzed based on visual observations and the results of initial chemical testing. Multiple direct push borings may be necessary to obtain sufficient soil volume for analysis.

In addition to soil investigations, one down-gradient shallow well (RL-4S) will be sampled to assess levels of PAHs in addition to analyses required by SSA 9 (Table 4). Depending on the results of chemical constituents present in this well, a second down-gradient well may be installed to further characterize groundwater in SSA 4; the location will be determined in coordination with Ecology. Refer to Section 3.5 for details regarding groundwater sampling methodology.

SSA 5: Casting Pit Soils. Six direct push borings are proposed for the Casting Pit Soils (Figure 6). Three borings will be placed in each of the two filled casting pits. Sampling locations may be adjusted based on field conditions and site access. Sampling below the casting pit caps will require concrete coring. In the main pits (AQ-SSA5-01, AQ-SSA5-03, AQ-SSA5-04, and AQ-SSA-06), target sample intervals will be collected at 8 to 10 and 14 to 16 feet bgs. In the side pits (AQ-SSA5-02 and AQ-SSA-05), the target sample depth is 4 to 6 feet. Sampling intervals may be adjusted if visually impacted fill is identified during coring.

Samples will be analyzed for PAHs and fluoride. Multiple direct push borings may be necessary to obtain sufficient soil volume for analysis.

SSA 6: HTM Oil Area. During Chinook Ventures, Inc. (Chinook), operations at the site, a release of HTM oil from the heating system's plumbing was discovered within the containment area between the two easternmost pitch storage tanks (Station C on Figure 7). Chinook conducted soil sampling and removed accessible impacted soils from the release area (Chinook 2010). Data from Chinook's historical records contained sampling results collected during soil removal, indicating diesel concentrations from Station C (the source of the oil leak) of 22,000 milligrams per kilogram (mg/kg). Samples collected to the north of Station C (N1 and N2) were less than MTCA Method A unrestricted land use cleanup levels for these constituents, and therefore, no proposed stations have been placed to the north of Station C. The two other stations with the highest measured concentrations of diesel range hydrocarbons, at one point in time, occurred at Stations S1 (21,300 mg/kg) and E2 (25,000 mg/kg). Proposed samples have been placed in the vicinity of these historic collection points in order to document remaining soil quality and to verify that this study area has been adequately remediated.

Six target direct push borings, two contingency borings, and one reservoir sample are proposed for the HTM Oil Area (Figure 7). Due to access constraints, borings in this area will be conducted using a limited access direct push rig. Proposed stations are depicted in Figure 7 but may be adjusted based on access. Target locations include three stations in between tanks (AQ-SSA6-01 through AQ-SSA6-03), three stations south of the tanks (AQ-SSA6-04 through AQ-SSA6-06), and if necessary, two contingency stations located around the area perimeter that will be assessed by field personnel based on field screening (AQ-SSA6-06 through AQ-SSA6-08). Field screening will involve visual inspection of samples and sheen testing in accordance with Ecology Guidance document 91-30 (Ecology, 1994). Sample depths will target 1 to 2 feet and 3 to 4 feet bgs. Additional intervals will be analyzed if field screening indicates the presence of petroleum hydrocarbons. Sampling intervals may be adjusted if potentially impacted soil is identified. Samples will be analyzed for extended-range petroleum hydrocarbons with silica gel cleanup (NWTPH-dx).

Based TPH-dx results, subsequent sampling may include one sample of the HTM oil product contained within the heating system reservoir. The reference oil sample (AQ-SSA6-HTM-RES) and two to three soil samples (selected based on NWTPH-dx results) would be analyzed for TPH-dx and extractable petroleum hydrocarbons (EPH).

3.4.3 Test Pit Excavation and Sampling Methods

Test pit excavation and backfilling of test pits will be conducted by the excavation subcontractor. Test pit walls will be cut as near to vertical as possible to facilitate stratigraphic logging. However, test pits will be excavated and sampled in compliance with Occupational Safety and Health Administration (OSHA) safety regulations. The subcontractor and sampling personnel will not enter a test pit that is deeper than 4 feet unless the: 1) side walls are sloped back to a grade of 1:1 or 2) side walls are braced or shored.

A confined space entry permit is required to enter a test pit greater than 4 feet deep (refer to OSHA Regulations 29 Code of Federal Regulations [CFR] Part 1926, 1910.120 and 1910.134).

If the test pit is less than 4 feet deep, samples may be collected directly from the trench wall or from the backhoe bucket. Before collecting trench wall samples, the wall surface must be shaved using a decontaminated stainless steel trowel, spatula, knife, or spoon to remove the

surface layer. Samples may be collected using a decontaminated trowel or spoon. Alternatively, the sample bottle or tube may be pushed directly into the trench wall or the sample may be collected from the center of the backhoe bucket, as described below.

If the test pit is deeper than 4 feet and its walls are not graded or shored, samples will be obtained using the excavator bucket. The entire grab sample will be collected from within a 1-foot radius of the designated sampling point. Samples obtained using a backhoe will be taken from the center of the backhoe bucket from material not touching the bucket walls or teeth. Samples will be placed in an appropriate sample container using decontaminated stainless-steel sampling equipment. Samples will be handled according to the procedures specified in Section 3.4.6. Additional soil from the backhoe bucket or sampler may be examined for visual and olfactory evidence of contamination.

The depth of the test pit, soil sample locations, stratigraphy, depth to groundwater and observations of contamination will be recorded on a test pit log (Appendix A). The test pit shall be inspected to ensure that all appropriate and required data and samples have been collected. All test pits will be backfilled to original grade and compacted after sampling and inspection are complete. The backfill will be placed in approximately the same sequence as the soils were excavated prior to the initiation of the next text pit.

3.4.4 Test Pit Sampling Design

Soil collection from test pits is planned for SSA 1, SSA 3, SSA 7, and potentially SSA 4 (see Section 3.4.2). The general sampling strategy for test pit samples is to collect discrete samples in 1-foot intervals based on visual screening for contamination; however, samples will be collected from the 2 to 3-foot-bgs interval at SSA 3.

SSA 1: Field Southwest of Cable Plant. Five soil test pits are planned for the target area of the Field Southwest of Cable Plant (AQ-SSA1-01 through AQ-SSA-05), with an additional three or more contingency test pits planned outside the perimeter of the target area to establish an outer boundary (e.g., AQ-SSA1-06 through AQ-SSA1-08; Figure 2). Test pits will be excavated to a minimum of 4 feet bgs or to the depth of native soil contact under the supervision of former Reynolds staff. The proposed locations may be adjusted by field staff depending on site conditions, access, and depth of groundwater. Sampling intervals will be

field selected to target dark soil layers (i.e., black mud) and suspected petroleum presence. Should field observations indicate possible presence of petroleum, a field sheen test will be conducted in accordance with Ecology guidance document 91-30 (Ecology, 1994). If dark soils or suspected petroleum impacted soils are identified within the first five test pits, additional contingency test pits are planned for the surrounding area. Contingency test pits will be conducted using the same sampling methodology as the initial five test pits. Where potential black mud is present, soil samples will be analyzed for PAHs, total cyanide, and fluoride on one grab sample in the test pit(s) where potential black mud is encountered. Where petroleum hydrocarbons are suspected, one grab sample from the test pit(s) where suspected hydrocarbon presence is encountered will be collected and analyzed for total petroleum hydrocarbons extended range (NWTPH-dx). In test pits where field screening indicates no impacts to soil, samples will not be collected and the test pits will be backfilled.

SSA 3: Northwestern Site Area. Eight test pits are proposed for the Northwestern Site Area and will be excavated along four transects with between one and three test pits per transect (AQ-SSA3-01 through AQ-SSA3-08; Figure 4). Test pits will be excavated to a minimum of 4 feet bgs or until groundwater is encountered. One grab sample will be collected from each test pit from 2 to 3 feet bgs for analysis. Sampling intervals may be adjusted to target potentially impacted fill materials, if observed. Due to potentially unstable soil conditions in this area, field personnel will not enter the test pits; soil samples will be collected from the backhoe bucket. The exact locations of test pits will depend on site conditions and accessibility for excavation equipment. Samples will be analyzed for fluoride and cyanide (WAD and total).

SSA 7: Southeastern Fill Area. Ten test pits are proposed for the Southeastern Fill Area (Figure 8). The five test pits located closest to the Consolidated Diking and Improvement District (CDID) levee (AQ-SSA7-01 through AQ-SSA7-05) will be excavated to 12 to 15 feet bgs, and the five test pits located closest to the river (AQ-SSA7-06 through AQ-SSA7-10) will be excavated to 6 to 8 feet bgs. Former Reynolds staff will supervise the test pit excavations to document the nature of the fill material. In the event that fill material is identified in a test pit (i.e., the material removed from the test pit does not consist of native soil or Columbia River sand associated with the DMSA), field personnel will collect samples of the observed fill material. Sampling depths will depend on the location of the observed fill. Due

to potentially unstable soil conditions, field personnel will not enter the test pits; samples will instead be collected from the backhoe bucket. Soil samples will be analyzed for PCBs, PAHs, fluoride, sulfate, and total cyanide. In test pits where field screening indicates no fill material (as defined above) is present, the test pits will be backfilled and no samples will be analyzed.

3.4.5 Test Plot Collection Methods

Test plot samples include 0 to 0.5 feet bgs. Samples will be collected using a shovel; however, the choice of sampling equipment will be at the discretion of field personnel and will depend on field conditions.

At each test plot, collected soil will be sieved, as practicable, in order to remove vegetation and placed in sample containers. Samples will then be processed as described in Section 3.4.7.

3.4.6 Test Plot Sampling Design

Test plot sampling is planned for SSA 2. Figure 4 presents the sampling locations, including two reference stations outside of the SSA 2 area.

SSA 2: Thin Stillage Application Areas. Samples from eight primary test plots (AQ-SSA2-01 through AQ-SSA-08) and two reference test plots (AQ-SSA2-REF-01 and AQ-SSA2-REF-02) are proposed for the Thin Stillage Application Areas. The sampling scheme includes four transects of two test plots each (Figure 3). The exact location of the test plots will be determined by field staff and are dependent on site conditions and access. Samples will be collected from the top 6 inches of soil. These samples will be analyzed for total nitrogen, nitrate, nitrite, ammonia, total and available phosphate, and potassium (Table 1).

3.4.7 Soil Sample Processing

Anchor QEA field staff will log soil samples on site in accordance with the sampling scheme presented in this SAP. Prior to sampling, color photographs will be taken. Soil will then be spooned into a clean stainless-steel bowl for homogenization. The soil will be mixed until homogenous in color and texture and then spooned into laboratory supplied jars for testing.

All containers will be kept on ice for transport to the analytical laboratory. Sample collection and handling will be consistent with procedures described in Section 4 and in the QAPP (Attachment B of the Work Plan Addendum). A COC form will be logged by Anchor QEA field staff and relinquished to the courier and then to the laboratory staff (Appendix A). Analytical methods, practical quantitation limits, and target detection limits are defined in the QAPP.

3.5 Groundwater Sampling and Design (SSA 9)

Groundwater samples will be collected from monitoring wells and piezometers throughout the site. Specifically, groundwater will be sampled from all 13 "G series" monitoring wells, all seven "PZ series" piezometers, all six "R series", all 13 "RL series", and all four "RLSW series" wells, as shown on Figure 10. Prior to groundwater sampling, the depth of each monitoring well (or piezometer) and the depth to groundwater will be measured. Well sampling will be performed in accordance with the procedures and methods approved in the 2007 RI Work Plan (Anchor 2007c) and are described in detail in Section 3.5.2.

Field measurements will include temperature, pH, sulfide, dissolved oxygen, ferrous iron, oxidation redox potential (ORP), and conductivity. Laboratory analyses will include total dissolved solids, total suspended solids, alkalinity, fluoride, total chloride, total phosphorus, cyanide (total, WAD, and free cyanide by micro-diffusion), sulfate, and dissolved metals (except for the R series wells), including aluminum, calcium, iron, magnesium, manganese, potassium, silicon, and sodium. In addition, several wells will be tested for PAHs (i.e., PZ-1 to PZ-5; G6-S and G6-D; and the R series wells). To support data needs for SSA-4, groundwater from well RL-4S will be analyzed for total dissolved solids, total suspended solids, alkalinity, fluoride, total chloride, total phosphorus, sulfate, and PAHs.

Ground water sampling will occur during two events: a July collection event and an October collection event to capture seasonal variations.

3.5.1 Monitoring Well Water Level Measurement and Sampling Analysis

Groundwater sampling methods used at the site are designed to obtain samples as representative of in situ groundwater quality as practicable. Groundwater samples from monitoring wells will be collected at each well location using a peristaltic pump or Waterra foot-valve pump fitted with silicon and/or polyethylene tubing and in accordance with low-flow groundwater purging and sampling methodology. Sample collection and handling will be consistent with procedures described below and in Section 3 of the QAPP (Attachment B of the Work Plan Addendum). The monitoring wells will be measured and sampled as follows:

1. Don the required personal protective equipment as defined in the HASP (in progress)
2. Ensure that the sampling area is visible to operational activities and communicate with on-site personnel.
3. Check the well for any damage or evidence of tampering and record the observations on the field data sheet.
4. Unlock and open the well monument and remove the well cap.
5. Allow the water in the well adequate time to equilibrate.
6. Measure and record the depth to water and record the measurement on the field data sheet. Measure water level from reference point to the nearest 0.01 foot.
7. Attach and secure the silicon and/or polyethylene tubing to the peristaltic pump. Lower the tubing slowly into the well. Set the end of the tubing at approximate middle of the well screen. Be careful not to place the end of the tubing on the bottom of the well, because this action may disturb any sediment present in the bottom of the well.
8. Start pumping the well by selecting the lowest pump speed. Ideally, the pump rate should equal the well recharge rate with little or no water level drawdown in the well (drawdown shall be 0.3 foot or less).
9. During purging, the ultimate low-flow rate should be from 0.1 to 0.5 liters per minute. Measure the pumping rate using a graduated cylinder and stopwatch or similar device. Record the pumping rate and depth to water on the field data sheet or in the logbook.
10. During purging, monitor the field parameters (temperature, pH, turbidity, ORP, specific conductance, and dissolved oxygen) approximately every 3 to 5 minutes. A flow-through cell or similar will be used to monitor the field parameters. Begin

measuring field parameters after the flow-through cell has been "flushed" with purged groundwater twice.

11. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings, as follows:
    - ± 0.1 for pH
    - ± 3 percent for conductivity
    - ± 10 percent for dissolved oxygen
    - ± 10 percent for turbidity
    - ± 10 mV for ORP
12. The tubing must not be removed from the well between purging and sampling.
13. If the recharge rate of the well is very low, take care to maintain the water level in the well above the level of the tubing inlet to prevent air entrainment. If air bubbles are observed in the purge stream, lower the flow rate. If air bubbles are still observed, turn off the pump and allow the well to recover before sampling. If the well pumps dry during purging, discontinue water quality field parameter monitoring. Collect a groundwater sample when the well reaches 90 percent of the pre-purge casing volume. Contact the Project Engineer with questions regarding low yield well sampling procedures.
14. Once the field parameters have stabilized, collect the samples directly from the end of the tubing. Analyses that degrade by aeration must be collected first. The bottles should be preserved and filled according to the procedures specified in the QAPP.
15. Fill all sample bottles by allowing the pump discharge to flow gently down the inside of the bottle with minimal turbulence. Cap each bottle as it is filled. For PAHs, fill each 1-liter amber bottle to nearly the top and cap thereafter. Samples collected for dissolved metals analysis will be field-filtered during collection, using disposable 0.45-micron in-line filters. The filters will be attached directly to the peristaltic pump discharge tubing and each in-line filter will be used only once. Fill one 500-milliliter high density polyethylene (HDPE) bottle to nearly the top and cap thereafter.
16. Once container filling is completed, label each sample (if not pre-labeled) and record them on the COC form. Sample labels should be smudge-proof or covered with transparent tape. Place sample containers into a sealable plastic bag and immediately put into an iced cooler for shipment to the analytical laboratory. Segregate larger

bottles with bubble wrap. Ice in coolers must be double-bagged to prevent leakage. Coolers must be packed to the top with bagged ice to prevent warming and bottle breakage.

17. Disconnect the tubing from the pump and dispose.
18. After sampling is complete, measure the total depth of the well.
19. Close and lock the well.
20. Decontaminate sampling equipment.

3.6 Surface Water Sampling and Design (SSA 10)

Surface water will be collected in the same locations as was performed in the 2007 RI/FS study (Figure 11). Surface water will be collected in three areas: Columbia River water collected from the dock (W5), CDID ditch system water collected in various locations throughout the site (W2, W3, and W4), and background waters located outside of site boundaries (W1, W6, and W7). The water sample collected from the dock (W5) will be extracted using a weighted peristaltic pump or similar device, which will be lowered into the river at a minimum depth of 2 feet below water surface (bws) in order to collect the sample. The remainder of the samples (those collected from within the CDID ditches) will be collected as close as practicable to the mudline.

Field measurements will include temperature, pH, sulfide, dissolved oxygen, and ferrous iron, ORP, and conductivity. Laboratory analyses will include total dissolved solids, total suspended solids, alkalinity, fluoride, total chloride, total phosphorus, cyanide (total, WAD, and free cyanide by micro-diffusion), sulfate, and dissolved metals, including aluminum, calcium, iron, magnesium, manganese, potassium, silicon, and sodium.

Surface water sampling methods are described below. Once surface water samples have been collected:

- The sample will be transferred directly to the containers with preservatives specific to the analysis begin performed.
- Samples collected for dissolved analyses will be field filtered during collection, using disposable 0.45-micron in-line filters. The filters will be attached directly to the peristaltic pump discharge line. Each in-line filter will be used only once.

- Should disposable bailers be used rather than a weighted peristaltic pump, they will be used for only one well and will then be disposed of properly.
- Other equipment used for water sample collection will be decontaminated both before and after each sample is collected (see Section 4).
- Samples will be labeled, preserved, and either shipped, picked up by courier, or hand delivered to the analytical laboratory.

3.7 Dock Area Visual Inspection and Sampling (SSA 8)

A visual assessment will be performed to evaluate the composition and lateral extent of the hardened materials (e.g., cementitious debris) in the dock area. This survey will be performed by a team of divers, a towed camera, or remotely operated vehicle in the areas shown on Figure 5. The best method will be chosen based on site conditions and subcontractor availability. The video survey will document apparent surface accumulations of deleterious materials. The visual assessment will be conducted in transects and GPS-tracked to verify real-time locations. Transects will occur generally perpendicular to the dock.

3.8 Field Quality Assurance Samples

Field quality assurance (QA) samples will be used to evaluate the efficiency of field decontamination and processing procedures. Samples will include field equipment rinsate blanks and field duplicates. QA samples will be blind-labeled and preserved as if they are typical samples. QA samples will be clearly identified on the sample collection logs. Analytical results from the blanks and duplicates will facilitate crosschecking of the data. Detection of analytes in blanks may indicate possible contamination introduced by field or laboratory procedures, while field duplicates indicate overall precision in both field and laboratory procedures. All field QA samples will be documented in the field logbook and verified by the QA/quality control (QC) manager or designee. Additional QA sample collection and processing details are discussed in the following sections and are outlined in Tables 10 and 11.

3.8.1 Equipment Rinsate Blanks

Equipment rinsate blanks will be obtained after non-dedicated sampling equipment is decontaminated and will involve passing deionized organic-free water through the sampling equipment and transferring the water into an appropriate sampling container. Rinsate blanks will not be collected if single-use or dedicated equipment (e.g., tubing) is used for sampling. Rinsate blanks will be analyzed to determine whether decontamination of sampling equipment is adequate. One equipment rinsate blank will be collected for each sampling method (e.g., direct push, test pits, and surface water methodologies). Additional collection and processing details are outlined in Tables 10 and 11.

3.8.2 Field Duplicates

A duplicate water sample will be collected to check the precision of groundwater sampling and analytical procedures. During each sampling event, at least one blind duplicate sample will be taken from one sampling point at the same time as the regular sample. Duplicate samples will be obtained by alternately filling like sample bottles for the two sample sets (original and duplicate). One field duplicate sample will be collected for every 20 samples collected. Field duplicates for soil samples will not be collected. Additional collection and processing details are outlined in Tables 10 and 11.

4 SAMPLE HANDLING PROCEDURES

This section addresses the sampling program requirements for maintaining custody of the samples throughout the sample collection and shipping process. It also provides specific procedures for sample shipping.

4.1 Sample Custody Procedures

Samples are considered to be in one's custody if they are: 1) in the custodian's possession or view; 2) in a secured location (under lock) with restricted access; or 3) in a container that is secured with an official seal such that the sample cannot be reached without breaking the seal.

COC procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form. Each sample will be represented on a COC form the day it is collected. All data entries will be made using indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, then dating and initialing the change. Blank lines/spaces on the COC form will be lined-out, dated, and initialed by the individual maintaining custody.

A COC form will accompany each cooler of samples to the analytical laboratories. Each person who has custody of the samples will sign the COC form and ensure that the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the project files.

4.2 Sample Shipping and Receipt Requirements

All samples will be hand delivered to the analytical laboratory by the sampler or by a courier on a daily basis. Samples will be shipped if neither of these options are available. Specific sample transportation procedures are as follows:

- Each cooler or container enclosing the samples for analysis will be transported via courier or hand delivery by the sampler to the appropriate analytical laboratory. Following each delivery by courier, the FC will call the laboratory and verify that the

samples were received and are in good condition.

- Coolant ice will be sealed in separate double plastic bags and placed in the sample coolers.
- Individual sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Glass jars will be separated in the sample coolers by shock absorbent material (i.e., bubble wrap) to prevent breakage.
- The sample coolers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.
- The courier delivery will be documented on all COC forms accompanying the samples.
- A sealed envelope containing COC forms will be enclosed in a plastic bag and taped to the inside lid of each cooler.
- A minimum of two signed and dated COC seals will be placed on adjacent sides of each cooler prior to transporting.
- Each cooler will be wrapped securely with strapping tape, labeled "Glass – Fragile" and "This End Up." In addition, each cooler will be clearly labeled with the laboratory's address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the COC form. Upon receipt of samples at the laboratory, the sample container seal will be broken and the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the laboratory to track sample handling and final disposition.

4.3 Field Equipment Decontamination

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sample material must meet high standards of cleanliness. All equipment and instruments used that are in direct contact with the soil, groundwater and/or surface water collected for analysis must be made of glass, stainless steel, or HDPE. These items will be cleaned prior to each day's use and between sampling or compositing events. The decontamination procedure is:

1. Pre-wash rinse with tap water
2. Wash with solution of warm tap water and Alconox soap (brush)
3. Rinse with warm tap water
4. First rinse with distilled water
5. Rinse three additional times with distilled water
6. Store in clean, closed container for next use

4.4 Investigation Derived Waste Management

All soil test pits and surface grabs will be backfilled as excavated in the order that they were removed. Decontamination of soil excavation equipment (backhoe) will include brushing off surfaces at each location with a broom and potentially an on site pressure wash or off-site wash. If backhoe buckets are washed on-site, all decontamination water will be disposed of at the on-site waste management decontamination facility. All soil cuttings obtained from the direct push soil boring collection activities will be stored on site in 55-gallon drums and consolidated until final disposal is arranged. The 55-gallon drums will be located in a secure area and appropriately labeled as "Investigation Derived Waste." After the completion of all soil borings, the 55-gallon drums will be transported for appropriate disposal. Soils will be managed using appropriately permitted off-site treatment/disposal facilities.

Purge water from groundwater wells will also be collected on site in 55-gallon drums or other suitable containers selected by the FC. Purge water will be managed within the facility's wastewater treatment unit.

All disposable sampling materials and personal protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, will be placed in

heavy-duty garbage bags or other appropriate containers and managed using appropriately permitted off-site disposal facilities. Disposable supplies not coming into contact with contaminated soils or groundwater will be placed in a normal refuse container for disposal as solid waste.

5 CHEMICAL AND PHYSICAL ANALYTICAL TESTING

This section summarizes the target physical and chemical analyses for the various media sampled. All sample analyses will be conducted in accordance with Ecology-approved methods and the QAPP (Attachment B to the Work Plan Addendum). Prior to analysis, all samples will be maintained according to the appropriate holding times and temperatures for each analysis. The proposed analytes, the analytical methods to be used, and the targeted detection limits for the chemical and physical testing are outlined in the QAPP. The analytical laboratory will prepare a detailed report in accordance with the QAPP.

Prior to the analysis of the samples, the laboratory will calculate method detection limits for each analyte of interest, where applicable. Method detection limits will be below the values specified in the QAPP (Attachment B to the Work Plan Addendum), if technically feasible. To achieve the required detection limits, some modifications to the methods may be necessary. These modifications from the specified analytical methods will be provided by the laboratory at the time of establishing the laboratory contract. The modifications must be approved by Ecology prior to implementation.

Chemical/physical testing will be conducted at APEX Laboratories, LLC (APEX) located in Portland, Oregon. APEX is an Ecology-accredited laboratory. In completing chemical analyses for this project, the contract laboratory is expected to meet the following minimum requirements:

- Adhere to the methods outlined in the QAPP (Attachment B of the Work Plan Addendum).
- Deliver facsimile, hard copy, and electronic data as specified.
- Meet reporting requirements for deliverables.
- Meet turnaround times for deliverables.
- Implement QA/QC procedures discussed in the QAPP, including DQOs, laboratory QC requirements, and performance evaluation testing requirements.
- Notify the project QA/QC manager of any QAPP QA/QC problems when they are identified to allow for quick resolution.
- Allow laboratory and data audits to be performed, if deemed necessary.

6 REFERENCES

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TABLES

Table 1
Soil Sampling Design for Supplemental Study Activity 1

Station ID	Proposed Coordinates[1,2] Easting	Proposed Coordinates[1,2] Northing	Sample ID	Target Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
AQ-SSA1-01	1004613.29	305509.49	AQ-SSA1-01-0-XX	TBD TBD TBD TBD	Minimum of 4 feet bgs or native soil contact	Test Pit	PAHs, Total CN, FL in samples where dark soils are identified. TPH-Dx where sheen tests indicate hydrocarbon presence.	Former Reynolds staff will supervise excavations. Field sheen tests will be conducted in accordance with Ecology Guidance document 91-30, revised April 1994). Sampling intervals will be determined in the field to target dark soils and fill material.
AQ-SSA1-02	1004742.65	305494.98	AQ-SSA1-02-0-XX	TBD TBD TBD TBD	Minimum of 4 feet bgs or native soil contact	Test Pit	PAHs, Total CN, FL in samples where dark soils are identified. TPH-Dx where sheen tests indicate hydrocarbon presence.	
AQ-SSA1-03	1004559.07	305392.61	AQ-SSA1-03-0-XX	TBD TBD TBD TBD	Minimum of 4 feet bgs or native soil contact	Test Pit	PAHs, Total CN, FL in samples where dark soils are identified. TPH-Dx where sheen tests indicate hydrocarbon presence.	
AQ-SSA1-04	1004698.06	305322.69	AQ-SSA1-04-0-XX	TBD TBD TBD TBD	Minimum of 4 feet bgs or native soil contact	Test Pit	PAHs, Total CN, FL in samples where dark soils are identified. TPH-Dx where sheen tests indicate hydrocarbon presence.	
AQ-SSA1-05	1004850.54	305357.47	AQ-SSA1-05-0-XX	TBD TBD TBD TBD	Minimum of 4 feet bgs or native soil contact	Test Pit	PAHs, Total CN, FL in samples where dark soils are identified. TPH-Dx where sheen tests indicate hydrocarbon presence.	
AQ-SSA1-06 *Contingency*[5]	1004381.33	305518.65	AQ-SSA1-06-0-XX	TBD TBD TBD TBD	Minimum of 4 feet bgs or native soil contact	Test Pit	PAHs, Total CN, FL in samples where dark soils are identified. TPH-Dx where sheen tests indicate hydrocarbon presence..	
AQ-SSA1-07 *Contingency*[5]	1004742.30	305616.61	AQ-SSA1-07-0-XX	TBD TBD TBD TBD	Minimum of 4 feet bgs or native soil contact	Test Pit	PAHs, Total CN, FL in samples where dark soils are identified. TPH-Dx where sheen tests indicate hydrocarbon presence.	
AQ-SSA1-08 *Contingency*[5]	1004991.13	305381.19	AQ-SSA1-08-0-XX	TBD TBD TBD TBD	Minimum of 4 feet bgs or native soil contact	Test Pit	PAHs, Total CN, FL in samples where dark soils are identified. TPH-Dx where sheen tests indicate hydrocarbon presence.	

Notes:

1 Coordinates will be determined based on finalization of sampling locations.

2 Horizontal datum: Washington State Plane South, NAD83, US Survey feet. Vertical Datum: NGVD 29.

3 BGS = below ground surface. Actual soil testing depth interval will be determined in the field based on visual observations.

4 Chemical testing: PAHs = polycyclic aromatic hydrocarbons, FL = fluoride, CN = cyanide, TPH-Dx = diesel-range hydrocarbons

5 Contingency samples will be triggered based on field observations. Contingency pits will be excavated only if dark soils or potentially impacted fill material are identified at the target stations (AQ-SSA1-01 to 05).

-- = not applicable

TBD = to be determined

XX = depth to be determined

Table 2
Soil Sampling Design for Supplemental Study Activity 2

Station ID	Proposed Coordinates[1,2]		Sample ID	Target Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
	Easting	Northing						
AQ-SSA2-01	1003994.04	306042.53	AQ-SSA2-01-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	Overlying vegetation will be removed by sieving as practicable prior to sample collection.
AQ-SSA2-02	1004048.43	305978.46	AQ-SSA2-02-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	
AQ-SSA2-03	1004000.38	305862.65	AQ-SSA2-03-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	
AQ-SSA2-04	1004054.77	305798.57	AQ-SSA2-04-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	
AQ-SSA2-05	1004006.72	305682.76	AQ-SSA2-05-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	
AQ-SSA2-06	1004061.10	305618.69	AQ-SSA2-06-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	
AQ-SSA2-07	1004013.05	305502.87	AQ-SSA2-07-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	
AQ-SSA2-08	1004067.44	305438.80	AQ-SSA2-08-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	
AQ-SSA2-REF-01	1003491.59	304547.47	AQ-SSA2-REF-01-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	
AQ-SSA2-REF-02	1003342.42	304594.19	AQ-SSA2-REF-02-0-0.5	0-0.5 feet bgs	0.5 feet bgs	Test Plots	Nutrients	

Notes:

1 Coordinates will be determined based on finalization of sampling locations.

2 Horizontal datum: Washington State Plane South, NAD83, US Survey feet. Vertical Datum: NGVD 29.

3 BGS = below ground surface. Actual soil testing depth interval will be determined in the field based on visual observations.

4 Nutrients: total nitrogen, nitrate, nitrite, ammonia, phosphate (total and available), potassium

-- = not applicable

Table 3
Soil Sampling Design for Supplemental Study Activity 3

Station ID	Proposed Coordinates[1,2]		Sample ID	Target Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
	Easting	Northing						
AQ-SSA3-01	1002955.20	305614.58	AQ-SSA3-01-0-1	--	Minimum 4 feet bgs or water table	Test Pit	--	Sampling depths may be adjusted if potentially impacted fill material is identified.
			AQ-SSA3-01-1-2	--			--	
			AQ-SSA3-01-2-3	2-3 feet bgs			FL, CN (WAD and Total)	
			AQ-SSA3-01-3-4	--			--	
AQ-SSA3-02	1002941.08	306157.47	AQ-SSA3-02-0-1	--	Minimum 4 feet bgs or water table	Test Pit	--	
			AQ-SSA3-02-1-2	--			--	
			AQ-SSA3-02-2-3	2-3 feet bgs			FL, CN (WAD and Total)	
			AQ-SSA3-02-3-4	--			--	
AQ-SSA3-03	1003009.80	306167.04	AQ-SSA3-03-0-1	--	Minimum 4 feet bgs or water table	Test Pit	--	
			AQ-SSA3-03-1-2	--			--	
			AQ-SSA3-03-2-3	2-3 feet bgs			FL, CN (WAD and Total)	
			AQ-SSA3-03-3-4	--			--	
AQ-SSA3-04	1002953.60	306503.40	AQ-SSA3-04-0-1	--	Minimum 4 feet bgs or water table	Test Pit	--	
			AQ-SSA3-04-1-2	--			--	
			AQ-SSA3-04-2-3	2-3 feet bgs			FL, CN (WAD and Total)	
			AQ-SSA3-04-3-4	--			--	
AQ-SSA3-05	1003031.12	306508.29	AQ-SSA3-05-0-1	--	Minimum 4 feet bgs or water table	Test Pit	--	
			AQ-SSA3-05-1-2	--			--	
			AQ-SSA3-05-2-3	2-3 feet bgs			FL, CN (WAD and Total)	
			AQ-SSA3-05-3-4	--			--	

Table 3
Soil Sampling Design for Supplemental Study Activity 3

Station ID	Proposed Coordinates[1,2]		Sample ID	Target Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
	Easting	Northing						
AQ-SSA3-06	1002959.39	306837.42	AQ-SSA3-06-0-1	--	Minimum 4 feet bgs or water table	Test Pit	--	Sampling depths may be adjusted if potentially impacted fill material is identified.
			AQ-SSA3-06-1-2	--			--	
			AQ-SSA3-06-2-3	2-3 feet bgs			FL, CN (WAD and Total)	
			AQ-SSA3-06-3-4	--			--	
AQ-SSA3-07	1003054.68	306833.95	AQ-SSA3-07-0-1	--	Minimum 4 feet bgs or water table	Test Pit	--	
			AQ-SSA3-07-1-2	--			--	
			AQ-SSA3-07-2-3	2-3 feet bgs			FL, CN (WAD and Total)	
			AQ-SSA3-07-3-4	--			--	
AQ-SSA3-08	1003139.36	306826.32	AQ-SSA3-08-0-1	--	Minimum 4 feet bgs or water table	Test Pit	--	
			AQ-SSA3-08-1-2	--			--	
			AQ-SSA3-08-2-3	2-3 feet bgs			FL, CN (WAD and Total)	
			AQ-SSA3-08-3-4	--			--	

Notes:

1 Coordinates will be determined based on finalization of sampling locations.

2 Horizontal datum: Washington State Plane South, NAD83, US Survey feet. Vertical Datum: NGVD 29.

3 BGS = below ground surface. Actual soil testing depth interval will be determined in the field based on visual observations.

4 Chemical testing: FL = fluoride, CN = cyanide, WAD = weak acid dissociable

-- = not applicable

Table 4
Soil Sampling Design for Supplemental Study Activity 4

Station ID	Proposed Coordinates[1,2]		Sample ID	Target Sampling Interval[3]	Archive Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
	Easting	Northing							
AQ-SSA4-01	1005932.61	305678.52	AQ-SSA4-01-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	Additional intervals may be archived and/or analyzed based on visual observations and the results of initial chemical testing. Sampling methods will be based on field conditions. Locations may be adjusted within the designated sampling grid in order to obtain sampling access.
			AQ-SSA4-01-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-01-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-01-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-01-4-5	--	4-5 feet bgs			--	
AQ-SSA4-02	1006007.79	305610.82	AQ-SSA4-02-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	
			AQ-SSA4-02-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-02-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-02-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-02-4-5	--	4-5 feet bgs			--	
AQ-SSA4-03	1006083.08	305504.51	AQ-SSA4-03-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	
			AQ-SSA4-03-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-03-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-03-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-03-4-5	--	4-5 feet bgs			--	
AQ-SSA4-04	1006196.72	305402.19	AQ-SSA4-04-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	
			AQ-SSA4-04-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-04-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-04-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-04-4-5	--	4-5 feet bgs			--	
AQ-SSA4-05	1006310.43	305299.81	AQ-SSA4-05-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	
			AQ-SSA4-05-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-05-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-05-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-05-4-5	--	4-5 feet bgs			--	
AQ-SSA4-06	1005857.35	305253.86	AQ-SSA4-06-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	
			AQ-SSA4-06-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-06-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-06-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-06-4-5	--	4-5 feet bgs			--	

Table 4
Soil Sampling Design for Supplemental Study Activity 4

Station ID	Proposed Coordinates[1,2] Easting	Proposed Coordinates[1,2] Northing	Sample ID	Target Sampling Interval[3]	Archive Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
AQ-SSA4-07	1005971.01	305151.52	AQ-SSA4-07-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	Additional intervals may be archived and/or analyzed based on visual observations and the results of initial chemical testing. Sampling methods will be based on field conditions. Locations may be adjusted within the designated sampling grid in order to obtain sampling access.
			AQ-SSA4-07-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-07-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-07-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-07-4-5	--	4-5 feet bgs			--	
AQ-SSA4-08	1006084.72	305049.13	AQ-SSA4-08-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	
			AQ-SSA4-08-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-08-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-08-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-08-4-5	--	4-5 feet bgs			--	
AQ-SSA4-09	1005631.64	305003.18	AQ-SSA4-09-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	
			AQ-SSA4-09-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-09-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-09-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-09-4-5	--	4-5 feet bgs			--	
AQ-SSA4-10	1005745.30	304900.84	AQ-SSA4-10-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	
			AQ-SSA4-10-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-10-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-10-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-10-4-5	--	4-5 feet bgs			--	
AQ-SSA4-11	1005859.01	304798.45	AQ-SSA4-11-0-1	0-1 feet bgs	0-1 feet bgs	5 feet bgs or water table	Direct Push Drilling Rig/Test Pit	PAHs	
			AQ-SSA4-11-1-2	1-2 feet bgs	1-2 feet bgs			PAHs	
			AQ-SSA4-11-2-3	--	2-3 feet bgs			--	
			AQ-SSA4-11-3-4	--	3-4 feet bgs			--	
			AQ-SSA4-11-4-5	--	4-5 feet bgs			--	
RL-4S	Low flow	8.5-13.5 ft	RL-4S-Date	8.5-13.5 ft	--	8.5-13.5 ft	Low Flow	Refer to Table 8 (SSA 9)	A second shallow well may be installed down gradient depending on chemical results of RL-4S

Notes:

1 Coordinates will be determined based on finalization of sampling locations.

2 Horizontal datum: Washington State Plane South, NAD83, US Survey feet. Vertical Datum: NGVD 29.

3 BGS = below ground surface. Actual soil testing depth interval will be determined in the field based on visual observations.

4 Chemical testing: PAHs = polycyclic aromatic hydrocarbons, FL = fluoride

-- = not applicable

Table 5
Soil Sampling Design for Supplemental Study Activity 5

Station ID	Proposed Coordinates[1,2] Easting	Proposed Coordinates[1,2] Northing	Sample ID	Target Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
AQ-SSA5-01	1007461.34	303756.15	AQ-SSA5-01-0-2	--	20 feet bgs	Direct Push Drilling Rig	--	Sampling intervals may be adjusted if potentially impacted fill is identified (i.e., sampling will target potentially impacted fill layers if present).
			AQ-SSA5-01-2-4	--			--	
			AQ-SSA5-01-4-6	--			--	
			AQ-SSA5-01-6-8	--			--	
			AQ-SSA5-01-8-10	8-10 feet bgs			PAHs, FL	
			AQ-SSA5-01-10-12	--			--	
			AQ-SSA5-01-12-14	--			--	
			AQ-SSA5-01-14-16	14-16 feet bgs			PAHs, FL	
			AQ-SSA5-01-16-18	--			--	
			AQ-SSA5-01-18-20	--			--	
AQ-SSA5-02	1007461.40	303716.56	AQ-SSA5-02-0-2	--	8 feet bgs	Direct Push Drilling Rig	--	
			AQ-SSA5-02-2-4	--			--	
			AQ-SSA5-02-4-6	4-6 feet bgs			PAHs, FL	
			AQ-SSA5-02-6-8	--			--	
AQ-SSA5-03	1007424.64	303714.92	AQ-SSA5-03-0-2	--	20 feet bgs	Direct Push Drilling Rig	--	
			AQ-SSA5-03-2-4	--			--	
			AQ-SSA5-03-4-6	--			--	
			AQ-SSA5-03-6-8	--			--	
			AQ-SSA5-03-8-10	8-10 feet bgs			PAHs, FL	
			AQ-SSA5-03-10-12	--			--	
			AQ-SSA5-03-12-14	--			--	
			AQ-SSA5-03-14-16	14-16 feet bgs			PAHs, FL	
			AQ-SSA5-03-16-18	--			--	
			AQ-SSA5-03-18-20	--			--	
AQ-SSA5-04	1007310.60	303588.88	AQ-SSA5-04-0-2	--	20 feet bgs	Direct Push Drilling Rig	--	
			AQ-SSA5-04-2-4	--			--	
			AQ-SSA5-04-4-6	--			--	
			AQ-SSA5-04-6-8	--			--	
			AQ-SSA5-04-8-10	8-10 feet bgs			PAHs, FL	
			AQ-SSA5-04-10-12	--			--	
			AQ-SSA5-04-12-14	--			--	
			AQ-SSA5-04-14-16	14-16 feet bgs			PAHs, FL	
			AQ-SSA5-04-16-18	--			--	
			AQ-SSA5-04-18-20	--			--	
AQ-SSA5-05	1007310.67	303549.30	AQ-SSA5-05-0-2	--	8 feet bgs	Direct Push Drilling Rig	--	
			AQ-SSA5-05-2-4	--			--	
			AQ-SSA5-05-4-6	4-6 feet bgs			PAHs, FL	
			AQ-SSA5-05-6-8	--			--	
AQ-SSA5-06	1007273.90	303547.66	AQ-SSA5-06-0-2	--	20 feet bgs	Direct Push Drilling Rig	--	
			AQ-SSA5-06-2-4	--			--	
			AQ-SSA5-06-4-6	--			--	
			AQ-SSA5-06-6-8	--			--	
			AQ-SSA5-06-8-10	8-10 feet bgs			PAHs, FL	
			AQ-SSA5-06-10-12	--			--	
			AQ-SSA5-06-12-14	--			--	
			AQ-SSA5-06-14-16	14-16 feet bgs			PAHs, FL	
			AQ-SSA5-06-16-18	--			--	
			AQ-SSA5-06-18-20	--			--	

Notes:

1 Coordinates will be determined based on finalization of sampling locations.

2 Horizontal datum: Washington State Plane South, NAD83, US Survey feet. Vertical Datum: NGVD 29.

3 BGS = below ground surface. Actual soil testing depth interval will be determined in the field based on visual observations.

4 Chemical testing: PAHs = polycyclic aromatic hydrocarbons, FL = fluoride

-- = not applicable

Table 6
Soil Sampling Design for Supplemental Study Activity 6

Station ID	Proposed Coordinates[1,2] Easting	Proposed Coordinates[1,2] Northing	Sample ID	Target Sampling Interval[3]	Archive Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
AQ-SSA6-01	1006749.20	303570.22	AQ-SSA6-01-1-2	1-2 feet bgs	1-2 feet bgs	Minimum 6 feet bgs or native soil contact	Limited Access Direct Push Drilling Rig	NWTPH-Dx with silica gel cleanup	Field screening will include visual inspection and sheen testing. Additional intervals will be analyzed if field screening indicates contamination. Sampling intervals may be adjusted if potentially impacted soil is identified. Two or three samples may be selected for EPH Petroleum Fractioning based on field screening results.
			AQ-SSA6-01-2-3	--	2-3 feet bgs			--	
			AQ-SSA6-01-3-4	3-4 feet bgs	3-4 feet bgs			NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-01-4-5	--	4-5 feet bgs			--	
			AQ-SSA6-01-5-6	--	5-6 feet bgs			--	
AQ-SSA6-02	1006710.32	303573.20	AQ-SSA6-02-1-2	1-2 feet bgs	1-2 feet bgs	Minimum 6 feet bgs or native soil contact	Limited Access Direct Push Drilling Rig	NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-02-2-3	--	2-3 feet bgs			--	
			AQ-SSA6-02-3-4	3-4 feet bgs	3-4 feet bgs			NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-02-4-5	--	4-5 feet bgs			--	
			AQ-SSA6-02-5-6	--	5-6 feet bgs			--	
AQ-SSA6-03	1006751.49	303537.47	AQ-SSA6-03-1-2	1-2 feet bgs	1-2 feet bgs	Minimum 6 feet bgs or native soil contact	Limited Access Direct Push Drilling Rig	NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-03-2-3	--	2-3 feet bgs			--	
			AQ-SSA6-03-3-4	3-4 feet bgs	3-4 feet bgs			NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-03-4-5	--	4-5 feet bgs			--	
			AQ-SSA6-03-5-6	--	5-6 feet bgs			--	
AQ-SSA6-04	1006711.95	303531.13	AQ-SSA6-04-1-2	1-2 feet bgs	1-2 feet bgs	Minimum 6 feet bgs or native soil contact	Limited Access Direct Push Drilling Rig	NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-04-2-3	--	2-3 feet bgs			--	
			AQ-SSA6-04-3-4	3-4 feet bgs	3-4 feet bgs			NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-04-4-5	--	4-5 feet bgs			--	
			AQ-SSA6-04-5-6	--	5-6 feet bgs			--	
AQ-SSA6-05	1006690.58	303532.31	AQ-SSA6-05-1-2	1-2 feet bgs	1-2 feet bgs	Minimum 6 feet bgs or native soil contact	Limited Access Direct Push Drilling Rig	NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-05-2-3	--	2-3 feet bgs			--	
			AQ-SSA6-05-3-4	3-4 feet bgs	3-4 feet bgs			NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-05-4-5	--	4-5 feet bgs			--	
			AQ-SSA6-05-5-6	--	5-6 feet bgs			--	
AQ-SSA6-06	1006725.41	303499.64	AQ-SSA6-06-1-2	1-2 feet bgs	1-2 feet bgs	Minimum 6 feet bgs or native soil contact	Limited Access Direct Push Drilling Rig	NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-06-2-3	--	2-3 feet bgs			--	
			AQ-SSA6-06-3-4	3-4 feet bgs	3-4 feet bgs			NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-06-4-5	--	4-5 feet bgs			--	
			AQ-SSA6-06-5-6	--	5-6 feet bgs			--	
AQ-SSA6-07 *Contingency*[5]	TBD	TBD	AQ-SSA6-07-1-2	1-2 feet bgs	1-2 feet bgs	Minimum 6 feet bgs or native soil contact	Limited Access Direct Push Drilling Rig	NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-07-2-3	--	2-3 feet bgs			--	
			AQ-SSA6-07-3-4	3-4 feet bgs	3-4 feet bgs			NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-07-4-5	--	4-5 feet bgs			--	
			AQ-SSA6-07-5-6	--	5-6 feet bgs			--	
AQ-SSA6-08 *Contingency*[5]	TBD	TBD	AQ-SSA6-08-1-2	1-2 feet bgs	1-2 feet bgs	Minimum 6 feet bgs or native soil contact	Limited Access Direct Push Drilling Rig	NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-08-2-3	--	2-3 feet bgs			--	
			AQ-SSA6-08-3-4	3-4 feet bgs	3-4 feet bgs			NWTPH-Dx with silica gel cleanup	
			AQ-SSA6-08-4-5	--	4-5 feet bgs			--	
			AQ-SSA6-08-5-6	--	5-6 feet bgs			--	
AQ-SSA6-HTM-RES	--	--	AQ-SSA6-HTM-RES	--	--	--	Tank Sample	NWTPH-Dx with silica gel cleanup, EPH Petroleum Fractioning	Contingency Sample

Notes:
1 Coordinates will be determined based on finalization of sampling locations.
2 Horizontal datum: Washington State Plane South, NAD83, US Survey feet. Vertical Datum: NGVD 29.
3 BGS = below ground surface. Actual soil testing depth interval will be determined in the field based on visual observations.
4 Chemical testing: TPH-Dx = diesel-range hydrocarbons, EPH = extractable petroleum hydrocarbons
5 Contingency samples/analyses will be triggered based on field observations. These borings will be completed only if visibly impacted soil is identified at the perimeter of stations AQ-SSA6-01 to 06.
TBD = to be determined
-- = not applicable

Table 7
Soil Sampling Design for Supplemental Study Activity 7

Station ID	Proposed Coordinates[1,2] Easting	Northing	Sample ID	Target Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
AQ-SSA7-01	1006648.87	303137.83	AQ-SSA7-01-0-1	--	12 to 15 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	Former Reynolds staff will supervise excavations. Sampling intervals will be determined in the field to target fill material.
			AQ-SSA7-01-1-2	--				
			AQ-SSA7-01-2-3	--				
			AQ-SSA7-01-3-4	--				
			AQ-SSA7-01-4-5	--				
			AQ-SSA7-01-5-6	--				
			AQ-SSA7-01-6-7	--				
			AQ-SSA7-01-7-8	--				
			AQ-SSA7-01-8-9	--				
			AQ-SSA7-01-9-10	--				
			AQ-SSA7-01-10-11	--				
			AQ-SSA7-01-11-12	--				
			AQ-SSA7-01-12-13	--				
			AQ-SSA7-01-13-14	--				
			AQ-SSA7-01-14-15	--				
AQ-SSA7-02	1006765.13	303050.39	AQ-SSA7-02-0-1	--	12 to 15 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	
			AQ-SSA7-02-1-2	--				
			AQ-SSA7-02-2-3	--				
			AQ-SSA7-02-3-4	--				
			AQ-SSA7-02-4-5	--				
			AQ-SSA7-02-5-6	--				
			AQ-SSA7-02-6-7	--				
			AQ-SSA7-02-7-8	--				
			AQ-SSA7-02-8-9	--				
			AQ-SSA7-02-9-10	--				
			AQ-SSA7-02-10-11	--				
			AQ-SSA7-02-11-12	--				
			AQ-SSA7-02-12-13	--				
			AQ-SSA7-02-13-14	--				
			AQ-SSA7-02-14-15	--				
AQ-SSA7-03	1006891.19	302960.61	AQ-SSA7-03-0-1	--	12 to 15 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	
			AQ-SSA7-03-1-2	--				
			AQ-SSA7-03-2-3	--				
			AQ-SSA7-03-3-4	--				
			AQ-SSA7-03-4-5	--				
			AQ-SSA7-03-5-6	--				
			AQ-SSA7-03-6-7	--				
			AQ-SSA7-03-7-8	--				
			AQ-SSA7-03-8-9	--				
			AQ-SSA7-03-9-10	--				
			AQ-SSA7-03-10-11	--				
			AQ-SSA7-03-11-12	--				
			AQ-SSA7-03-12-13	--				
			AQ-SSA7-03-13-14	--				
			AQ-SSA7-03-14-15	--				
AQ-SSA7-04	1007016.14	302877.87	AQ-SSA7-04-0-1	--	12 to 15 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	
			AQ-SSA7-04-1-2	--				
			AQ-SSA7-04-2-3	--				
			AQ-SSA7-04-3-4	--				
			AQ-SSA7-04-4-5	--				
			AQ-SSA7-04-5-6	--				
			AQ-SSA7-04-6-7	--				
			AQ-SSA7-04-7-8	--				
			AQ-SSA7-04-8-9	--				
			AQ-SSA7-04-9-10	--				
			AQ-SSA7-04-10-11	--				
			AQ-SSA7-04-11-12	--				
			AQ-SSA7-04-12-13	--				
			AQ-SSA7-04-13-14	--				
			AQ-SSA7-04-14-15	--				
AQ-SSA7-05	1007127.56	302777.45	AQ-SSA7-05-0-1	--	12 to 15 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	
			AQ-SSA7-05-1-2	--				
			AQ-SSA7-05-2-3	--				
			AQ-SSA7-05-3-4	--				
			AQ-SSA7-05-4-5	--				
			AQ-SSA7-05-5-6	--				
			AQ-SSA7-05-6-7	--				
			AQ-SSA7-05-7-8	--				
			AQ-SSA7-05-8-9	--				
			AQ-SSA7-05-9-10	--				
			AQ-SSA7-05-10-11	--				
			AQ-SSA7-05-11-12	--				
			AQ-SSA7-05-12-13	--				
			AQ-SSA7-05-13-14	--				
			AQ-SSA7-05-14-15	--				

Table 7
Soil Sampling Design for Supplemental Study Activity 7

Station ID	Proposed Coordinates[1,2] Easting	Proposed Coordinates[1,2] Northing	Sample ID	Target Sampling Interval[3]	Sampling Depth[3]	Sample Method	Soil Chemistry[4]	Comments
AQ-SSA7-06	1006638.74	303020.69	AQ-SSA7-06-0-1	--	6 to 8 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	Former Reynolds staff will supervise excavations. Sampling intervals will be determined in the field to target fill material.
			AQ-SSA7-06-1-2	--				
			AQ-SSA7-06-2-3	--				
			AQ-SSA7-06-3-4	--				
			AQ-SSA7-06-4-5	--				
			AQ-SSA7-06-5-6	--				
			AQ-SSA7-06-6-7	--				
			AQ-SSA7-06-7-8	--				
AQ-SSA7-07	1006750.17	302920.27	AQ-SSA7-07-0-1	--	6 to 8 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	
			AQ-SSA7-07-1-2	--				
			AQ-SSA7-07-2-3	--				
			AQ-SSA7-07-3-4	--				
			AQ-SSA7-07-4-5	--				
			AQ-SSA7-07-5-6	--				
			AQ-SSA7-07-6-7	--				
			AQ-SSA7-07-7-8	--				
AQ-SSA7-08	1006861.60	302819.85	AQ-SSA7-08-0-1	--	6 to 8 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	
			AQ-SSA7-08-1-2	--				
			AQ-SSA7-08-2-3	--				
			AQ-SSA7-08-3-4	--				
			AQ-SSA7-08-4-5	--				
			AQ-SSA7-08-5-6	--				
			AQ-SSA7-08-6-7	--				
			AQ-SSA7-08-7-8	--				
AQ-SSA7-09	1006973.02	302719.43	AQ-SSA7-09-0-1	--	6 to 8 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	
			AQ-SSA7-09-1-2	--				
			AQ-SSA7-09-2-3	--				
			AQ-SSA7-09-3-4	--				
			AQ-SSA7-09-4-5	--				
			AQ-SSA7-09-5-6	--				
			AQ-SSA7-09-6-7	--				
			AQ-SSA7-09-7-8	--				
AQ-SSA7-10	1007084.50	302619.06	AQ-SSA7-10-0-1	--	6 to 8 feet or depth practicable	Test Pit	PAHs, FL, Total CN, Sulfate, PCBs where fill material is identified	
			AQ-SSA7-10-1-2	--				
			AQ-SSA7-10-2-3	--				
			AQ-SSA7-10-3-4	--				
			AQ-SSA7-10-4-5	--				
			AQ-SSA7-10-5-6	--				
			AQ-SSA7-10-6-7	--				
			AQ-SSA7-10-7-8	--				

Notes:

1 Coordinates will be determined based on finalization of sampling locations.

2 Horizontal datum: Washington State Plane South, NAD83, US Survey feet. Vertical Datum: NGVD 29.

3 BGS = below ground surface. Actual soil testing depth interval will be determined in the field based on visual observations.

4 Chemical testing: PAHs = polycyclic aromatic hydrocarbons, FL = fluoride, CN = cyanide, PCBs = polychlorinated biphenyls

-- = not applicable

Table 8
Groundwater Sampling Design for Supplemental Study Activity 9

Station ID	Proposed Coordinates[1,2]		Sample ID[3]	Screened Interval	Sample Method	Well Diameter	Groundwater Chemistry[4,5,6]	
	Easting	Northing					July Event	October Event
G Series Monitoring Wells								
G1-S	1008434.98	301735.48	G1-S-Date	13-18 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G1-D	1008426.65	301724.96	G1-D-Date	28-33 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G2-S	1008669.75	302089.07	G2-S-Date	5-10 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G2-D	1008676.20	302086.19	G2-D-Date	20-25 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G3-S	1009089.69	302357.83	G3-S-Date	8-13 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G3-D	1009095.10	302362.57	G3-D-Date	23-28 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G4-S	1009468.74	303634.29	G4-S-Date	15-20 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G4-D	1009474.41	303628.96	G4-D-Date	30-35 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G5-S	1003755.69	307264.44	G5-S-Date	14-19 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G5-D	1003757.06	307255.93	G5-D-Date	29-34 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
G6-S	1004092.36	304519.02	G6-S-Date	15-20 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
G6-D	1004094.38	304524.33	G6-D-Date	30-35 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
G7-D	1002976.73	305867.50	G7-D-Date	20-30 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
PZ Series Monitoring Wells								
PZ-1	1008299.05	302744.72	PZ-1-Date	8.6-13 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
PZ-2	1008300.80	302751.01	PZ-2-Date	20.2-24.6 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
PZ-3	1008251.97	302972.98	PZ-3-Date	5.1-9.5 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
PZ-4	1008584.21	303050.14	PZ-4-Date	13-17.4 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
PZ-5	1007993.58	302595.68	PZ-5-Date	18.4-22.8 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
PZ-6	1002978.72	306391.57	PZ-6-Date	7.5-11.9 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS

Table 8
Groundwater Sampling Design for Supplemental Study Activity 9

Station ID	Proposed Coordinates[1,2]		Sample ID[3]	Screened Interval	Sample Method	Well Diameter	Groundwater Chemistry[4,5,6]	
	Easting	Northing					July Event	October Event
PZ-7	1002976.47	305858.71	PZ-7-Date	8.4-17.8 feet	Low flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
R Series Monitoring Wells[7]								
R-1S	1007690.16	302585.06	7-12 ft	7-12 ft	Low flow	2-Inch	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
R-1D	1007692.58	302584.67	20-24 ft	20-24 ft	Low flow	2-Inch	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
R-2	1008794.48	303565.60	9-14 ft	9-14 ft	Low flow	2-Inch	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
R-3	1008030.74	302689.09	19-24 ft	19-24 ft	Low flow	2-Inch	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
R-4S	1007914.58	302370.26	14-19 ft	14-19 ft	Low flow	2-Inch	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
R-4D	1007916.23	302368.85	23-27 ft	23-27 ft	Low flow	2-Inch	Total CL, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
RL Series Monitoring Wells[7]								
RL-1S	1003078.70	305242.74	8-18 ft	8-18 ft	Low Flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RL-1D	1003078.65	305242.58	28-38 ft	28-38 ft	Low Flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RL-2S	1003087.21	306911.05	7.5-17.5 ft	7.5-17.5 ft	Low Flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RL-2D	1003090.83	306914.68	23-33 ft	23-33 ft	Low Flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RL-3S	1004055.78	305291.95	7.5-17.5 ft	RL-3S-Date	Low Flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RL-3D	1004052.27	305291.42	23-38 ft	RL-3D-Date	Low Flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RL-4S	1006242.94	305652.76	8.5-13.5 ft	8.5-13.5 ft	Low Flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total), PAHs	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS, PAHs
RL-4D	1006236.70	305658.02	25-35 ft	25-35 ft	Low Flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RL-5	1004098.84	306842.49	12-22 ft	12-22 ft	Low Flow	2-Inch	Total CL, SO_4, FL, CN (WAD, Free and Total)	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RLSW Series Monitoring Wells[7]								
RLSW1	1004328.55	305045.01	9-18 ft	9-18 ft	Low Flow	2-Inch	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RLSW2	1004130.45	305041.60	9-18 ft	9-18 ft	Low Flow	2-Inch	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS

Table 8
Groundwater Sampling Design for Supplemental Study Activity 9

Station ID	Proposed Coordinates[1,2]		Sample ID[3]	Screened Interval	Sample Method	Well Diameter	Groundwater Chemistry[4,5,6]	
	Easting	Northing					July Event	October Event
RLSW3	1003879.21	305040.25	9-18 ft	9-18 ft	Low Flow	2-Inch	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS
RLSW4	1004014.08	304416.09	18-28.5 ft	18-28.5 ft	Low Flow	2-Inch	--	Total CL, SO_4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS

Notes:

1 Coordinates will be determined based on finalization of sampling locations.

2 Horizontal datum: Washington State Plane South, NAD83, US Survey feet. Vertical Datum: NGVD 29.

3 Date = MMDDYY format

4 Water chemistry: CL = chloride, SO4 = sulfate, FL = fluoride, CN = cyanide, WAD = weak acid dissociable, P = phosphorous, TDS = total dissolved solids, TSS = total suspended solids, PAHs = polycyclic aromatic hydrocarbons

5 GeoChem = dissolved metals including aluminum, calcium, iron, magnesium, manganese, potassium, silicon, and sodium

6 Field parameters analyzed at each groundwater / surface water location include: temperature, pH, sulfide, dissolved oxygen, oxidation reduction potential, conductivity, and ferrous iron (Fe^{2+})

7 These wells are sampled for other constituents as part of an ongoing quarterly monitoring program. Additional data may be generated as a result of those requirements.

-- = not applicable

Table 9
Surface Water Sampling Design for Supplemental Study Activity 10

Station ID	Proposed Coordinates[1,2]		Sample ID[3]	Sampling Interval	Sample Method	Surface Water Chemistry[4]	Comments[5]
	Easting	Northing					
W1	1009662.79	303659.69	W1-Date	Just above mudline	Weighted Peristaltic Pump	Total CL, SO4, FL, CN (WAD, Free and Total), GeoChem, Alkalinity, Total P, TDS, TSS	Field Analyses: Temperature, pH, Sulfide, DO, ORP, Conductivity, and Ferrous iron (Fe^{2+})
W2	1003804.35	307373.01	W2-Date	Just above mudline	Weighted Peristaltic Pump		
W3	1003147.03	307026.25	W3-Date	Just above mudline	Weighted Peristaltic Pump		
W4-A	1002892.02	305139.89	W4-A-Date	Just above mudline, prior to to Reynolds pump operation	Weighted Peristaltic Pump		
W4-B *Contingency*[6]	1002892.02	305139.89	W4-B-Date	Just above mudline, after Reynolds pump operation for 30 minutes (if applicable)	Weighted Peristaltic Pump		
W5 *Columbia River Sample*	1006080.15	302686.34	W5-Date	Minimum of 2 feet below water surface	Weighted Peristaltic Pump		
W6	1002902.51	319116.16	W6-Date	Just above mudline	Weighted Peristaltic Pump		
W7	1010578.31	302771.58	W7-Date	Just above mudline	Weighted Peristaltic Pump		

Notes:

1 Coordinates will be determined based on finalization of sampling locations.

2 Horizontal datum: Washington State Plane South, NAD83, US Survey feet. Vertical Datum: NGVD 29.

3 Date = MMDDYY format

4 Water chemistry: CL = chloride, SO4 = sulfate, FL = fluoride, CN = cyanide, WAD = weak acid dissociable, P = phosphorous, TDS = total dissolved solids, TSS = total suspended solids, PAHs = polycyclic aromatic hydrocarbons
GeoChem = dissolved metals including aluminum, calcium, iron, magnesium, manganese, potassium, silicon, and sodium

5 Field Analyses: DO = dissolved oxygen, ORP = oxidation reduction potential. Field parameters will be measured by HACH or YSI field meter and colorimeter.

6 Sample contingent on Reynolds pump operation.

Table 10
Guidelines for Sample Handling and Storage

Parameter	Sample Size	Container Size and Type[1]	Holding Time	Preservative
Soil Analysis				
Total organic carbon	50 g	8-oz glass	14 days	Cool/4° C
			6 months	Freeze -18°C
Metals	50 g	from TOC jar	6 months	Cool/4° C
			2 years	Freeze/-18° C
Cyanide (WAD, Total) [2]	100 g	from TOC jar	14 days	Cool/4° C
Fluoride	50 g	from TOC jar	28 days	Cool/4° C
Ammonia	50 g	from TOC jar	7 days	Cool/4° C
Nitrate/Nitrite	50 g	from TOC jar	7 days	Cool/4° C
Total kjeldahl nitrogen, total phosphorous, fluoride, sulfate	50 g	from TOC jar	28 days	Cool/4° C
Phosphate	50 g	from TOC jar	48 hours	Cool/4° C
Sulfide	50 g	2-oz glass, no headspace	7 days	ZnAC/Cool 4° C
Total petroleum hydrocarbons, diesel and residual range	150 g	8-oz glass	14 days until extraction	Cool/4° C
			1 year until extraction	Freeze -18°C
			40 days after extraction	Cool/4° C
Polychlorinated biphenyls (PCB)	150 g	8-oz glass	14 days until extraction	Cool/4° C
			1 year until extraction	Freeze -18°C
			40 days after extraction	Cool/4° C
Extractable petroleum hydrocarbons (EPH)	150 g	8-oz glass	14 days until extraction	Cool/4° C
			1 year until extraction	Freeze -18°C
			40 days after extraction	Cool/4° C
Polycyclic aromatic hydrocarbons (PAHs)	150 g	16-oz Glass	14 days until extraction	Cool/4° C
			1 year until extraction	Freeze -18°C
			40 days after extraction	Cool/4° C
Water Analysis				
Total dissolved solids	500 mL	1-L HDPE	7 days	Cool/4° C
Fluoride	50 mL	500-mL HDPE	28 days	Cool/4° C
Total chloride	50 mL	From fluoride bottle	28 days	Cool/4° C
Sulfate	50 mL	From fluoride bottle	28 days	Cool/4° C
Total phosphorous	100 mL	500-mL HDPE	28 days	H_2SO_4 to pH < 2/ Cool/4° C
Alkalinity	100 mL	500-mL HDPE	14 days	Cool/4° C
Cyanide (WAD, Total) [2]	100 mL	500-mL HDPE	14 days	NaOH to pH > 12/ Cool/4°C
Free cyanide	100 mL	500-mL HDPE	48 hours	NaOH to pH > 12/ Cool/4°C
Metals	200 mL	500-mL HDPE	6 months	HNO_3 to pH < 2/ Cool/ 4° C HNO3

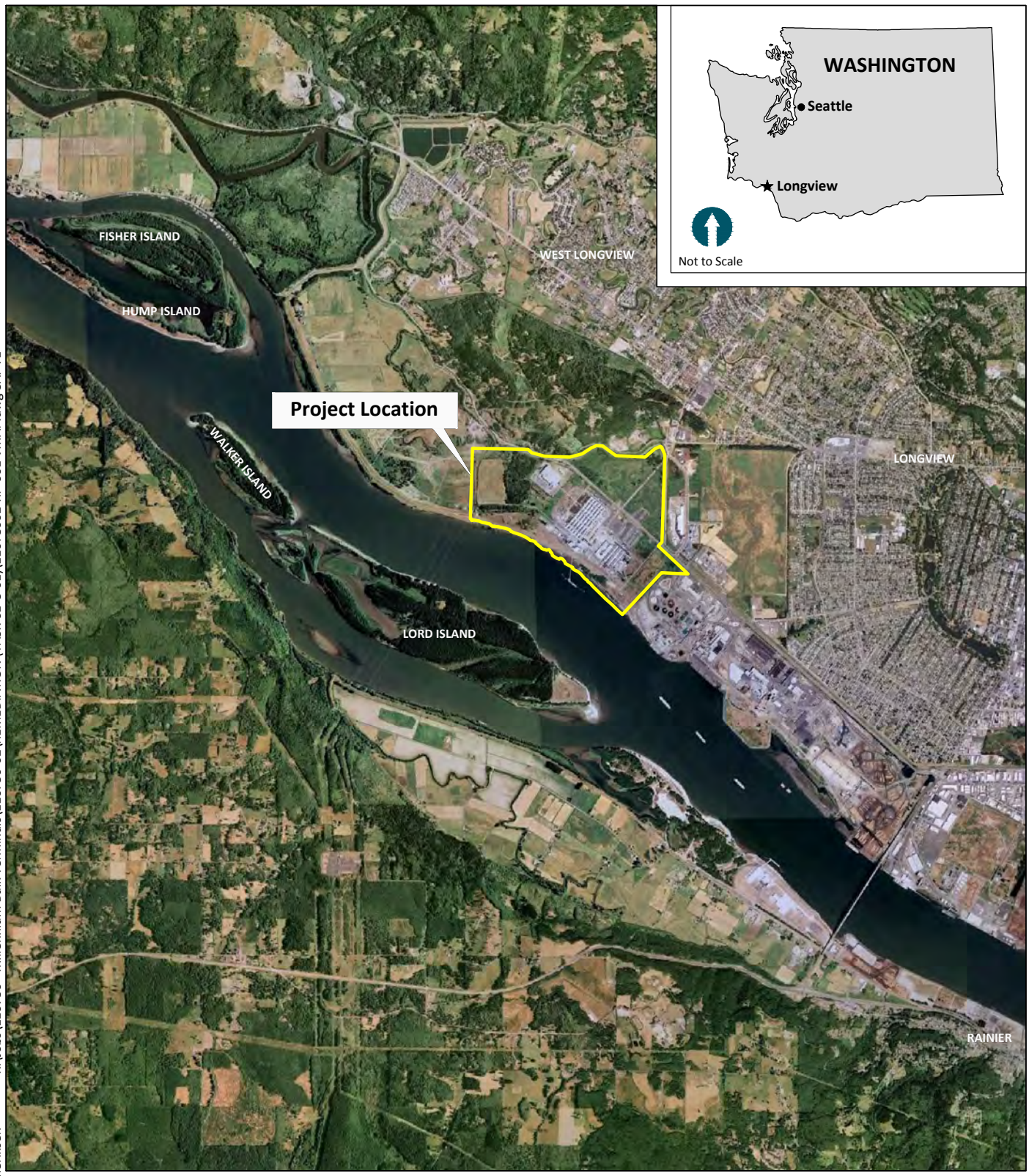
Notes:
° C = degree Celsius
HDPE = high density polyethylene
L = liter
mL = milliliter
oz = ounce
1 All sample containers will have lids with teflon inserts
2 WAD = weak acid dissociable

Table 11
Laboratory Quality Assurance/Quality Control Criteria

	Field Quality Assurance Samples			Laboratory Quality Control Elements								
Analysis Type	Rinsate Blank	Field Duplicates[1]	Temperature Blank	Initial Calibration	Ongoing Calibration	Replicates	Matrix Spikes	LCS	SRM[5]	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes
Total solids/total dissolved solids	NA	1 per 20 samples	1 per cooler	Each batch[2,3]	NA	1 per 20 samples	NA	NA	NA	NA	NA	NA
Total organic carbon	1 per sampling method	1 per 20 samples	1 per cooler	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	NA
Nutrients	1 per sampling method	1 per 20 samples	1 per cooler	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	NA
Metals	1 per sampling method	1 per 20 samples	1 per cooler	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per sampling event	NA	1 per 20 samples	NA
PAHs	1 per sampling method	1 per 20 samples	1 per cooler	As needed[4]	Every 12 hours	NA	1 per 20 samples	1 per 20 samples	1 per sampling event	1 per 20 samples	1 per 20 samples	Every sample
PCBs	1 per sampling method	1 per 20 samples	1 per cooler	As needed[4]	1 per 10 samples	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
TPH/EPH	1 per sampling method	1 per 20 samples	1 per cooler	As needed[4]	1 per 10 samples	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample

Notes:
EPH = extractable petroleum hydrocarbons
LCS = laboratory control sample
NA = not applicable
SRM = standard reference material
TPH = Total petroleum hydrocarbons
PCBs = polychlorinated biphenols
1 Field duplicates will be taken for water samples only. No soil field duplicates will be collected.
2 Calibration and certification of drying ovens and weighing scales are conducted bi-annually.
3 Initial calibration verification and calibration blank must be analyzed at the beginning of each batch.
4 Initial calibrations are considered valid until the ongoing continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.
5 Where a SRM is available.
PCBs will have all detects confirmed via second column confirmation. The second column must be of a dissimilar stationary phase from the primary column and meet all method requirements for acceptance.

FIGURES



AERIAL SOURCE: Google Earth Pro, 2010.

0 5000
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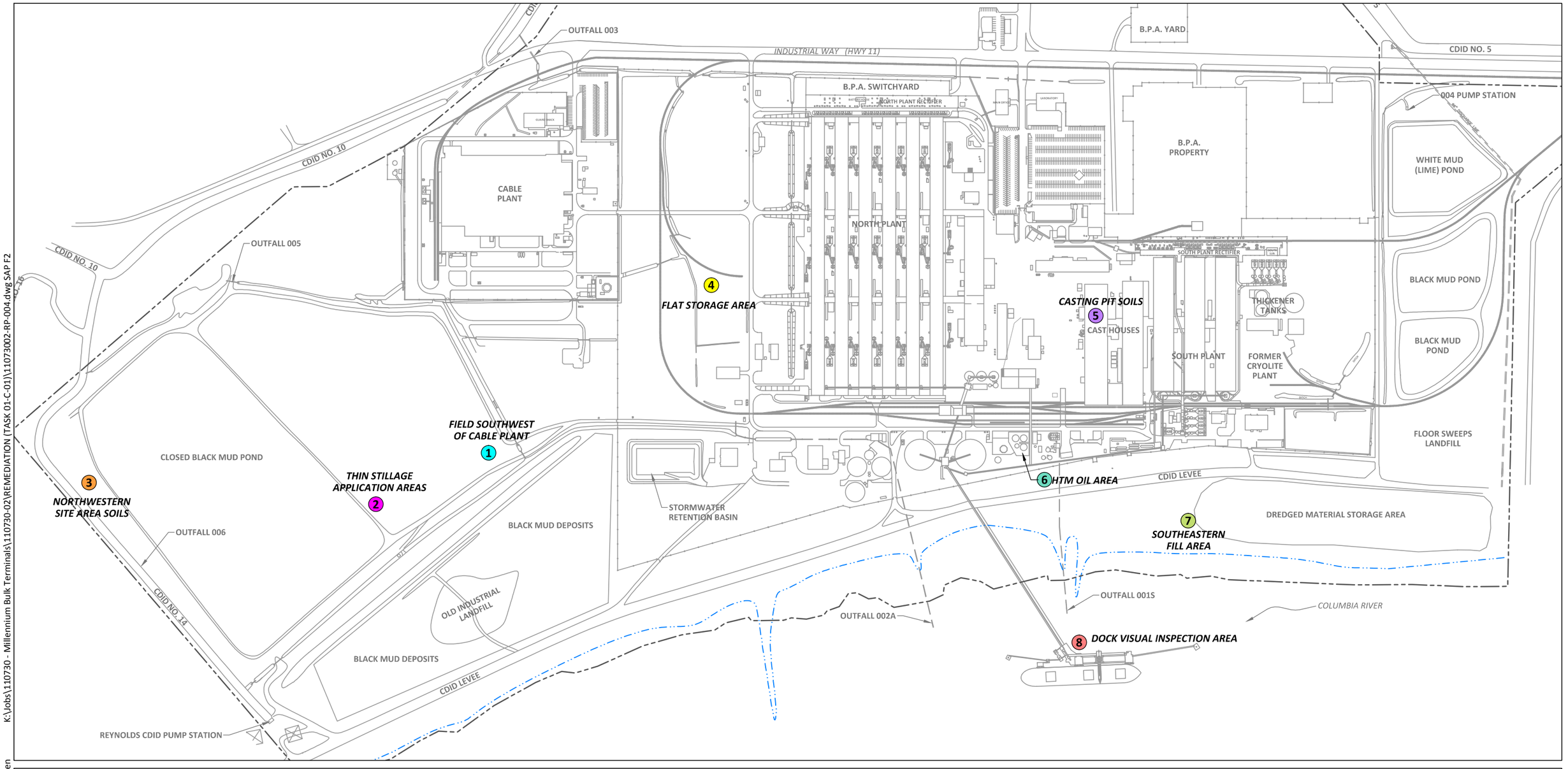
Jul 13, 2011 2:56pm heriksen

Figure 1
Vicinity Map
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington

ANCHOR QEA



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Aug 12, 2011 3:46pm heriksen

LEGEND:

- Site Boundary
- Approximate Ordinary High Water Line

Supplemental Study Activities:

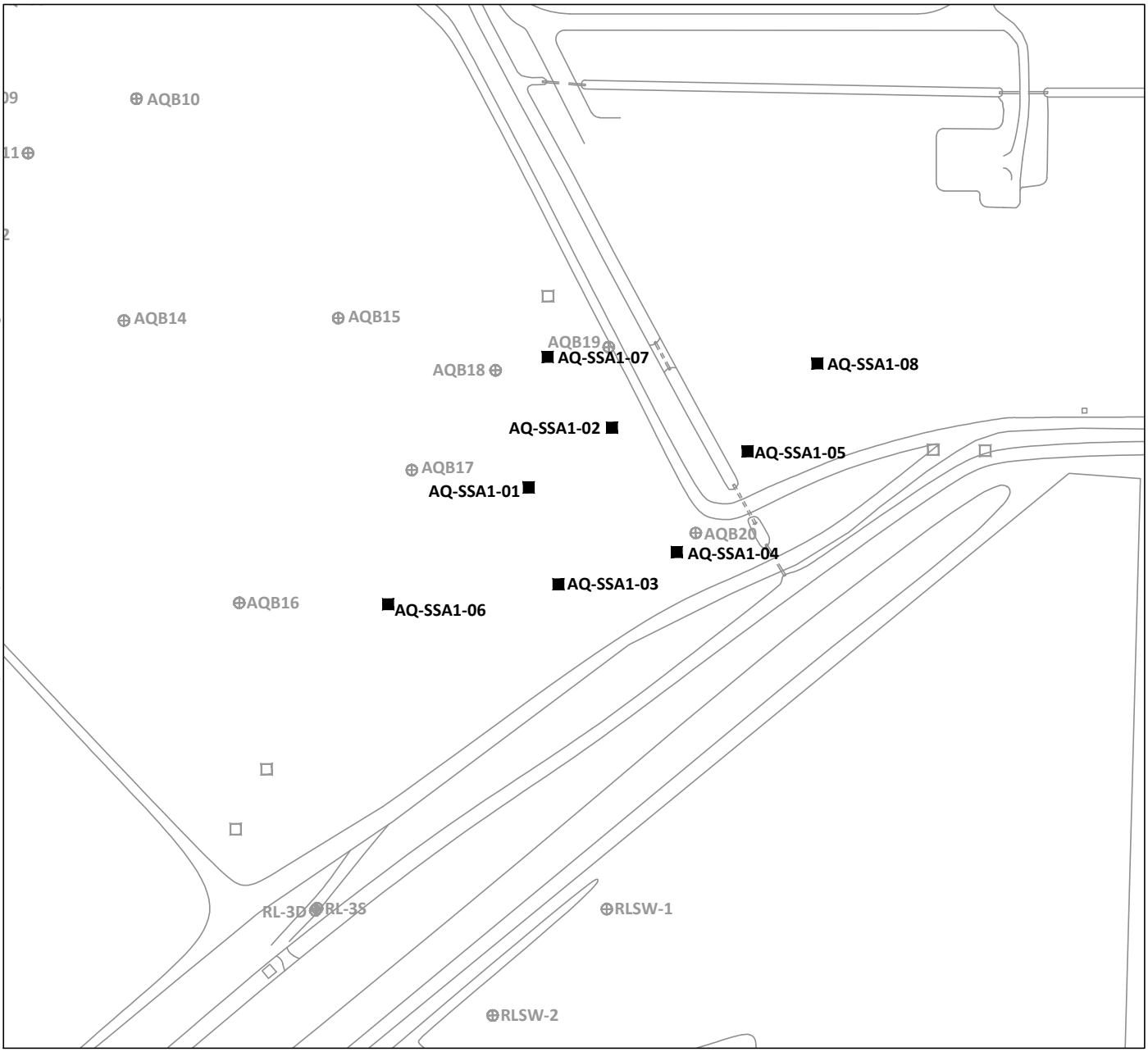
1. Field Southwest of Cable Plant
2. Thin Stillage Application Areas
3. Northwestern Site Area Soils
4. Flat Storage Area
5. Casting Pit Soils
6. HTM Oil Area
7. Southeastern Fill Area
8. Dock Visual Inspection Area (no sampling)
9. Groundwater Sampling (at previously established wells)
10. Surface Water Sampling (at previously established locations)

0 500
Scale in Feet

NOTE: Activities 9 and 10 cover broad areas; sampling locations associated with these activities are depicted on Figures 10 and 11.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

ANCHOR QEA

Figure 2
Supplemental Sampling Activities
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington



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Aug 12, 2011 3:50pm heriksen

Proposed Sampling Locations

- **AQ-SSA1-01** ■ Test Pit
- **AQ-SSA1-12** ● Geoprobe
- **PZ-2D, G2S** ⊕ Monitoring Well
- **W2** △ Surface Water Sample

Previously Sampled Locations

- □ Test Pit
- ○ Chinook Soil Sample
- RL-1S ⊕ Monitoring Well
- LYS2 ⧅ Lysimeter
- RY1 ⦶ Soil Sample
- SPLP3 ⊞ SPLP Soil
- AQB02 ⊕ Geotechnical Boring

0 200

Scale in Feet

NOTE: Sampling locations are approximate and may be changed based on field conditions.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

Figure 3
Proposed Sampling Locations for Supplemental Study Activity 1
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington

ANCHOR QEA

Proposed Sampling Locations

- AQ-SSA2-01 ■ Test Pit
- AQ-SSA2-12 ● Geoprobe
- PZ-2D, G2S ⊕ Monitoring Well
- W2 △ Surface Water Sample

Previously Sampled Locations

- □ Test Pit
- ○ Chinook Soil Sample
- RL-1S ⊕ Monitoring Well
- LYS2 ⧅ Lysimeter
- RY1 ⦶ Soil Sample
- SPLP3 ⊞ SPLP Soil
- AQB02 ⊕ Geotechnical Boring

0 200
Scale in Feet

NOTE: Sampling locations are approximate and may be changed based on field conditions.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

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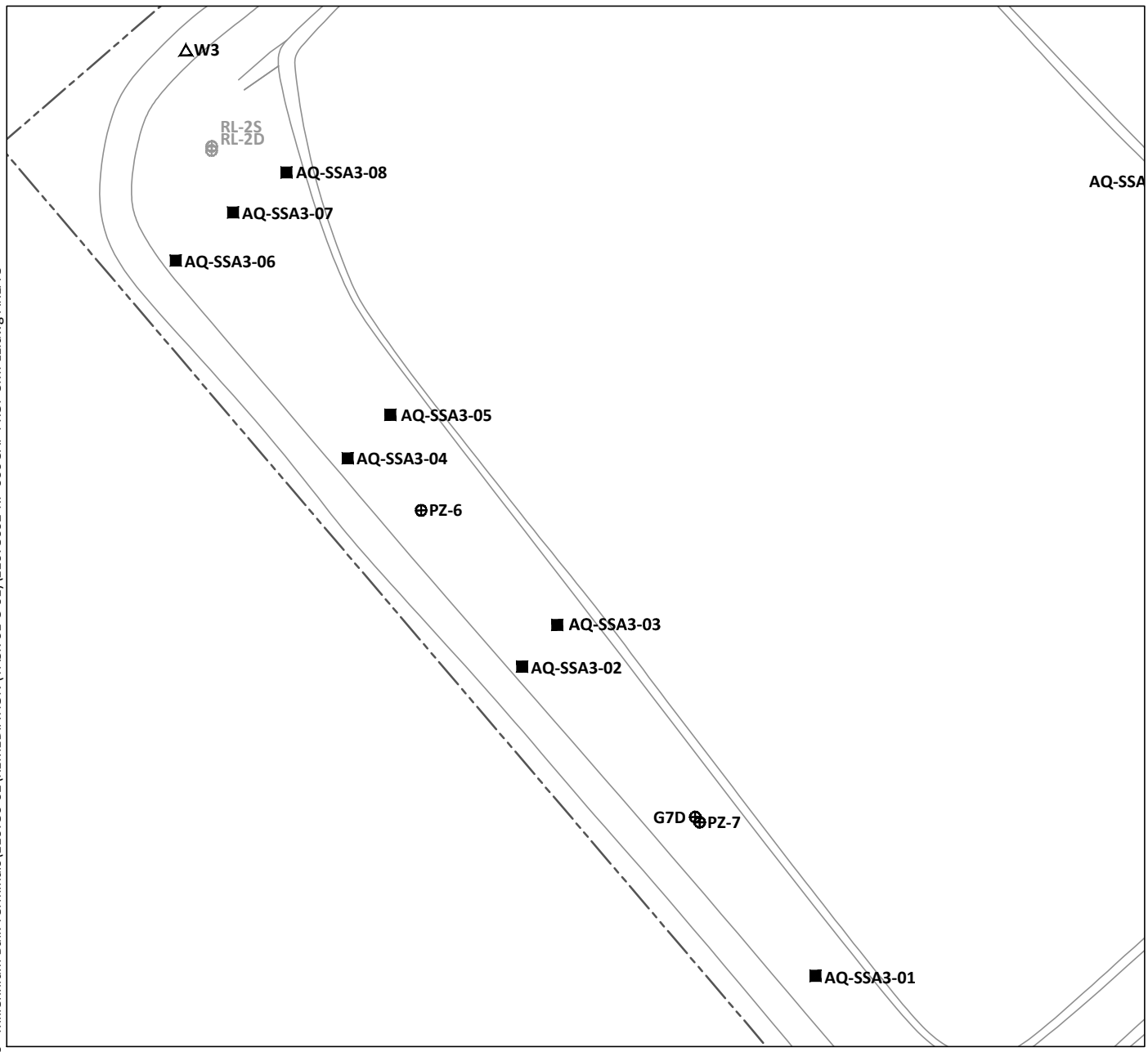
Aug 12, 2011 3:51pm heriksen

Figure 4
Proposed Sampling Locations for Supplemental Study Activity 2
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington

ANCHOR QEA



Proposed Sampling Locations

- AQ-SSA3-01 ■ Test Pit
- AQ-SSA3-12 ● Geoprobe
- PZ-2D, G2S ⊕ Monitoring Well
- W2 △ Surface Water Sample

Previously Sampled Locations

- □ Test Pit
- ○ Chinook Soil Sample
- RL-1S ⊕ Monitoring Well
- LYS2 ▨ Lysimeter
- RY1 ◐ Soil Sample
- SPLP3 ⊞ SPLP Soil
- AQB02 ⊕ Geotechnical Boring

0 200
Scale in Feet

NOTE: Sampling locations are approximate and may be changed based on field conditions.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

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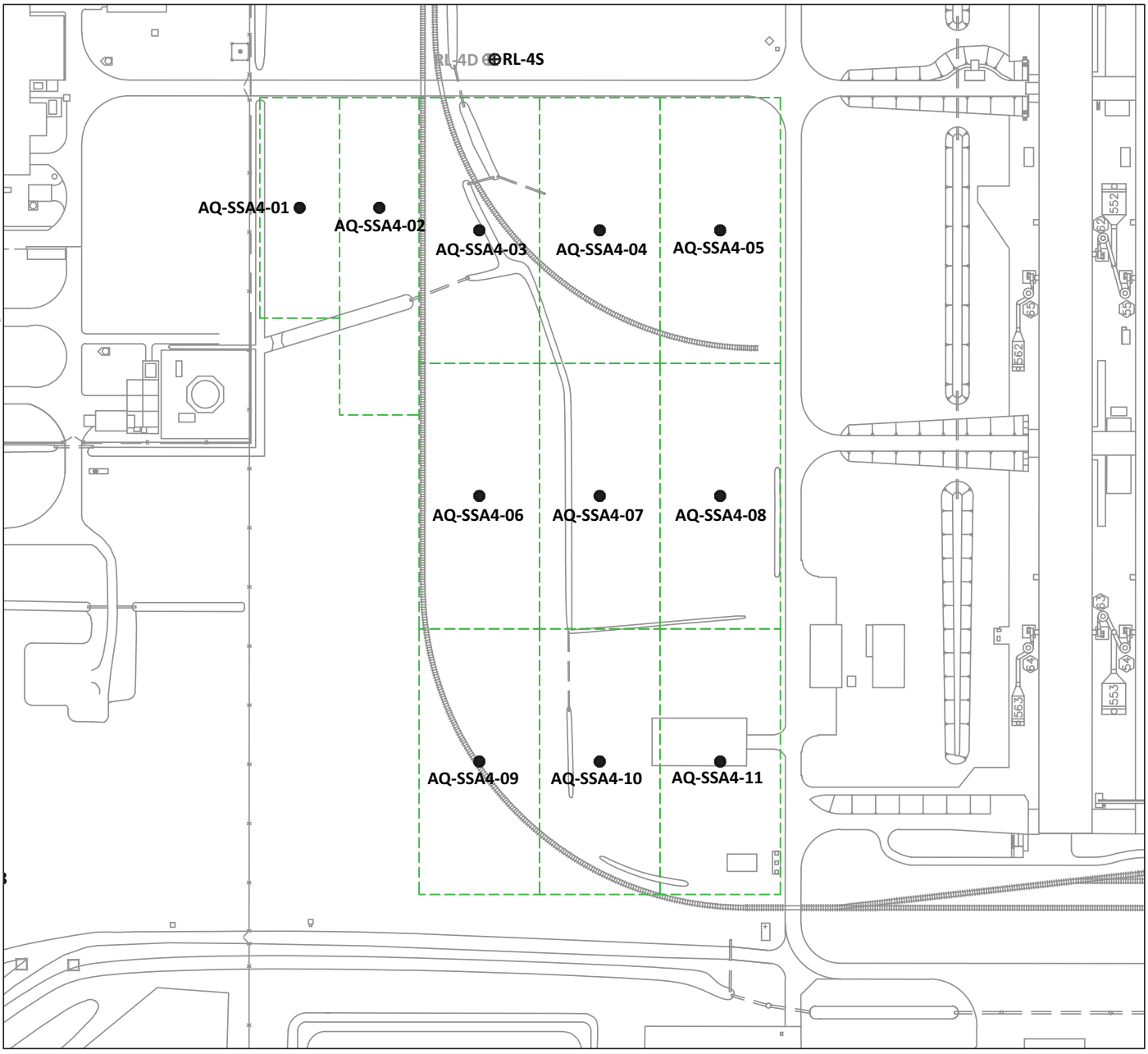
Aug 12, 2011 3:53pm heriksen

Figure 5
Proposed Sampling Locations for Supplemental Study Activity 3
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington

ANCHOR QEA



Proposed Sampling Locations

- **AQ-SSA4-01** ■ Test Pit
- **AQ-SSA4-12** ● Geoprobe
- **PZ-2D, G2S** ⊕ Monitoring Well
- **W2** △ Surface Water Sample

Previously Sampled Locations

- □ Test Pit
- ○ Chinook Soil Sample
- RL-1S ⊕ Monitoring Well
- LYS2 ⧅ Lysimeter
- RY1 ⦶ Soil Sample
- SPLP3 ⊞ SPLP Soil
- AQB02 ⊕ Geotechnical Boring

0 200
Scale in Feet

NOTE: Sampling locations are approximate and may be changed based on field conditions.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

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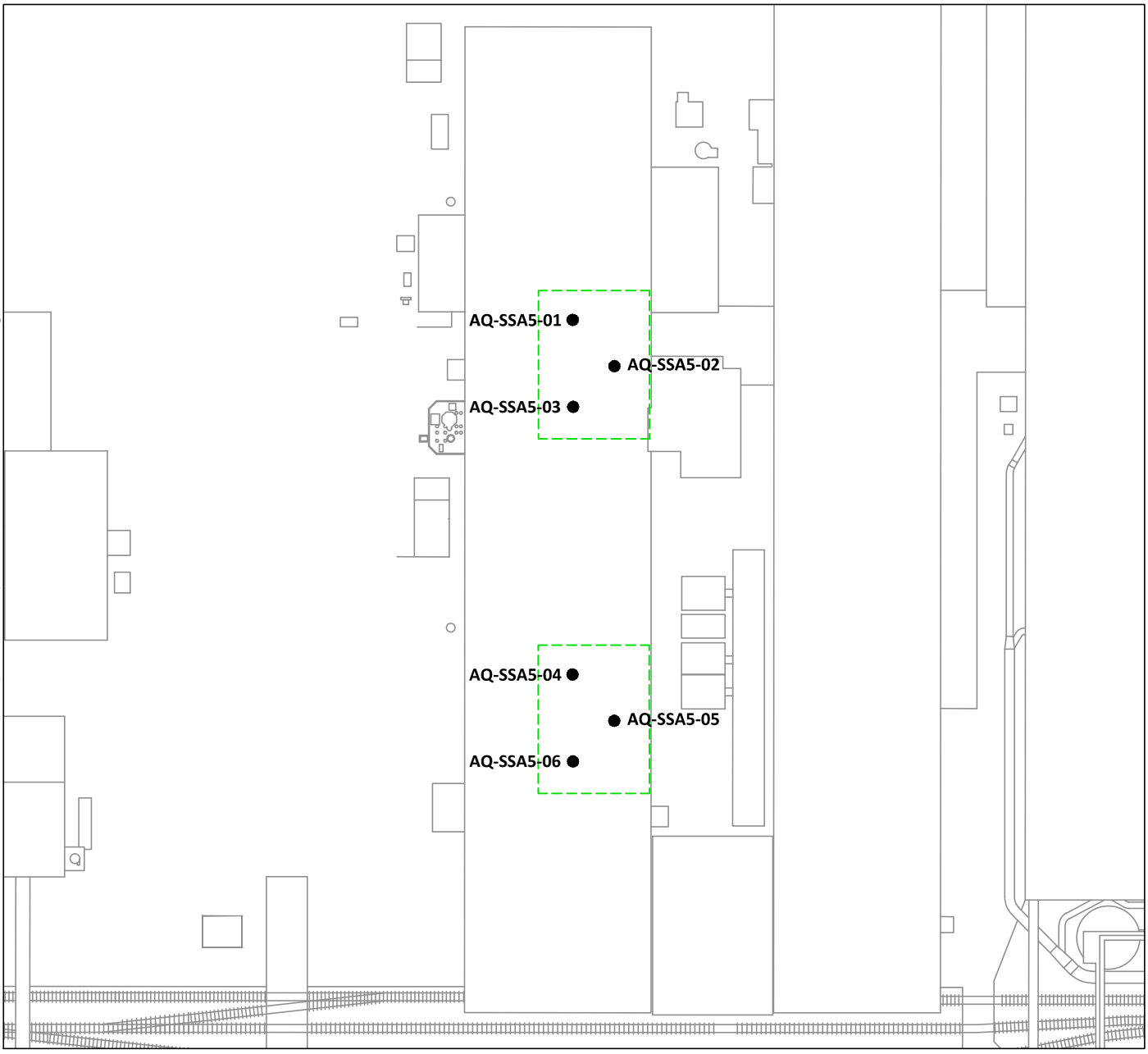
Aug 12, 2011 3:53pm heriksen

Figure 6
Proposed Sampling Locations for Supplemental Study Activity 4
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington



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Aug 12, 2011 3:53pm heriksen

Proposed Sampling Locations

- **AQ-SSA5-01** ■ Test Pit
- **AQ-SSA5-12** ● Geoprobe
- **PZ-2D, G2S** ⊕ Monitoring Well
- **W2** △ Surface Water Sample

Previously Sampled Locations

- □ Test Pit
- ○ Chinook Soil Sample
- RL-1S ⊕ Monitoring Well
- LYS2 ⧅ Lysimeter
- RY1 ◐ Soil Sample
- SPLP3 ⊞ SPLP Soil
- AQB02 ⊕ Geotechnical Boring

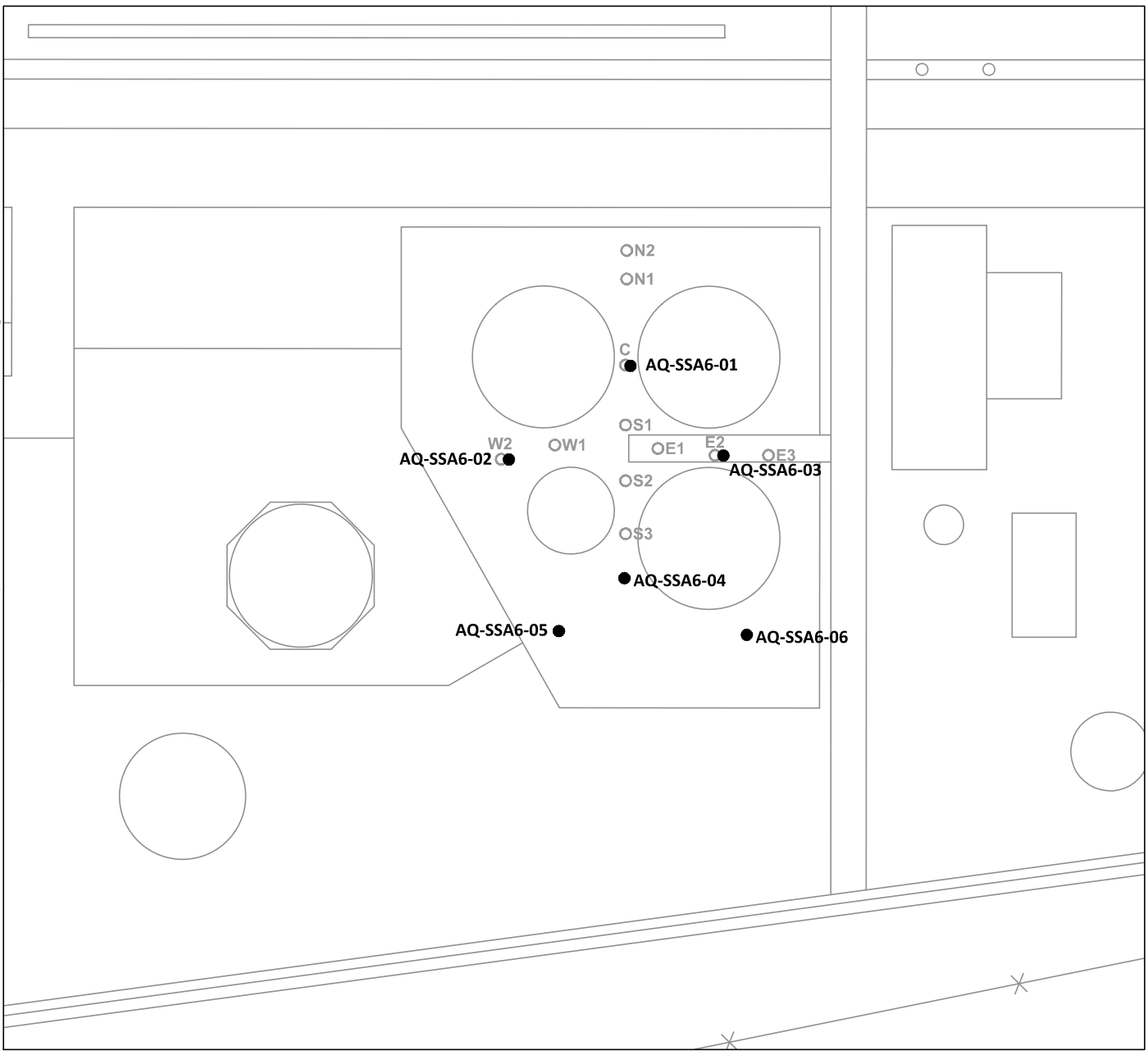
0 100

Scale in Feet

NOTE: Sampling locations are approximate and may be changed based on field conditions.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

ANCHOR QEA

Figure 7
Proposed Sampling Locations for Supplemental Study Activity 5
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington



Proposed Sampling Locations

- **AQ-SSA6-01** ■ Test Pit
- **AQ-SSA6-12** ● Geoprobe
- **PZ-2D, G2S** ⊕ Monitoring Well
- **W2** △ Surface Water Sample

Previously Sampled Locations

- □ Test Pit
- ○ Chinook Soil Sample
- RL-1S ⊕ Monitoring Well
- LYS2 ⧅ Lysimeter
- RY1 ⦶ Soil Sample
- SPLP3 ⊞ SPLP Soil
- AQB02 ⊕ Geotechnical Boring

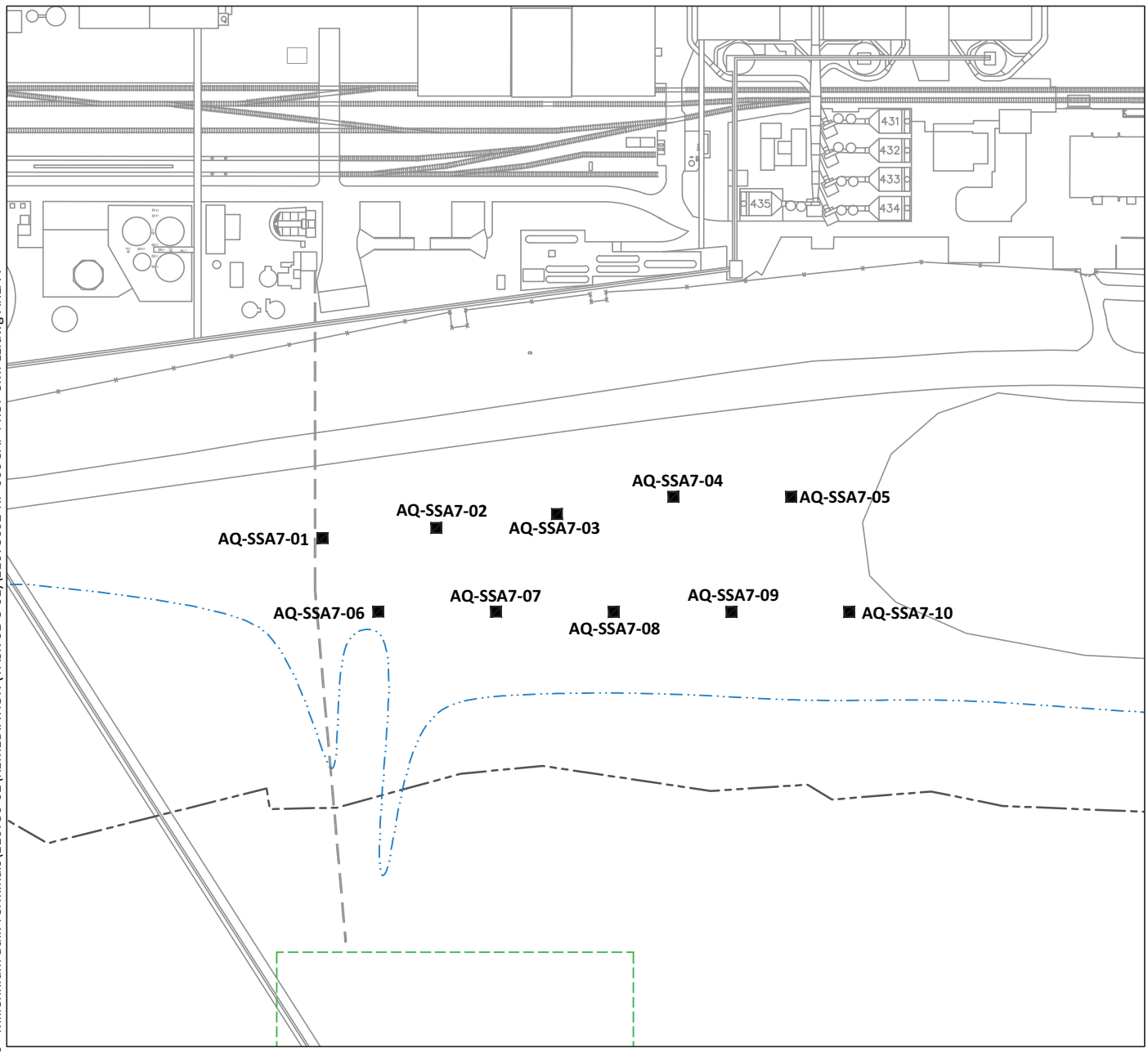
0 40
Scale in Feet

NOTE: Sampling locations are approximate and may be changed based on field conditions.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

K:\Jobs\110730 - Millennium Bulk Terminals\110730-02\REMEDIATION (TASK 01-C-01)\11073002-RP-006 SAP PROP SMPLE.dwg AREA 6
Aug 12, 2011 3:54pm heriksen

Figure 8
Proposed Sampling Locations for Supplemental Study Activity 6
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington

ANCHOR QEA



K:\Jobs\110730 - Millennium Bulk Terminals\110730-02\REMEDIATION (TASK 01-C-01)\11073002-RP-006 SAP PROP SMPLE.dwg AREA 7

Aug 12, 2011 3:54pm heriksen

Proposed Sampling Locations

- **AQ-SSA7-01** ■ Test Pit
- **AQ-SSA7-12** ● Geoprobe
- **PZ-2D, G2S** ⊕ Monitoring Well
- **W2** △ Surface Water Sample

Previously Sampled Locations

- □ Test Pit
- ○ Chinook Soil Sample
- RL-1S ⊕ Monitoring Well
- LYS2 ⧅ Lysimeter
- RY1 ⦶ Soil Sample
- SPLP3 ⊞ SPLP Soil
- AQB02 ⊕ Geotechnical Boring

True North

Project North

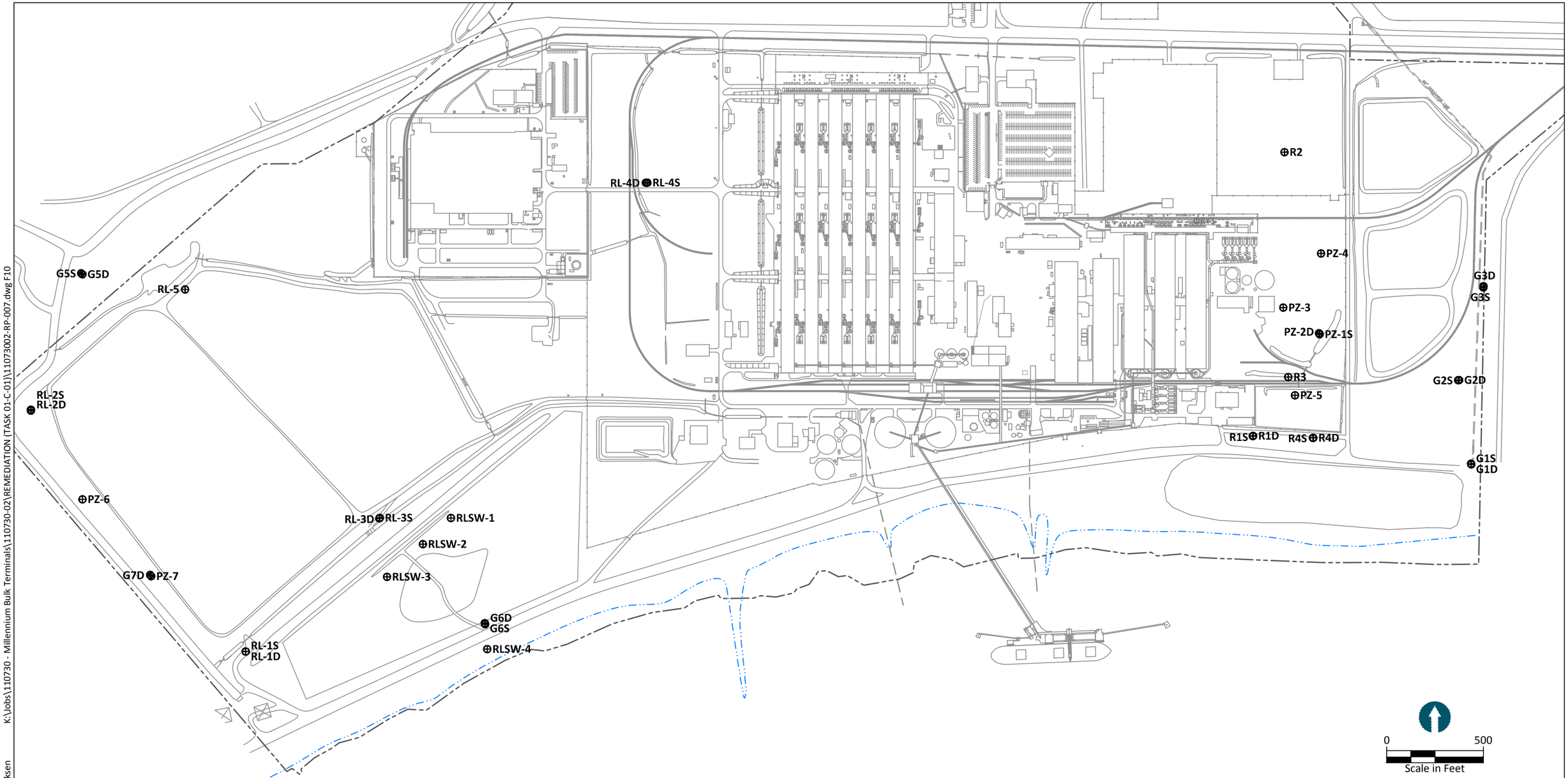
0 200

Scale in Feet

NOTE: Sampling locations are approximate and may be changed based on field conditions.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

Figure 9
Proposed Sampling Locations for Supplemental Study Activity 7
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington

ANCHOR QEA



LEGEND:

PZ-2D, G2S Proposed Resampling Well Locations

Site Boundary

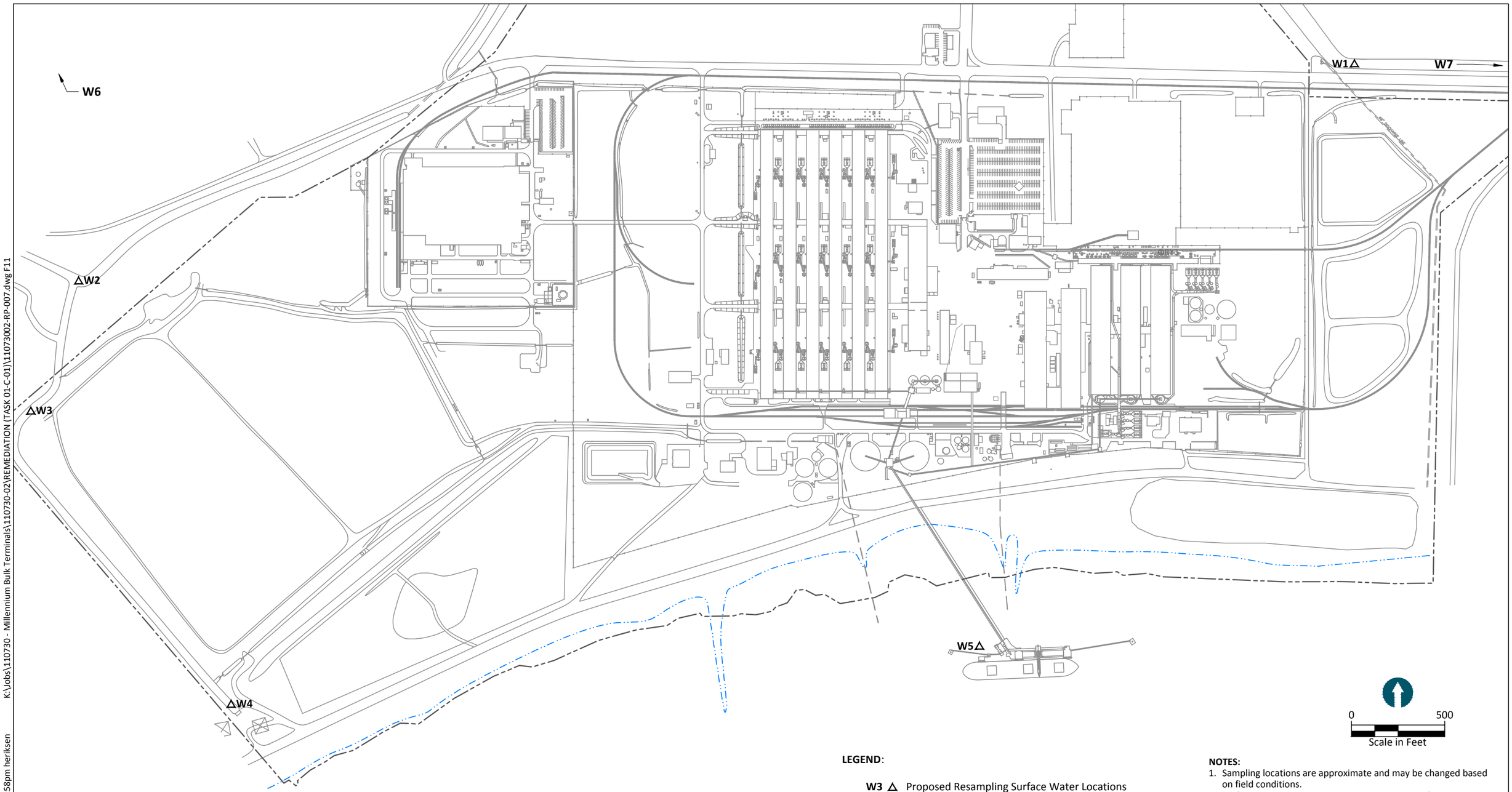
Approximate Ordinary High Water Line

NOTE: Sampling locations are approximate and may be changed based on field conditions.
HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

Aug 18, 2011 9:33am heriksen K:\Jobs\110730 - Millennium Bulk Terminals\110730-02\REMEDIATION (TASK 01-C-01)\11073002-RP-007.dwg F10

ANCHOR QEA

Figure 10
Groundwater Sampling Locations - Supplemental Study Activity 9
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington



LEGEND:

W3 △ Proposed Resampling Surface Water Locations

Site Boundary

Approximate Ordinary High Water Line

NOTES:
1. Sampling locations are approximate and may be changed based on field conditions.
2. Surface Water samples W6 and W7 are outside of the site boundary and are not shown on this figure.

HORIZONTAL DATUM: Washington State Plane South, NAD83, US Survey Feet.
VERTICAL DATUM: NGVD 29.

Aug 12, 2011 3:58pm heriksen K:\Jobs\110730 - Millennium Bulk Terminals\110730-02\REMEDIATION (TASK 01-C-01)\11073002-RP-007.dwg F11

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Figure 11
Surface Water Sampling Locations - Supplemental Study Activity 10
Sampling and Analysis Plan Addendum
Former Reynolds Metals Reduction Plant - Longview, Washington

APPENDIX A
FIELD FORMS AND LOGS

Daily Log

Anchor QEA, LLC
720 Oive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: _____ **DATE:** _____

SITE ADDRESS: _____ **PERSONNEL:** _____

WEATHER: **WIND FROM:**

N	NE	E	SE	S	SW	W	NW
SUNNY		CLOUDY		RAIN		?	

LIGHT	MEDIUM	HEAVY

TEMPERATURE: ° F . ° C
[Circle appropriate units]

TIME	COMMENTS

Signature: _____

ANCHOR QEA

LOG OF GEOPROBE EXPLORATORY BORING

CLIENT/PROJECT NAME_____ BORING #_____

PROJECT NUMBER_____ DATE BEGAN_____

GEOLOGIST/ENGINEER_____ DATE COMPLETED_____

DRILLING CONTRACTOR_____ TOTAL DEPTH_____

DRILLING METHOD_____ SHEET_____OF_____

HOLE DIAMETER_____

OTHER*	COMMENTS	SAMPLING DATA: SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	DRIVE (1-5, 1=easy 5=hard)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring / LITHOLOGIC DESCRIPTION
								1		
								2		
								3		
								4		
								5		
								6		
								7		
								8		
								9		
								0		
								1		
								2		
								3		
								4		
								5		
								6		
								7		
								8		
								9		
								0		

Remarks:

Soil Boring Processing Log

ANCHOR QEA

Boring Location:									Boring ____ Date ____ Sheet ____ of ____ Job ____ Job No. ____ Logged By ____ Weather ____ Drilled By ____ Drill Type/ Method ____ Sampling Method				
Elevation: Datum:									Bottom of Boring ____ ATD Water Level Depth				
Obs. Well Install. Yes No													
SIZE (%)			PID or other	DEPTH		SAMPLE		SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMMARY LOG (Water & Date)	
G	S	F		From	To	Type	Number						
Max.	Range	Att. Limits						0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0					

ANCHOR QEA

SOIL TEST PIT LOG

CLIENT/PROJECT NAME_____ TEST PIT #_____

PROJECT NUMBER_____ DATE BEGAN_____

GEOLOGIST_____ DATE COMPLETED_____

EXCAVATION CONTRACTOR_____ TOTAL DEPTH_____

EXCAVATION METHOD_____ SHEET_____OF_____

PIT DIAMETER_____

SAMPLING DATA					DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of test pit
SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	DEPTH SAMPLED (feet)			**LITHOLOGIC DESCRIPTION**
					1		
					2		
					3		
					4		
					5		
					6		
					7		
					8		
					9		
					0		
					1		
					2		
					3		
					4		
					5		
					6		
					7		
					8		
					9		
					0		

Notes:

WELL DEVELOPMENT FORM

Project No.	Date: Well:	
Site Location:	Initial DTB:	Final DTB:
Name:	Initial DTW:	Final DTW:
Development Method:	Pore Volume:	
Total Water Removed:	Casing Diameter:	
Water Contained ? NO	Meter #:	
Estimate of specific capacity or recharge to well:		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments

GROUNDWATER SAMPLING DATA SHEET

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Office: 206.287.9130 Fax: 206.287.9131

PROJECT NAME: **WELL ID:**

SITE ADDRESS: **BLIND ID:**

DUP ID: **NA**

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY		CLOUDY		RAIN		?		**TEMPERATURE:**	° F .	° C

[Circle appropriate units]

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW [Product Thickness]	DTB-DTW [Water Column]		[Water Column x Gal/ft] Volume (gal)
/ /	:	.	.	.	.	.	X 1	.
/ /	:	.	.	.	.		X 3	.

Gal/ft = (dia./2)^2 x 0.163	1" = 0.041	2" = 0.163	3" = 0.367	4" = 0.653	6" = 1.469	10" = 4.080	12" = 5.875

§ METHODS: (A) Submersible Pump (B) Peristaltic Pump (C) Disposable Bailer (D) PVC/Teflon Bailer (E) Dedicated Bailer (F) Dedicated Pump (G) Other =

GROUNDWATER SAMPLING DATA (if product is detected, do NOT sample) Sample Depth: [√ if used]

Bottle Type	Date	Time	Method §	Amount & Volume mL	Preservative [circle]	Ice	Filter	pH	√
VOA Glass	/ /	:		3	40 ml HCl	YES	NO		
Amber Glass	/ /	:			250, 500, 1L (None) (HCl) (H_2SO_4)	YES	NO		
White Poly	/ /	:			250, 500, 1L None	YES	NO	NA	
Yellow Poly	/ /	:			250, 500, 1L H_2SO_4	YES	NO		
Green Poly	/ /	:			250, 500, 1L NaOH	YES	NO		
Red Total Poly	/ /	:			250, 500, 1L HNO_3	YES	NO		
Red Diss. Poly	/ /	:			250, 500, 1L HNO_3	YES	YES		
	/ /	:			250, 500, 1L	YES			
Total Bottles (include duplicate count):									

Analysis Allowed per Bottle Type

BOTTLE TYPE	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
VOA - Glass	(8021) (8260B) (BTEX) (NWTPH-Gx)
AMBER - Glass	(PAH) (TPH-HCID) (NWTPH-Dx) (TPH-418.1) (Oil &Grease) (8081A)
WHITE - Poly	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO_3/CO_3) (Cl) (SO_4) (NO_3) (NO_2) (F)
YELLOW - Poly	(COD) (TOC) (Total PO_4) (Total Keldahl Nitrogen) (NH_3) (NO_3/NO_2)
GREEN - Poly	(Cyanide)
RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA Purge Start Time: : Pump/Bailer Inlet Depth:

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O_2 (mg/l)	Water Quality
4		.	.		.		.	
3		.	.		.		.	
2		.	.		.		.	
1		.	.		.		.	
0		**0.00**	.		.		.	

[Casing] [Select A-G] [Cumulative Totals] [Circle units] [Clarity, Color]

SAMPLER:

(PRINTED NAME) (SIGNATURE)

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

Water Quality Sample Form

Station ID:		**Date:**	**Time:**
Project Name:		**Project Number:**	
Coordinates: Datum**:**			
Lat/Northing		Long/Easting	
Depth of Sample (LLW):			
Weather Observations:			
Field Parameters			
Temperature	°C	Turbidity	NTU
pH		DO	mg/L
TSS Collected	Y / N		
Evidence of floating or suspended materials:		Y / N	Description:
Evidence of oil/hydrocarbon sheen:		Y / N	Description:
Discoloration and Turbidity:			
	Color:		
	Source:		
	Area:		
	Plume:	Y / N	
Odor	none, slight, moderate, strong H_2S, petroleum, septic		
Volume collected:			
Comments: TSS samples taken to lab: Date:_____ Time: _____			
Recorded by:			

ATTACHMENT B
QUALITY ASSURANCE PROJECT PLAN ADDENDUM

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

MEMORANDUM

To:	Paul Skyllingstad, Washington State Department of Ecology	**Date:**	August 23, 2011
From:	Rebecca Gardner, Nicole LaFranchise, Leslie McKee, and Mark Larsen, Anchor QEA, LLC		
Cc:	Mark Stiffler and Steve Shaw, Northwest Alloys, Inc. Kristin Gaines, Millennium Bulk Terminals – Longview, LLC		
Re:	Quality Assurance Project Plan Addendum		

INTRODUCTION

The purpose of this memorandum is to provide the Washington State Department of Ecology (Ecology) with an addendum to the *Quality Assurance Project Plan for Chinook Venture, Inc, Longview, Washington* previously prepared by Anchor Environmental, L.L.C., and submitted in June 2007. This Quality Assurance Project Plan (QAPP) Addendum provides additional quality assurance (QA) objectives for conducting sampling and evaluation activities at the Former Reynolds Metals Reduction Plant in Longview, Washington.

In 2007, a Remedial Investigation (RI) was performed at the site and included the analysis of soil and groundwater for volatile organic compounds (VOCs), diesel range organics (DRO), oil range organics (ORO), pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), semi-volatiles organic compounds (SVOCs), metals, and several conventional chemistry tests. This QAPP Addendum is an attachment to the Work Plan Addendum (Anchor QEA 2011), which describes the tasks necessary to augment previous sampling information for soil, groundwater, and surface water at the site. This QAPP Addendum provides project management updates, QA objectives, analyte lists, sample collection requirements, and laboratory QA requirements for additional soil and groundwater site investigations. All other QA/quality control (QC) procedures will follow the 2007 QAPP (Anchor 2007).

PROJECT MANAGEMENT

The project team for the QAPP Addendum has been updated as follows:

- Ecology Project Manager: Paul Skyllingstad
- Anchor QEA Project Manager: Mark Larsen
- Anchor QEA Field Coordinator: Tim Stone
- Anchor QEA QA/QC Manager: Delaney Peterson
- Anchor QEA Data Manager: Laurel Menoche
- Laboratory Manager: Darwin Thomas of Apex Laboratories in Tigard, Oregon

DATA QUALITY OBJECTIVES AND CRITERIA

The analyte lists, analytical method, and target quantitation limits for soil and groundwater are provided in Table 1. The quantitative goals for the laboratory data are provided in Table 2.

DATA GENERATION AND ACQUISITION

Samples will be collected, preserved, and analyzed within the method protocols provided in Table 3. The laboratory will follow the method QA/QC criteria provided in Table 4.

DATA VALIDATION AND USABILITY

Project data quality will be reviewed as identified in the 2007 QAPP (Anchor 2007) including Level 3 validation.

REFERENCES

Anchor Environmental, L.L.C., 2007. *Quality Assurance Project Plan for Chinook Venture, Inc., Longview, Washington*. June 2007.

Anchor QEA, LLC, 2011. *Work Plan Addendum*. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. July 2011.

TABLES

Table 1
Parameters for Analysis, Methods, and Target Quantitation Limits

Parameter	Analytical Method	Laboratory Reporting Limit[1,2]
Soils Analysis		
Conventional and Physical Parameters (mg/kg dry weight)		
Soil Description and Classification	ASTM D-2488/D-2487	--
Total Organic Carbon	SM5310B MOD	200
Ammonia	SM4500-NH3 MOD	0.20
Fluoride	300.0/9056A	1.00
Nitrate/Nitrite	varies	0.20
Total Kjeldahl Nitrogen	351.4/4500N D	1.00
Total Nitrogen	Calculation	--
Sulfate	300.0/9056A	--
Sulfide	376.2	1.00
Phosphate	300.0/9056A	1.00
Total Phosphorous	SM4500 P B	5.00
Cyanide (µg/kg dry weight)		
Total Cyanide	9013M/9014	0.25
WAD Cyanide	9013M/SM4500-CN (I/E)	--
Petroleum Hydrocarbons (mg/kg dry weight)		
TPH-diesel range hydrocarbons	NWTPH-Dx	4.00
TPH-heavy oil range hydrocarbons	NWTPH-Dx	8.00
Petroleum Fractionation-Extractable	EPH	--
Metals (mg/kg dry weight)		
Aluminum	6020	50
Antimony	6020	1
Arsenic	6020	2
Beryllium	6020	1
Cadmium	6020	0.2
Calcium	6020	100
Chromium	6020	2.0
Copper	6020	4.0
Iron	6020	50
Lead	6020	1
Magnesium	6020	50
Manganese	6020	1.00
Mercury	6020	0.80
Nickel	6020	2
Potassium	6020	100
Selenium[2]	6020	2
Silicon	6010C	100
Silver	6020	1.0
Sodium	6020	100
Thallium	6020	1.0
Zinc	6020	4
Polycyclic Aromatic Hydrocarbons (PAHs; µg/kg dry weight)		
Acenaphthene	8270	4.00
Acenaphthylene	8270	4.00
Anthracene	8270	4.00
Benz(a)anthracene	8270	4.00
Benzo(a)pyrene	8270	6.00
Benzo(b)fluoranthene	8270	6.00
Benzo(k)fluoranthene	8270	6.00
Total benzofluoranthenes	8270	--
Benzo(g,h,i)perylene	8270	4.00

Table 1
Parameters for Analysis, Methods, and Target Quantitation Limits

Parameter	Analytical Method	Laboratory Reporting Limit[1,2]
Chrysene	8270	4.00
Dibenzo(a,h)anthracene	8270	4.00
Dibenzofuran	8270	4.00
Fluoranthene	8270	4.00
Fluorene	8270	4.00
Indeno(1,2,3-cd)pyrene	8270	4.00
1-Methylnaphthalene	8270	8.00
2-Methylnaphthalene	8270	8.00
Napthalene	8270	8.00
Phenanthrene	8270	4.00
Pyrene	8270	4.00
Polychlorinated Biphenyls (PCBs; µg/kg dry weight)		
Aroclor 1016	8082A	10
Aroclor 1221	8082A	10
Aroclor 1232	8082A	10
Aroclor 1242	8082A	10
Aroclor 1248	8082A	10
Aroclor 1254	8082A	10
Aroclor 1260	8082A	10
Surface Water Analysis		
Conventional Parameters (mg/L)		
Total Dissolved Solids	SM2540 B	10
Fluoride	300.0/9056A	0.1
Sulfate	300.0/9056A	0.1
Total Chloride	--	--
Total Phosphorous	SM4500 P B	0.1
Alkalinity	SM2320B	1.0
Total Metals (µg/L)		
Aluminum	6020	50
Calcium	6020	100
Iron	6020	50
Magnesium	6020	50.0
Manganese	6020	1.0
Potassium	6020	100.0
Silicon	6010C	35.0
Sodium	6020	100
Cyanide (mg/L)		
Total Cyanide	335.4	0.005
WAD Cyanide	SM4500-CN (I/E)	0.005
Free Cyanide	ASTM D 4282	0.005

Notes:

µg/L = microgram per liter

µg/kg = microgram per kilogram

ASTM = American Society of Testing Materials

mg/kg = milligram per kilogram

mg/L = milligram per liter

SM - Standard Method

1 Quantitation limits derived from *Test Methods for Evaluating Solid Waste,* SW-846 (USEPA 1986).

2 Specific quantitation limits are matrix-dependent. Quantitation limits listed are provided for guidance and

Table 2
Quantitative Goals for Analytical Data

Parameter	Replicate and MS/MSD Precision	LCS and MS/MSD Accuracy	Completeness
Soil Parameters			
Total organic carbon	± 20% RPD	75-125% R	95%
Metals	± 20% RPD	75-125% R	95%
Petroleum hydrocarbons	± 35% RPD	50-150% R	95%
Cyanide	± 20% RPD	75-125% R	95%
Polycyclic aromatic hydrocarbons (PAHs)	± 35% RPD	50-150% R	95%
Polychlorinated biphenyls (PCBs)	± 35% RPD	50-150% R	95%
Nutrients	± 20% RPD	75-125% R	95%
Water Parameters			
Total dissolved solids	± 20% RPD	NA	95%
Nutrients	± 20% RPD	80-120% R	95%
Metals	± 20% RPD	80-120% R	95%
Cyanide	± 20% RPD	75-125% R	95%

Notes:
LCS = laboratory control sample
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
R = recovery
RPD = relative percent difference
SRM = standard reference material

Table 3
Guidelines for Sample Handling and Storage

Parameter	Sample Size	Container Size and Type[1]	Holding Time	Preservative
Soil Analysis				
Total organic carbon	50 g	8-oz glass	14 days	Cool/4° C
			6 months	Freeze -18°C
Metals	50 g	from TOC jar	6 months	Cool/4° C
			2 years	Freeze/-18° C
Cyanide (WAD, Total) [2]	100 g	from TOC jar	14 days	Cool/4° C
Fluoride	50 g	from TOC jar	28 days	Cool/4° C
Ammonia	50 g	from TOC jar	7 days	Cool/4° C
Nitrate/Nitrite	50 g	from TOC jar	7 days	Cool/4° C
Total kjeldahl nitrogen, total phosphorous, fluoride, sulfate	50 g	from TOC jar	28 days	Cool/4° C
Phosphate	50 g	from TOC jar	48 hours	Cool/4° C
Sulfide	50 g	2-oz glass, no headspace	7 days	ZnAC/Cool 4° C
Total petroleum hydrocarbons, diesel and residual range	150 g	8-oz glass	14 days until extraction	Cool/4° C
			1 year until extraction	Freeze -18°C
			40 days after extraction	Cool/4° C
Polychlorinated biphenyls (PCB)	50 g	4oz jar	14 days until extraction	Cool/4° C
			1 year until extraction	Freeze/ -18°C
			40 days after extraction	Cool/4° C
Extractable petroleum hydrocarbons (EPH)	50 g	4oz jar	14 days until extraction	Cool/4° C
			1 year until extraction	Freeze/ -18°C
			40 days after extraction	Cool/4° C
Polycyclic aromatic hydrocarbons (PAHs)	150 g	16-oz Glass	14 days until extraction	Cool/4° C
			1 year until extraction	Freeze -18°C
			40 days after extraction	Cool/4° C
Water Analysis				
Total dissolved solids	500 mL	1-L HDPE	7 days	Cool/4° C
Fluoride	50 mL	500-mL HDPE	28 days	Cool/4° C
Total chloride	50 mL	From fluoride bottle	28 days	Cool/4° C
Sulfate	50 mL	From fluoride bottle	28 days	Cool/4° C
Total phosphorous	100 mL	500-mL HDPE	28 days	H_2SO_4 to pH < 2/ Cool/4° C
Alkalinity	100 mL	500-mL HDPE	14 days	Cool/4° C
Cyanide (WAD, Total) [2]	100 mL	500-mL HDPE	14 days	NaOH to pH > 12/ Cool/4°C
Free cyanide	100 mL	500-mL HDPE	48 hours	NaOH to pH > 12/ Cool/4°C
Metals	200 mL	500-mL HDPE	6 months	HNO_3 to pH < 2/ Cool/ 4° C HNO3

Notes:
° C = degree Celsius
HDPE = high density polyethylene
L = liter, mL = milliliter, oz = ounce
1 All sample containers will have lids with teflon inserts
2 WAD = weak acid dissociable

Table 4
Laboratory Quality Assurance/Quality Control Criteria

Analysis Type	Field Quality Assurance Samples			Laboratory Quality Control Elements								
	Rinsate Blank	Field Duplicates[1]	Temperature Blank	Initial Calibration	Ongoing Calibration	Replicates	Matrix Spikes	LCS	SRM[5]	Matrix Spike Duplicates	Method Blanks	**Surrogate Spikes**
Total solids/total dissolved solids	NA	1 per 20 samples	1 per cooler	Each batch [2,3]	NA	1 per 20 samples	NA	NA	NA	NA	NA	NA
Total organic carbon	1 per sampling method	1 per 20 samples	1 per cooler	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	NA
Nutrients	1 per sampling method	1 per 20 samples	1 per cooler	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	NA
Metals	1 per sampling method	1 per 20 samples	1 per cooler	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per sampling event	NA	1 per 20 samples	NA
PAHs	1 per sampling method	1 per 20 samples	1 per cooler	As needed[4]	Every 12 hours	NA	1 per 20 samples	1 per 20 samples	1 per sampling event	1 per 20 samples	1 per 20 samples	Every sample
PCBs	1 per sampling method	1 per 20 samples	1 per cooler	As needed[4]	1 per 10 samples	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
TPH/EPH	1 per sampling method	1 per 20 samples	1 per cooler	As needed[4]	1 per 10 samples	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample

Notes:
EPH = extractable petroleum hydrocarbons
LCS = laboratory control sample
NA = not applicable
SRM = standard reference material
TPH = Total petroleum hydrocarbons
PCBs = polychlorinated biphenols
1 Field duplicates will be taken for water samples only. No soil field duplicates will be collected.
2 Calibration and certification of drying ovens and weighing scales are conducted bi-annually.
3 Initial calibration verification and calibration blank must be analyzed at the beginning of each batch.
4 Initial calibrations are considered valid until the ongoing continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.
5 Where a SRM is available.
PCBs will have all detects confirmed via second column confirmation. The second column must be of a dissimilar stationary phase from the primary column and meet all method requirements for acceptance.